
Cost and Management Accounting-I

Cost and Management Accounting-I

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Preface

In the last few years, there have been many changes in the field of Cost and Management Accounting. In the past, the role of the cost and management accountants was very narrow. Nowadays, their job is not only limited to report the past events to the management, but also they act as internal consultants. They are actively involved in the decision-making process of the organisation. Hence, there is a dire need to equip students with the skills required according to the dynamic requirements of the corporate world so that they can pursue this profession with efficacy.

This book has been a modest approach in this direction. Cost and Management Accounting-I has been structured as per the CBCS syllabus prescribed by the University of Calcutta w.e.f. 2017-18, for the students of B. Com Semester II.

Thorough knowledge of the subject is of vital importance for the students, and hence, a sincere effort has been made throughout this book to give students a clear view of the subject. Considering the changing students' need, a considerable restructuring of the book has been done, especially in terms of pedagogical respect.

Previous years' CU question papers with solutions have been provided in every chapter. The question papers are further segregated into two categories: 'for general course students' and 'for honours course students'. The questions provided in the book will enable the students to assess the kind of questions asked in the university examination and will also help them in evaluating their conceptual understanding.

An exclusive section named 'special problems' has been dedicated for advance learners. It includes questions that are more challenging and are of higher order of difficulty.

A number of colleagues, friends and students helped in the preparation of this book. The author thanks each and every one of them. Special thanks to Mr. S. Rangarajan for typesetting and formatting the book.

Utmost care has been taken to make this book error-free, but still if any error comes up, it can be addressed at pmhanif@gmail.com. All suggestions will be most welcomed.

M Hanif

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Syllabus

CC2.1Ch: Cost and Management Accounting–I

(As per CBCS Syllabus prescribed by University of Calcutta w.e.f. 2017–18)

Marks : 100

Internal Assessment	20 marks
Semester-end Examinations	<u>80 marks</u>
Total	<u>100 marks</u>

Marks shown against the units indicate marks for Semester-end Examinations

Unit	Topic	Content	Marks	Chapters in Book
1.	Introduction	◆ Definition of Costing, Objectives of Cost Accounting; Management Accounting and difference with Cost Accounting; Installing a Cost Accounting System, Essentials of a good Cost Accounting System. ◆ Cost concepts, terms and classification of costs: Cost, Cost objects, Cost units and Cost Centres, Types of costs, classification of costs – Direct Indirect, Element-wise, Function-wise, Behaviour-wise, Sunk Cost, Opportunity Cost, Costing Methods and Techniques (introduction only).	10	Chapter-1 Chapter-2
2.	Material Costs	◆ <i>Purchase of materials</i>: Organisation, purchase procedure, documentation, determination of material purchase costs. ◆ <i>Storage of materials</i>: Need for storage, location and types, functions of a storekeeper, requisition, receipt, issue and transfer of materials, storage record, accounting for materials cost. ◆ <i>Materials control</i>: Organisation; Tools: Just-in-Time Purchase; Various stock levels, Economic Ordering Quantity and ABC Analysis; Periodic Inventory, Perpetual Inventory, Physical Verification; Discrepancies in stock and their treatment. ◆ <i>Methods of Pricing Material Issues</i>: FIFO, LIFO and Weighted Average. ◆ Treatment of Normal and Abnormal Loss of Materials.	10	Chapter-3

Unit	Topic	Content	Marks	Chapters in Book
3.	Employee Cost and Incentive Systems	◆ Introduction, Recording Labour Cost: Attendance and Payroll procedure (Time-keeping, Time-Booking, Payroll procedure, Payment of Wages – Piece Rate, Different Piece Rate, Time Rate); Idle Time (causes and treatment in Cost Accounting), Overtime (its effect and treatment in Cost Accounting), Labour Turnover (Causes, Impact and Methods of calculating Labour Turnover). ◆ Main Principles for sound system of wage incentive schemes, labour utilization, System of wage payment and incentives (Halsey, Halsey-Weir, Rowan and Emerson). ◆ System of Incentive schemes for Indirect Workers; Component of wages cost for costing purpose.	10	Chapter-4
4.	Overhead and Cost Statement	Overhead ◆ <i>Introduction</i>: Definition, Classification of Overhead – Functional and Behavioural. ◆ <i>Manufacturing Overheads</i>: Allocation and apportionment of Overhead; Absorption of Overhead; Various methods and their application; Treatment of under absorption / over absorption of overheads. ◆ <i>Administration and Selling & Distribution Overheads and their charging</i>: an introduction only. ◆ Preparation of Cost Sheet and estimation.	20	Chapter-5
5.	Cost Book-Keeping	◆ <i>Non-Integrated System</i>: Meaning & Features; Ledgers Maintained; Accounts prepared; General / Cost Ledger Adjustment Accounts; Meaning of Closing Balance in Various Accounts; Disadvantages. ◆ <i>Reconciliation</i>: Need for reconciliation, Items causing differences between Cost and Financial Profits and their reconciliation.	10	Chapter-6
6.	Costing Methods	◆ <i>Job Costing</i>: (Job cost cards and databases, Collection direct costs of each job, Attributing overhead costs to jobs, Application of job costing). Batch Costing. ◆ <i>Contract Costing</i>: Progress payments, Retention money, Escalation clause, Contract Accounts, Accounting for material, Accounting for plant used in a contract, Contract Profit and Balance Sheet entries. ◆ <i>Service Costing and Output Costing</i>: Introduction; Motor Transport Costing only. ◆ <i>Process Costing</i>: Meaning, Features, Process vs. Job Costing, Principles of Cost ascertainment for Materials, Labour & Overhead; Normal Loss, Abnormal Loss and Gain and Preparation of Process Accounts. Inter-process profit (simple cases), Valuation of WIP and equivalent units (excluding intermediary process).	20	Chapter-7 Chapter-8 Chapter-9 Chapter-10
	TOTAL		80	

Introduction to Cost Accounting

Definition of Cost Accounting

Kohler defines 'cost accounting' as a "... *that branch of accounting dealing with the classification, recording, allocation, summarisation and reporting of current and prospective costs. Included in the field of cost accounting are the design and operation of cost systems and procedures; the determination of costs by departments, functions, responsibilities, activities, products, territories, periods and other units of forecasted future costs and standard or desired costs, as well as historical costs; the comparison of costs of different periods, of actual with estimated or standard costs, and of alternative costs; the presentation and interpretation of cost data as an aid to management in controlling current and future operations.*"

Cost accounting is concerned with setting up budgets and actual cost of operations, processes, departments or product and the analysis of variances, profitability or social use of funds. The managers, to support decision-making to cut a company's costs and improve profitability, use Cost Accounting. The information produced by the cost accountants is for internal use of the business for taking future decisions and therefore, not exposed to the outsiders. These reports need not follow accounting standards, because its primary use is for internal managers, rather than outside users. Therefore, what to compute is decided pragmatically i.e., practicably, based on the need of the management.

To understand cost accounting and its role in an organisation, you have to learn why an organisation should keep the accounts after all. Accounting is divided into two parts :

- (i) Financial Accounting
- (ii) Management Accounting

Financial accounting is concerned with preparing the financial reports like, the Balance Sheet, the Profit and Loss Accounts, Cash Flow Statement, etc. based on transaction during the accounting period.

These reports work as the scorecards of the company and are prepared for the benefit of the shareholders/owners, lenders, tax authorities, regulators and other interested parties, i.e., the external stakeholders of a business.

Stakeholders are those who have a vested interest in the business and/or its products and services. Generally, stakeholders of an organisation are :

- ⇒ Customers
- ⇒ Suppliers
- ⇒ Employees
- ⇒ Investors and
- ⇒ Communities

Since the outsiders use financial reports and they take important decisions like, investing money in the organisation etc., based on these reports, there should be some common baseline on which the reports are prepared, so that they are same and comparable with other organisations. Making of the financial reports have to follow some norms and guidelines. These are called the generally accepted accounting principles or GAAP. Recent trend is to follow a global protocol for keeping accounting records – IFRS. The financial reports or accounts should be precise, correct and must follow the generally accepted accounting principles. Basically financial accounting is mandatory for external reports.

1.2 Introduction to Cost Accounting

Management accounting, on the other hand, is concerned with providing the information to the managers. This branch of accounting reports to the managers of the organisation and on the basis of these reports, the managers perform their job of planning, directing, motivating, controlling and performance evaluation. When we will discuss various aspects of management accounting with more details, you will understand that, it puts emphasis on decision affecting the future of the organisation.

Cost accounting is an integral part of management accounting, which deals with budget and actual cost of operation, different work processes, departments or products and the analysis of variances and ultimately the profitability and expansion of the business organisation. You can well understand that a manager's job would naturally be to reduce cost and increase profitability. For this, the management needs to convert the different events of the supply chain into financial values and cost accounting precisely does that for the business.

Role of Cost Accounting

The role of a cost accountant in an organisation is manifold. A cost accountant, though reports mainly to the manager, also takes part in external reporting. In present days, the difference between cost accounting and management accounting is reducing, as both involve the same plethora of activities. However, cost accounting is more about calculation and analysis, whereas, management accounting is more involved in strategic decision-making.

The most important tasks of a cost accountant are :

1. External reporting
2. Internal reporting
3. Scorekeeping
4. Budgeting
5. Cost reduction analysis
6. Pricing
7. System development and maintenance
8. Cost-benefit analysis
9. Internal consulting
10. Government billings

Let us discuss these traditional tasks of a cost accountant first, and then we will study the future role of a cost accountant in the changing scenario.

1. External Reporting

Although cost accounting is a part of management accounting, which mostly deals with internal reporting, a cost accountant, however, contributes a lot in making of external financial reports of the organisation. You must understand the fact, that management accounting and cost accounting mainly reports to the internal users of an organisation like the managers and financial accounting reports to the external users like shareholders, bankers, customers etc. but, in many cases, cost accountants need to provide crucial information for these external reports, too.

One such example case is, inventory valuation. Inventory valuation, in turn, affects the cost of goods sold. Both these valuation, which is part of the financial report, requires involvement of a cost accountant in cost layering technique. The cost accountant needs to ensure that the qualities and cost of the inventory is accurate, as the financial reports demand accuracy. The cost accountant is also responsible for compiling these data into suitable format, as needed for the external reporting.

Later on, you will see that management accounting reports are segmented on the departments, divisions, products, customers and employee – according to the need and policy of the organisation. The financial accountant calculates the profit of the past accounting period for the entire organisation. The cost accountant provides the profitability levels for different product lines or profit levels by division. The cost accountant may also contribute few footnotes to the financial statements.

2. Internal Reporting

This is the main role of a cost accountant in an organisation. Depending upon the rules, conventions and requirements of an organisation, the cost accountant can follow any costing paradigm, i.e., any approaches for preparing the informative reports to the management team. These approaches could be one of the following: job costing, process costing, direct-cost costing, activity based costing, throughput costing and so on. We will study the most prevalent approaches in detail in due time.

However, the cost accountant can follow different reporting structures, based on the need of the management. The following structures are most commonly used :

Corporate level reports: These reports are for the senior-most level of management and contain only information regarding critical success factors, bottom-line profits, forecasts at the product line level and returns on investments, for each production facility or store.

Business unit level reports: These reports are basically about department-wise information on operational issues like, inventory turnover, machine utilisation, profitability and cash flow projection. These reports need thorough understanding and of financial as well as operational information and its compilation.

Function level reports: These are lower level functional reports, prepared, for example, on each machine used. Generally, these reports are custom-designed turnover for every recipient. These reports could be both operational as well as financial. For example, an inventory turnover report prepared for a warehouse manager would contain operational report, and a report on bad debts prepared for a sales manager will be a financial report.

Project-specific reports: These reports are prepared on individual project and the cost and contain information on cost and resource allocation on each project. These reports are prepared for :

- ⇒ Comparing the budgeted cost and include cost at different stages of the project.
- ⇒ Providing different operational statistics, percentage of completion, etc.
- ⇒ Preparing various to-do lists.

Decision-specific reports: Many times cost accountants are called to report on a specific issue, for example, reduction of wastage in a specific production process. The decision specific reports are prepared during such occurrence and discarded thereafter.

The job of and role of a cost accountant spreads over every single nook and corner of the organisation. It's a challenging and highly interesting job. When you go to the corporate world, you will find that different enormous range of issues might come under internal reporting.

3. Scorekeeping

Other than preparing the above-mentioned formal reports, a cost accountant issues numerous scorekeeping record cards on different daily activities, for example, the graphs on machine utilisation.

4. Budgeting

Budgeting is one of the most important aspects of running a successful business organisation, where the contribution of a cost accountant is quite prominent. A company makes its production budget for a year for taking a business decision. Now, this production budget is combination of :

- ⇒ Direct costs for each product
- ⇒ Estimated overhead allocation

Cost accountants have worked with both these information throughout the previous accounting year. So they are in best position to provide the information required for preparing the budget for the next accounting year, which are :

- ⇒ Sales estimate
- ⇒ Throughput capacity and constraints
- ⇒ Other charges

1.4 Introduction to Cost Accounting

Moreover, the cost accountants will know how much would be the direct labour costs, the department-wise cost estimates, costs for maintenance and repairs, insurance and utilities. In fact, the cost accountants would understand the entire cost structure involving the cost of resources and their rightful allocation, covering the wide range of activities in the organisation.

5. Cost Reduction Analysis

There are two basic ways for a company to achieve better bottom-line performance:

- ⇒ increase revenue, or
- ⇒ reduce total costs

In today's unpredictable marketplace, more stress is given on reducing costs. Cost accountants provide both strategic and hands-on-assistance with cost reduction programmes of an organisation. They help the business to reduce costs and eliminate supply chain waste to establish a competitive advantage.

Cost accountants study the cost incurred in every business process and sub-process in an organisation, whether in engineering, production or sales. Therefore, they take responsible position in cost reduction analysis.

6. Pricing

Pricing is one of the cardinal responsibilities of a cost accountant. Product price depends upon many things like,

- ⇒ cost of manufacturing the product
- ⇒ market condition
- ⇒ price set by the competitors
- ⇒ need for the product
- ⇒ innovativeness or technical advantage of the product

Responsibility of setting product price lies mainly with the sales and marketing department as they are the people, who understand the market very well. However, they need to know the cost of each product manufactured, so, that the business does not incur loss on every unit sold. It is the responsibility of the cost accountant to compile these costs and provide it to the sales and marketing people.

It is very important to set a minimum price below which the product cannot be sold without incurring loss. This price should be calculated, because, many times customer, particularly the retailers, offer to accept large volume of product if the sales price per unit is lowered substantially. As cost accountants know the direct cost as well as the overhead costs associated with the product, so, they are in a position to determine the price below which the product cannot be sold.

When you will go deeper into the subject, you will find that, depending upon the size and the need of the organisation, cost accountants of the organisation also take up the following cost and pricing related analysis works :

- ⇒ overall impact on project using throughput analysis
- ⇒ separate analysis for each customer's request
- ⇒ profitability of individual customers, products, product lines, facilities

7. System Development and Maintenance

Before studying the role of a cost accountant in system development, you need to know what a business system is.

By definition the business system means, "***Methodical procedure or process, used as a delivery mechanism for providing specific goods or services to customers in a well defined market.***"

The business system follows a hierarchy with the business model at the top. The experts extract the value chain from this topmost business model. The primary processing systems are derived from the value chain. The processes are derived from each primary processing system. Finally each process is comprised of sub-processes, tasks and sub-tasks.

You must have comprehended that creation of such a system requires collection of lots of data and its summarisation into reports, which will be used for decision-making. The main concern of a cost accountant is to collect a large enough quantity of data and convert it into information that could be used for various types of costing analysis.

A little thought over the matter will tell you that even data collection also involves huge cost. So, the cost account should also spend time exploring data collection automation to keep the cost low.

A very common activity in all businesses, is to divide the processes into sub-processes and then assign cost to each of these sub-processes. For doing this, each process in the business system is assigned some cost and should be scrutinized to check whether it is adding value to the system or not. If not, then, the cost incurred is kind of a loss or wastage for the business system, so, the process should be discarded. Cost accountants are involved in assigning cost to various entities, such as departments and product lines, and they review and reassess this information.

Apart from cost allocations, the cost accountants also trace back each cost incurred by the organisation, through the accounting system, all the way back to their original source. This is used for investigation of the causes of costs or better allocation of costs.

8. Cost Benefit Analysis

Cost benefit analysis is usually done for decision-making during acquisitions or disposal of any asset or equipment. This complex analysis involves gathering all the related cash flows and their reduction to net present value with a discount factor.

9. Internal Consulting

A cost accountant often works as an internal consultant for various projects, *for example*:

- ⇒ taking decision in outsourcing some part of the works
- ⇒ whether shrinking inventory level would reduce working capital
- ⇒ whether the alternative mode of transport of raw materials and finished products will be economical for the organisation or not.

10. Government Billing

A significant part of purchases made by government follows a process known as cost plus contracts. These cost-plus contracts are made when the government acquires some innovative and new equipment, which has not been used before. *For example*, if a company makes a new defense equipment, which has not been used before, or produces some technical equipment to be used during some natural calamity, which has not yet been marketed, and sells these equipments to government, the government may buy it under cost-plus contracts. In such cases, the companies do not want to quote a fixed price for such equipments, because, they do not know whether they can manufacture these products and still make a profit. Therefore, the government offers them a cost-plus contract under which the company is reimbursed all the cost for producing the equipment, plus a percentage allowance for profit.

The cost accountants working for the company prepare these bills. This is an important role of cost accountants. They have to learn the costing rules of the government and then create a cost accumulation system for recording the costs. They also determine the allowable allocation of overhead costs to be applied to the project costs and billed to the government.

Generally, the cost that are billed to government are drawn from different functional area, like research and development, product planning and designing, production, administrative functions etc. and track down the cost incurred in each of these areas, for calculating the total cost of the product. Moreover, the cost reimbursement rules of any government are often complex and intricate and if the billing were somehow not supported by the billing rules, the contracting officers would protest and refuse to pay. Therefore, the government billings require cost accounting skills of maximum competence.

Future Role of Cost Accounting

A cost accountant's job does not have a closely defined boundary. In contrast with a financial accountant, whose job is primarily concerned with the accounting for external reporting, a cost accountant's job extends to every tiny part of the organisation. He has to understand the enterprise and its working thoroughly as he could be assigned with any task, which relates to management information and decision-making. He is the most reliable and trusted person from the enterprise's point of view.

You have already observed the typical jobs of a cost accountant involving analysis, drawing conclusions and making recommendations on various topics for making overall improvement and bringing cost effectiveness. A cost accountant's responsibility is huge because, his recommendations will have a direct impact in the operations and profitability of the organisation.

In the present scenario, the decision made by an experienced cost accountant influences the corporate strategy. The role of a cost accountant as a part of the decision maker is gaining more emphasis with the new business environment. With the ability of a cost accountant to provide different costing information to the planning process, they help in decision-making, alteration of business strategies and in turn increasing profitability. They help in avoiding low profit yielding alternatives.

With the advent of information technology, most cost information and production volumes are kept in large databases. Different stakeholders in the production system like the purchasing department, engineers, suppliers etc., contribute to this information about change of cost at different production volume levels. With the availability of such information, the role of a cost accountant becomes that of a strategy maker who can determine the cost of production when changes are made in different variables like sale, volumes, etc., for different product lines.

Newer methods of accounting like throughput accounting allow the corporate planners to determine the bottleneck in production process in advance and shift the bottleneck to shift to another level in the production process, where it can help in enhancement of profitability. In such a scenario, the cost accountant can use this information to create a specific production planning for most effective use of all equipments.

Installing a Cost Accounting System

The following steps are followed for installing a cost accounting system :

1. Based on the nature of the organisation and expectations of the management, the objectives of installing a cost accounting system should be identified first.
2. The area of focus of cost accounting system should be determined according to the need of the management. *For example*, management may be interested to control production cost rather than selling and distribution cost. In such a situation, the cost accounting system should be designed to control costs of production.
3. A detailed study of the nature of business, product range, production methods and techniques are to be made to find out the suitable method of cost accounting system (*e.g.*, Job Costing, Process Costing, etc.)
4. A detailed study of the organizational structure is to be made to fix the responsibilities at different levels.
5. Before installing a cost accounting system, the management should discuss the same with the employees and labour unions.
6. Details of record to be maintained and different reports to be prepared should be carefully worked out taking costs and benefits into consideration.
7. Different forms (*e.g.*, material requisition, job tickets, etc.) to be used by store-keeper, foreman, workers should be standardised.
8. Necessary arrangements should be made for collection of data from different departments.

9. Before installing the cost accounting system, it is to determined that the cost records are to be maintained under integrated system or separate record to be maintained for financial accounting and cost accounting.
10. The cost accounting should be designed in such a manner that it is easily understandable and not very expensive or cumbersome.

Advantage of Cost Accounting System

The following are the advantages of installing cost accounting system :

1. Cost determination will be more reliable and scientific.
2. The management will be able to get necessary information quickly and easily.
3. The profitability of different products and operations will be revalued. The management will be able to review them and to consider the elimination or modification of these to improve overall profitability.
4. A good cost accounting system will help to control cost in different areas of the organisation.
5. Reliable information will enable management to compare the profitability of different alternatives. For example, whether it is more profitable to produce a component or to buy it from a manufacturer who specialises in its production.
6. An efficient cost accounting system may help the organisation to claim extra amount from customer where there is an escalation clause in the agreement.
7. In case of cost plus contract, the client may demand the details of the expenses. In this case, an efficient cost accounting system will be able to supply the required information quickly.

Distinction between Financial Accounting and Cost Accounting

	Financial Accounting		Cost Accounting
1.	It aims at determining the profit of an organisation	1.	It aims at determining the cost of a product or service.
2.	It is not prepared from cost accounting.	2.	It is prepared from financial accounting.
3.	Financial accounting is meant for external users.	3.	Cost accounting is meant for internal users.
4.	It is prepared in accordance with generally accepted accounting principles.	4.	It is prepared in accordance with established cost accounting principles.
5.	It uses natural classification of income and expenses.	5.	It uses different classification of income and Expenses.
6.	It strikes a balance between relevance and reliability.	6.	It emphasizes only relevance.
7.	It uses matrices that use accounting numbers.	7.	Along with accounting numbers, it also uses Non-financial measures.
8.	Periodicity of financial reporting is fixed, e.g., quarterly, annually.	8.	Periodicity of cost accounting depends on the need of the organisation.
9.	Financial accounting uses only actual costs and revenues.	9.	Along with actual costs and revenue, cost Accounting uses notional costs and revenues.
10.	It is prepared in the format prescribed by regulatory authorities.	10.	It is prepared in the format internally decided by the firm.

Meaning of Management Accounting

Management Accounting is concerned with the provision and use of different accounting information to the managers of an organisation, so that, using these information they can make strategic decisions for the business and have a better control over the business processes and activities.

Following are the definitions provided by different accounting bodies :

According to the Chartered Institute of Management Accountants (CIMA), Management Accounting is *“the process of identification, measurement, accumulation, analysis, preparation, interpretation and communication of information used by management to plan, evaluate and control within an entity and to assure appropriate use of and accountability for its resources. Management accounting also comprises the preparation of financial reports for non-management groups such as shareholders, creditors, regulatory agencies and tax authorities.”* (CIMA Official Terminology)

The American Institute of Certified Public Accountants (AICPA) states that management accounting practice extends to the following three areas :

- ⇒ **Strategic Management** – Advancing the role of the management accountant as a strategic partner in the organisation.
- ⇒ **Performance Management** – Developing the practice of business decision-making and managing the performance of the organisation.
- ⇒ **Risk Management** – Contributing to frameworks and practices for identifying, measuring, managing and reporting risks to the achievement of the objectives of the organisation.

The Institute of Certified Management Accountants (CIMA) state *“A management accounting applies his or her professional knowledge and skill in the preparation and presentation of financial and other decision oriented information in such a way as to assist management in the formulation of policies and in the planning and control of the operation of the undertaking. Management Accountants therefore are seen as the “value-creators” amongst the accountants. They are much more interested in forward looking and taking decisions that will affect the future of the organisations, than in the historical recording and compliance (scorekeeping) aspects of the profession. Management accounting knowledge and experience can therefore be obtained from varied fields and functions within an organisation, such as information management, treasury, efficiency auditing, marketing, valuation, pricing, logistics, etc.”*

Management accounting is concerned with providing information to managers – that is, people inside an organisation who direct and control the business operations. In contrast, financial accounting is concerned with providing information to stockholders, creditors and others who are outside an organisation.

Management accounting provides the indispensable data with which the business are actually run. What the financial accounting provides, could be described as the company’s scorecard, based on which it’s overall past performance is judged by the outsiders.

Managerial accounting deals with variety of reports. These reports are used for reviewing all business decisions, and how different strategies, projects or business units have actually performed, how much was the deviation from actual planning, what was the reason(s) for the deviations.

Management accounting also reports on timely update on key indicators of the business, for example:

- ⇒ orders received
- ⇒ order backlog
- ⇒ capacity utilisation
- ⇒ sales

Management accounting also deals with analysis of various specific problems and investigates on the cause, *for example*, a decline in the profitability of a product line. Managers make decision on expansion of business; accordingly, some of the management accounting reports are prepared solely for the purpose of analysing different situations or opportunities for business development and expansion. In contrast, financial

accounting is oriented towards producing a limited set of specific prescribed annual and quarterly financial statements in accordance with Generally Accepted Accounting Principles (GAAP).

Information is of great essence in management accounting. However, management accounting information differs from financial accounting information. The management accounting deals with information, which is typically used for decision making. These information are computed using internal control and Management Information System (MIS); they are not publicly reported. Management accounting deals with information, which is forward-looking, not based on past data.

Management accounting gets involved in :

- ⇒ formulation of business strategies
- ⇒ planning and implementing business processes and activities
- ⇒ strategic decision-making
- ⇒ resource optimisation
- ⇒ safeguarding organization's assets
- ⇒ supporting preparation of financial reports

Various tasks taken by the management accountants are a superset of that of the cost accountants, though, the difference between these two groups are diminishing fast. Following is a list of activities performed by a management accountant :

- ⇒ Variance Analysis
- ⇒ Rate & Volume Analysis
- ⇒ Business Metrics Development
- ⇒ Pride Modelling
- ⇒ Product Profitability
- ⇒ Geographic vs. Industry or Client Segment Reporting
- ⇒ Sales Management Scorecards
- ⇒ Cost Analysis
- ⇒ Cost Benefit Analysis
- ⇒ Client Profitability Analysis
- ⇒ Capital Budgeting
- ⇒ Buy vs. Lease Analysis
- ⇒ Strategic Planning
- ⇒ Strategic Management Advise
- ⇒ Internal Financial Presentation and Communication
- ⇒ Sales and Financial Forecasting
- ⇒ Annual Budgeting
- ⇒ Cost Allocation
- ⇒ Resource Allocation and Utilisation

Distinction between Cost Accounting and Management Accounting

	Cost Accounting		Management Accounting
1.	Cost Accounting is normally viewed as a process of determining a 'cost' measured in terms of money.	1.	Management Accounting is the application of techniques and concepts in processing the historical and projected economic data of an entity
2.	Cost Accounting classifies, records, presents and interpretes in a significant manner the cost of materials, labour and expenses necessary to manufacture and sell each product.	2.	Management Accounting functions largely through operating reports based upon standard cost and budgets.

1.10 Introduction to Cost Accounting

3.	Cost Accounting includes not only the collection of cost data useful to management but also the arrangement and presentation of such data in such a manner as to reveal significant relationship to management.	3.	Management Accounting is concerned with providing information to managers who direct and control the business operations.
4.	Double entry principles are followed for recording of different transactions in the cost books. In many cases, Cost Accounting Standards are strictly followed.	4.	Management Accounting reports on timely updates on key indicators of the business, for example, orders received; orders backlog; capacity utilisation; and sales
5.	Cost Accounting generates different reports from cost accounting records as per the requirement of the managers.	5.	Management Accounting deals with analysis of various specific problems and investigates on the causes. <i>For example</i> , a decline in the profitability of a product line.

THEORETICAL QUESTIONS

1. Define cost accounting. (Page 1.1)
2. Discuss the role of cost accounting in an organisation. (Page 1.2)
3. What are the different steps to be followed for installing a cost accounting system in an organisation? (Page 1.6)
4. What are the advantages of cost accounting system ? (Page 1.7)
5. What do you mean by management accounting ? (Page 1.8)
6. Distinguish between financial accounting and cost accounting. (Page 1.7)
7. Distinguish between cost accounting and management accounting. (Page 1.9)

Cost Terms, Concepts and Classifications

Introduction

Costs are associated with all types of organisations – manufacturing and non-manufacturing, business and non-business, retail and wholesale. As a first step in studying cost accounting, it is very important to understand the meaning of cost, various types of costs incurred by organisations and how these costs are managed.

In cost and management accounting the term 'cost' can have different meanings depending on the nature of the organisation and the needs of the management. Managers may require cost data for (i) external reporting; (ii) calculating the cost of the product; (iii) valuation of stock; and (iv) decision making.

Each different use of cost data requires a different definition and classification of costs. Cost data compiled for one purpose may not be appropriate for another purpose. *For example*, current cost of manufacturing diesel and petrol may be appropriate for valuation of closing stock of Reliance Industries Ltd for the year. However, those costs may not be useful in planning the company's refinery operations for the future years because of fluctuation in crude oil price in the international market. The important point is that different cost definition and classifications are used for different purposes. *A clear understanding of these concepts and classifications enables the cost and management accountants to provide proper cost data to the managers right in time.*

Definition of Cost

Cost Accounting Standard on "Classification of Cost" (Revised 2015) — (CAS – I) issued by the *Council of the Institute of Cost and Works Accountants of India (ICWAI)* has defined cost as *"Cost is a measurement, in monetary terms of the amount of resources used for the purpose of production of goods or rendering services."* (Para 4.5)

The committee on Cost Concepts and Standards of the American Accounting Association (AAA) defines 'cost' as *"Cost is a foregoing, measured in monetary terms, incurred or potentially to be incurred to achieve a specific objective."*

Definition of Cost Object

Cost Accounting Standard on "Classification of Cost" (Revised 2015) — (CAS – I) defines 'cost object' as *"an activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained."* (Para 4.7)

For example, The Oberoi Grand Hotel's cost objects are its major departments — maintenance department, house-keeping department, hospitality department and food and beverage department.

Definition of Cost Unit

Cost Accounting Standard on "Classification of Cost" (Revised 2015) — (CAS – I) defines 'cost unit' as *"a form of measurement of volume of production of a product or a service. Cost unit is generally adopted on the basis of convenience and practice in the industry concerned."* (Para 4.10)

For example : Power – MW; Cement – MT; Automobile – Number; Transportation – Tonne-Kilometre

Cost units of some important industries are given in the next page. It must be appreciated that technological or other changes may prompt a change in the cost unit.

2.2 Cost Terms, Concepts and Classifications

Cost Units of Representative Industries

S.N.	Industry	Product or Operation	Possible Cost Unit
1.	Accounting Firm	Auditing / Accounting / Advising	Audit Job performed per hour
2.	Advertising	Printing / Painting advertising signs	Job order
3.	Automobile	Car / Truck / Bus	1 or 100 units
4.	Auto Parts	Head lights, steering, piston, radiator, etc.	100 units
5.	Battery manufacturing	Batteries	100 units
6.	Brass Foundry	Alloy	Kg
7.	Bicycles	Bicycle	1 or 100 units
8.	Brick	Bricks	1,000 units
9.	Cement	Cement	Ton (raw mill); Bag (sales unit)
10.	Chemical	Chemicals	Gallon / Litre
11.	Clay Products	Mine clay	Ton
12.	Cotton Textile	Yarns	Kg and Meter
13.	Coal	Coal	Ton
14.	Dried fruit	Apricots, Grapes	20 kg cartons (sales unit)
15.	Fertiliser	Phosphate	Ton (raw mill); Bag (sales unit)
16.	Furniture	Furniture	Each article
17.	Flour Mill	Flour	Ton (raw mill); Packet (sales unit)
18.	Gold Plating	Melting	Ounce / Gram
19.	Hospital	Consultation / Operation / Staying	Patient per day / Outdoor patient visit
20.	Pharmaceutical	Cold creams	Jar / Tube
21.	Pharmaceutical	Cosmetics	Gram
22.	Pharmaceutical	Tablets, Pills	Per 1,000 units
23.	Pharmaceutical	Toothpaste	Kg (bulk); Tube (sales unit)
24.	Printing Press	Impression	Per 1,000 sheets
25.	Printing	Folding	Units and Sheets
26.	Printing	Ruling	Units and Sheets
27.	Rubber Tyre	Tyre and Tube	Per 100 units
28.	Restaurant	Meal served	Per item
29.	Sugar	Sugar	Ton / 100 kg bag
30.	Screw Machine	Screws, Bolts	100 pieces
31.	Salt Mining and Refining	Salt	Ton and 1, 5 kg packet
32.	Steel	Steel	Ton
33.	Transport (Road / Rail)		Passenger – km; Ton – km
34.	Nursing		Per Bed per day
35.	Construction House Contract		Each Contract
36.	Interior Decoration		Each job

Composite Cost Units

It is to be noted in the above table that some cost units are made up of *two parts*, e.g., ton – km (cost unit for road transport) or per bed per day (cost unit for nursing home). The two-part cost units are known as **Composite Cost Units**. Composite cost units are very useful for controlling costs. *For example*, in a passenger transport, the measure of 'cost per passenger' might not be useful for control purposes. The cost per passenger will vary depending on the distance travelled by the passenger. Therefore, controlling costs using this basis would be difficult.

The **cost per passenger – kilometer** (cost of carrying one passenger for one kilometer) is not affected by the distance travelled by a passenger. Therefore, it would be more useful for **monitoring and controlling costs**.

Definition of Cost Centre

Cost centre is defined as a location, person or an item of machinery or a group of machineries in respect of which all costs are accumulated for the purposes of cost ascertainment and cost control.

Cost Accounting Standard on “Classification of Cost” (Revised 2015) — (CAS – I) defines ‘cost centre’ as **“Any unit of entity selected with a view to accumulating all cost under that unit. The unit can be division, department, section, group of plant and machinery, group of employees or combination of several units.”** (Para 4.6)

Cost centre may be of two types – personal and impersonal cost centres. A cost centre which consists of a person or a group of persons is called a **Personal cost centre**.

Cost centre which consists a location or an item of plant / machinery or a group of these is called an **Impersonal cost centre**.

In case of a manufacturing organisation (**For example**, Tata Motors Ltd.) there are two types of cost centres — Production Cost Centers and Service Costs Centers.

Production cost centers are those which are directly engaged in production. Examples are machine shop, assembly shop, paint shop etc.

Service cost centers are those which are not directly engaged in production but these cost centers are necessary for smooth running of the production activities. Examples are maintenance department, power house, canteen, etc.

It should be noted that cost centre may be very small, .e.g., a single machine, or quite large. There may be a series of cost centers within a department or whole department may be a cost centre.

Distinction between Cost Centre and Cost Unit

	Cost Centre		Cost Unit
1.	Cost centre is a location, person or an item of machinery or a group of machineries in respect of which all costs are accumulated for the purpose of cost ascertainment and cost control.	1.	Cost unit is a unit of quantity of product, service in respect of which cost is ascertained .
2.	Cost centre may be personal or impersonal. Again, it may be production cost centre or service cost centre.	2.	No distinction is made in respect of cost unit as personal and impersonal.
3.	Cost centre is unique.	3.	Cost unit may be composite cost unit, e.g., ton-km or per bed per day, etc.
4.	As per the requirement of the management, cost centre may be changed to generate more meaningful data.	4.	Generally, cost unit remains same for a long time. However, technological or other changes may prompt a change in the cost unit.

Illustration 1

From the following information of Apollo Hospital identify the **cost centres** or **cost units** as suitable :

1. Children ward	2. Pharmacy
3. Operation theatre	4. Per bed per day
5. Outdoor patient visit fees	6. Canteen
7. Operation theatre hour	8. Radiology department
9. House keeping department	

2.4 Cost Terms, Concepts and Classifications

Solution

Sl.No.	Cost Centres	Sl.No.	Cost Units
1.	Children ward	4.	Per bed per day
2.	Pharmacy	5.	Outdoor patient visit fees
3.	Operation theatre	7.	Operation theatre hour
6.	Canteen		
8.	Radiology department		
9.	House keeping department		

Illustration 2

Given below is a list of ten industries. State the cost unit against each industry.

1. Nursing Home	6. Bridge construction
2. Road transport	7. Interior decoration
3. Steel	8. Advertising
4. Coal	9. Furniture
5. Bicycles	10. Sugar company

Solution

S.No.	Industry	Possible Cost Units
1.	Nursing Home	Per bed per day
2.	Road transport	Ton – km / passenger – km
3.	Steel	Per ton
4.	Coal	Per Ton
5.	Bicycles	Per 100 units
6.	Bridge construction	Each contract
7.	Interior decoration	Each job
8.	Advertising	Each job
9.	Furniture	Each unit
10.	Sugar company	Per ton / Quintal

Types of Cost

The term cost is used in very wide manner such as :

1. Historical cost	8. Period cost	15. Opportunity cost
2. Future costs	9. Prime cost	16. Sunk cost
3. Replacement cost	10. Conversion costs	17. Controllable cost
4. Standard costs	11. Direct costs	18. Uncontrollable cost
5. Marginal cost	12. Indirect costs	19. Joint costs
6. Estimated costs	13. Fixed cost	20. Differential cost, etc.
7. Product cost	14. Variable cost	21. Explicit Costs / Out of Pocket Costs

- Historical Cost** : Historical costs are those costs applicable to production already completed or to service already rendered. Historical costs cannot be used for the purpose of cost control as this has already been incurred before the costing figures are available to management.
- Future Costs** : Future costs are those costs which are expected to be incurred if a particular decision is taken. At the time of replacing an existing machine with a new one, the future costs of operating the new machine are to be taken into consideration for taking replacement decision.

3. **Replacement Cost** : Replacement cost is the cost at which there could be purchase of an asset identical to that which is being replaced.
4. **Standard Cost** : Standard cost is a particular type of predetermined cost under specified efficient operating conditions. It is generally used in standard costing for calculating cost variances.
5. **Marginal Cost** : The official terminology of CIMA has defined marginal cost as "the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit." In this context, it is to be noted that a unit may be a single article, a batch of articles, a stage of production capacity, a process or a department.
6. **Estimated Costs** : Estimated costs are a form of predetermined costs calculated by the firm in advance of production or construction. Manufacturers of computer, laptop, furniture calculate estimated costs for determining price and profit. Construction companies engaged in construction of roads, bridges, airports make use of the estimated cost for the purpose of quotation or biddings.
7. **Product Costs** : Product costs are those costs which are directly related to product. Examples are direct material cost, direct labour cost, etc.
8. **Period Costs** : Period costs are those costs which are not included in the product costs. At the time of stock valuation, no part of these costs are taken into consideration. *Examples* of period costs are sales commission, advertisements, etc.
9. **Prime Cost** : Prime cost is the sum total of direct material, direct labour and direct expenses. Prime cost reflect the primary sources of costs for units in production.
10. **Conversion Cost** : Conversion cost is the sum total of direct labour, direct expenses and production overheads costs of converting raw material to the finished goods.
11. **Direct Costs** : Direct costs are those costs that can be identified directly with the product, process or department. Examples are cost of leather used in manufacturing a bag, depreciation of a delivery van.
12. **Indirect Costs** : Indirect costs are those costs which are incurred for the benefit of all products, processes or departments during a certain period. Examples are rent, rates and taxes of the factory building, salary of the security staff, etc.
13. **Fixed Costs** : Fixed cost is a cost which does not vary with the change in the level of activity. Examples include insurance, depreciation of plant and machinery, rent, rates and taxes of factory building. Fixed cost is normally related to time rather than output / activity.
14. **Variable Cost** : Variable cost is a cost which vary in direct proportion to a change in the level of output. Direct material and direct labour are good examples of variable costs.
15. **Opportunity Cost** : Opportunity cost is earnings or potential benefits foregone for taking certain decisions. *For example*, an office space can be given on rent for ₹ 50,000 per month or it can be used for own business. If the office space is used for own business, the opportunity cost is ₹ 50,000 per month.
16. **Sunk Cost** : Sunk cost is a historical cost that has been incurred and that cannot be changed by any decision made now or in the future. *For example*, you want to replace an existing machine with a more efficient machine, the cost paid for existing machine is a sunk cost.
17. **Controllable Cost** : Controllable cost is a cost which can be controlled by the action of a specified member of the undertaking. *For example*, the accounts and finance manager probably has control over the stationery used in his department but had no control over the air-conditioning expenses allocated to the department.
18. **Uncontrollable Cost** : Uncontrollable cost is a cost which cannot be controlled by the action of a specified member of an undertaking. Uncontrollable costs include fixed costs and allocated costs.

2.6 Cost Terms, Concepts and Classifications

19. **Joint Cost** : Joint cost is the common cost incurred in the process up to the point of separation. It includes raw materials, direct materials, direct labour and production overheads.
20. **Differential Cost** : Differential cost is the difference in cost between one alternative and another. *For example*, running cost per KM of a petrol car is ₹ 10 and that of a diesel car is ₹ 6. The differential cost is ₹ 4 per KM of running.
21. **Explicit Costs** : Explicit costs are also known as “Out of Pocket Costs”. These are the costs which requires immediate payment in cash. *Examples* are salary of the staff, rent, rates and taxes, etc.

Classification of Costs

Cost Accounting Standard on “Classification of Cost” (Revised 2015) — (CAS – I) defines ‘classification of costs’ as “*the arrangement of items of costs in logical groups having regard to their nature (subjective classification) and purpose (objective classification).*” (Para 4.3)

Classification of costs are necessary to bring out the significance of information. Cost must be so classified and arranged that they can be combined in different ways to serve the above purposes.

At the time of classification of costs, the following generally accepted rules should be observed.

1. *Cost should be classified by one characteristic at a time.*
2. *Classification scheme should be such that all items of cost can be classified. A miscellaneous group may be used for small items of cost.*
3. *Classification scheme should be such that it will serve the purpose of the management.*

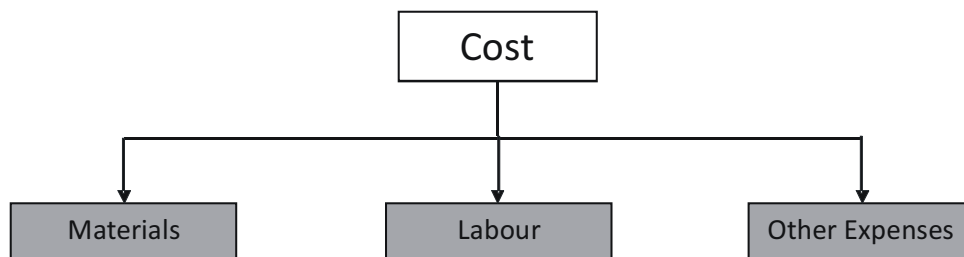
Basis of Classification

Some of the more common bases of cost classification are given below :

1. Nature of cost / expense.
2. Relation to cost centre / object – traceability.
3. Functions / activities.
4. Behavior – fixed, semi–variable, variable and semi–fixed.
5. Management decision making
6. Product cost and period cost

Classification on the Basis of Nature of Cost / Expense

The process of classifying costs and expenses may start with a natural grouping of all manufacturing costs according to the three main elements of cost : (i) materials; (ii) labour; and (iii) other expenses.



[Fig. 2.1]

Material Cost : Material cost is the cost of all materials used in manufacturing the product or a service. *For example*, in manufacturing a computer table – cost of plywood, cost of screw, cost of glue, etc. will be classified under material. Material cost includes cost of purchase, freight inward, taxes, duties and insurance, etc.

Labour Cost : Labour cost is the remuneration paid to the worker involved in the manufacturing of the product. Workers may be permanent or temporary. Remuneration will include all fringe benefits, wages for holidays, overtime, etc. *For example*, in manufacturing a computer table, the wages paid to the carpenter will be classified under labour cost.

Other Expenses : Other than material cost and labour cost, all expenses will fall under this category. It will include rent, taxes and insurance, depreciation of machineries and equipments, job processing charges paid to the outsiders, etc.

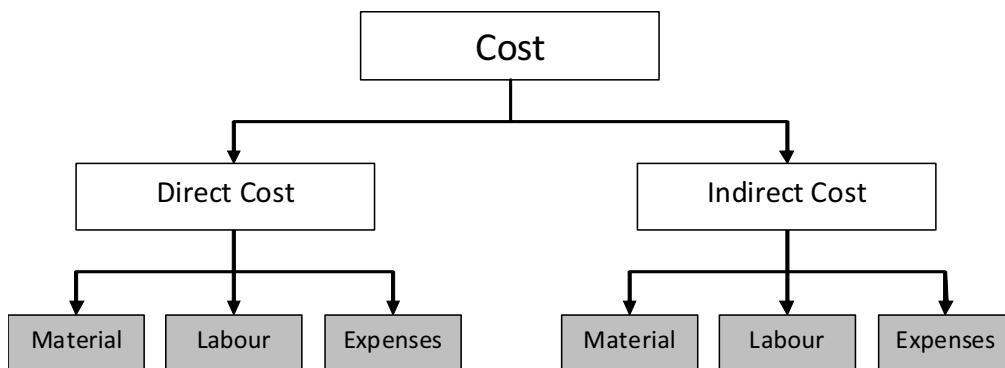
$$\text{Total Cost} = \text{Material Cost} + \text{Labour Cost} + \text{Expenses}$$

Classification on the Basis of Relation to Cost Centre / Cost Object — Traceability

Taking cost centre / cost object into consideration costs are basically classified into two: (i) Direct cost; and (ii) Indirect cost.

Direct Costs : Direct costs are costs which can be traced in full to the cost centre / cost object. Conventionally, direct costs can be further sub-divided into direct materials, direct labour and direct expenses.

If any cost cannot be traced to a cost centre / cost object in an economically feasible way then it is called **indirect cost**. Indirect cost is also called **overhead**. Indirect costs can be further sub-divided into indirect material, indirect labour and indirect expenses.



[Fig. 2.2]

Direct Material Cost : Direct material cost is the cost of material which can be directly traced to a cost centre or cost object in an economically feasible way. It becomes an integral part of the finished product. This would include, *for example*, the battery Tata Motors Ltd. purchases from Exide Ltd installed in its Indica car. Another example is the small electric motor 'Sony' uses in its CD players to make the CD spin.

Direct Labour Cost : Direct labour cost is the cost of wages of those workers who are readily identified or linked with a cost centre or cost object. Direct labour is sometimes called touch labour, since direct labour workers typically touch the produce while it is being manufactured. *For example*, labour cost of assembly-line workers of 'Apple' mobile factory would be direct labour costs.

Direct Expenses : Direct expenses are the expenses other than direct materials cost or direct labour cost which can be directly traced to the cost centre / cost object. The cost of hiring a special machine for any cost centre or cost object is an example of direct expense. Another example of direct expense is royalties paid in connection with the production of an article to the owner of the patent or copyright.

Indirect Materials : Indirect materials are those which are required for production but do not become an integral part of the finished product. *For example*, materials used for the repair of a machine which is used for

2.8 Cost Terms, Concepts and Classifications

the manufacturing of different products are treated as indirect materials. These items cannot be traced with any one specific product.

However, it is important to note that materials which become an integral part of the finished product but are insignificant in cost are also often treated as indirect materials. *For example*, cost of glue used in fixing 'Honda' logo of Honda Civic Car may be so inexpensive that it is not worth tracing this cost to a specific car as direct material.

Indirect Labour Cost : Indirect labour cost is wages and salaries of employees who do not work on the product itself but who help in manufacturing operations.

For example, the salaries of the factory supervisors, salaries paid to the staff of computer department etc.

It should be noted here that in many industries (e.g., readymade garment industry) major shifts are taking place in the structure of labour cost. Sophisticated computer controlled machines are increasingly replacing direct labour. Direct labour has become insignificant.

Indirect expenses are those expenses which cannot be directly traced to a particular cost centre / cost object. *For example*, rent, rates and taxes of the factory building, depreciation of plants and equipment, etc.

Illustration 3

Classify the following items as direct or indirect materials :

- (a) Sandpaper used in furniture making.
- (b) Bags in flour mills.
- (c) Ingots used by a foundry for making casting.
- (d) Battery to be installed in a car.
- (e) Detergent used for factory cleaning.
- (f) Milk to make ice cream.

Solution

- (a) Sandpaper used in furniture making is an **indirect material** because its cost is insignificant and it is not worth tracing their cost to a specific furniture.
- (b) Bags in flour mills is a **direct material** because flour cannot be sold without the bag.
- (c) Ingots used by a foundry for making casting is a **direct material** because it can be directly traced to a cost object and it is an integral part of the finished product.
- (d) Battery to be installed in a car is a **direct material** because it can be directly traced to a cost object and it is an integral part of the finished product.
- (e) Detergent used for factory cleaning is an **indirect material** because it cannot be directly traced to any particular product.
- (f) Milk to make ice cream is a **direct material** because it can be directly traced to a cost object and it is an integral part of the finished product.

Summary of Analysis of Cost

Materials Cost	=	Direct Materials Cost	+	Indirect Materials Cost
+		+		+
Labour Cost	=	Direct Labour Cost	+	Indirect Labour Cost
+		+		+
Expenses	=	Direct Expenses	+	Indirect Expenses
Total Cost	=	Direct Cost	+	Indirect Cost or Overhead Cost

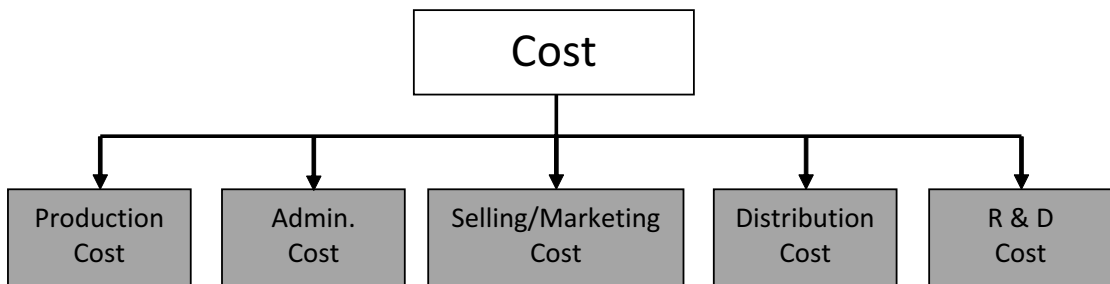
Classification on the Basis of Functions / Activities

A business has mainly five functions : (i) Production; (ii) Administration; (iii) Selling / Marketing; (iv) Distribution; and (v) Research and Development.

Cost is classified according to major functions for which costs are incurred. The main objectives of this classification are to *ascertain cost of the product or service and control of cost based on different functions of the business.*

On the basis of functions, costs are classified into five categories as :

- (i) Production cost
- (ii) Administration cost
- (iii) Selling / marketing cost
- (iv) Distribution cost
- (v) Research and development cost



[Fig. 2.3]

Production Cost : Production cost is the total cost incurred in the production of a product or service. It includes all direct costs (e.g., direct materials, direct labour and direct expenses) and *production overhead* (e.g., depreciation of plant and machinery, salaries of security guards, salaries of factory supervisors, etc.).

There are many organisations which are not manufacturing products but they are engaged in service production. *For example*, hospitals, hotels, airlines, banks, etc. The same cost classification is used by these organisations. *For example*, an airline produces air transport services. Direct materials includes cost of aviation fuel, cost of foods and drinks, cost of tyre, parts, etc., of the aircraft. Direct labour includes salary of pilots, cabin crew, etc. overhead costs include depreciation of different equipments, salaries of booking staff and baggage handling staff, insurance etc.

Administration Costs : Administration costs are those costs which are incurred for general administration of the organisation. These costs are *indirect* in nature. Salary of HR manager, system manager, accountants and other office staff, legal expenses, audit fees, etc. are the examples of administration costs.

Selling / Marketing Costs : Selling / marketing costs are costs incurred for selling / marketing the products or services. *For example*, advertising cost, product launching cost, salary of marketing manager and selling staff, travel cost of sales personnel, etc.

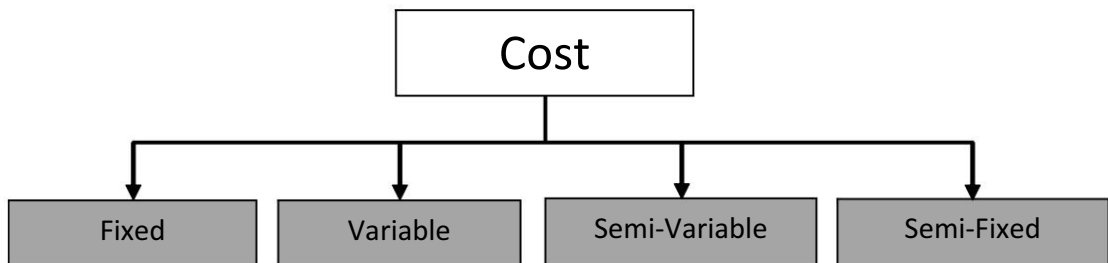
Distribution Cost : Distribution costs are associated with transferring products from factory godown to customers. Examples are transportation cost, secondary packing costs, etc.

2.10 Cost Terms, Concepts and Classifications

Research and Development Costs : Research and Development Costs are costs incurred for developing new products and services. It also include costs incurred for improving the quality of the existing products. The cost of running laboratories, salaries of research staff, making of prototypes of new products and testing new products are all classified as research and development costs.

Classification on the Basis of Behaviour

According to this criterion, costs are classified on the basis of their behavior with the change in the output. These are : (i) Fixed; (ii) Variable; (iii) Semi-variable; and (iv) Semi-fixed.



[Fig. 2.4]

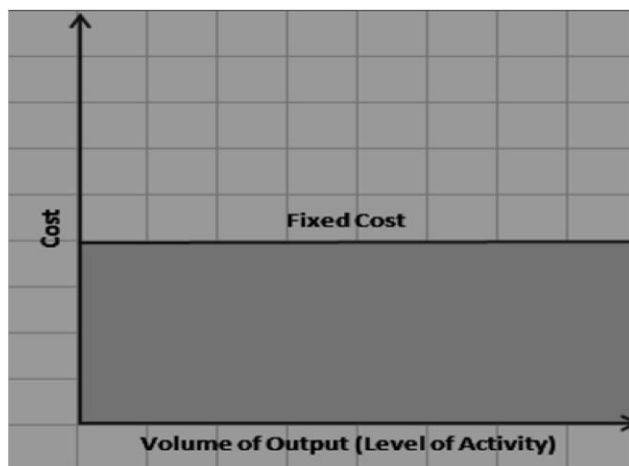
Fixed Cost : Fixed Cost is a cost which does not vary with the change in the level of output. Examples include insurance, depreciation of plant, machinery and factory building; rates and taxes of the local government etc.

A fixed cost is generally fixed only upto a certain level of production, beyond which a higher fixed cost is to be incurred.

The *characteristics of fixed cost* are :

- (i) Fixed cost remain same in total within a relevant output range.
- (ii) Fixed cost per unit will decrease with the increase in output.
- (iii) In most cases, fixed cost depends upon *time* factor rather than *output* factor.
- (iv) Control of fixed cost rests with the top management rather than works manager or factory supervisors.

A *graphical presentation of fixed cost* is shown below :



[Fig. 2.5]

Let us assume that total fixed cost is ₹ 1,00,000. The fixed cost per unit will change with the number of output. The behaviour of fixed cost has been shown in the following table :

Tabulation of Fixed Cost

Output	Total Fixed Cost	Fixed Cost per Unit
1	₹ 1,00,000	₹ 1,00,000
2	₹ 1,00,000	₹ 50,000
.	.	.
.	.	.
5	₹ 1,00,000	₹ 20,000
.	.	.
.	.	.
10	₹ 1,00,000	₹ 10,000
.	.	.
.	.	.
100	₹ 1,00,000	₹ 1,000

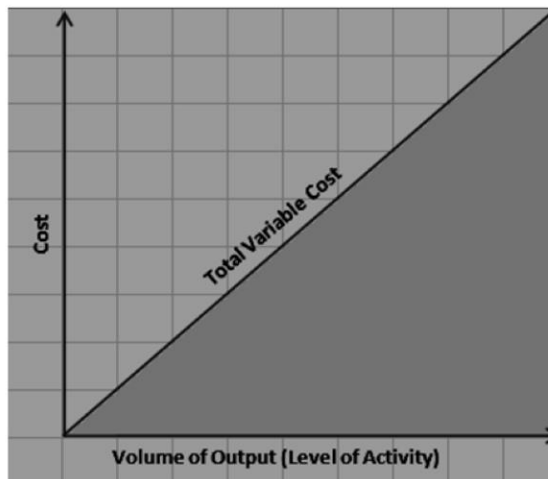
Here, it should be noted that fixed costs can and do change. For example, corporation / municipality taxes virtually always increase each year. However, this change in fixed cost is due to external factor rather than change in volume.

Variable Cost : A variable cost changes in total in direct proportion to a change in the level of output. If there is an increase of 50% in output, the variable cost increases by 50%. **For example**, cost of battery used by Maruti in its car will increase by 50% if the output is increased by 50%. Direct material and direct labour are good examples of variable costs.

The **characteristics of Variable Costs** are :

- (i) Variable cost in total varies in **direct** proportion to output.
- (ii) Variable cost per unit comparatively remain **constant** at all level of activity.
- (iii) Variable cost is easy to assign to product / departments.
- (iv) Variable cost can be controlled by the department head.

A **graphical presentation of variable cost** is given below :

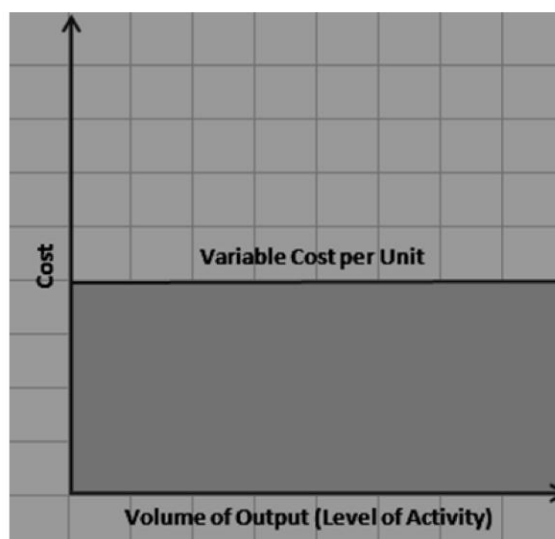


[Fig. 2.6]

2.12 Cost Terms, Concepts and Classifications

Tabulation of Variable Cost

Output	Total Variable Cost	Variable Cost per Unit
1	₹ 100	₹ 100
2	₹ 200	₹ 100
.	.	.
.	.	.
5	₹ 500	₹ 100
.	.	.
.	.	.
10	₹ 1,000	₹ 100
.	.	.
.	.	.
50	₹ 5,000	₹ 100
.	.	.
.	.	.
100	₹ 10,000	₹ 100

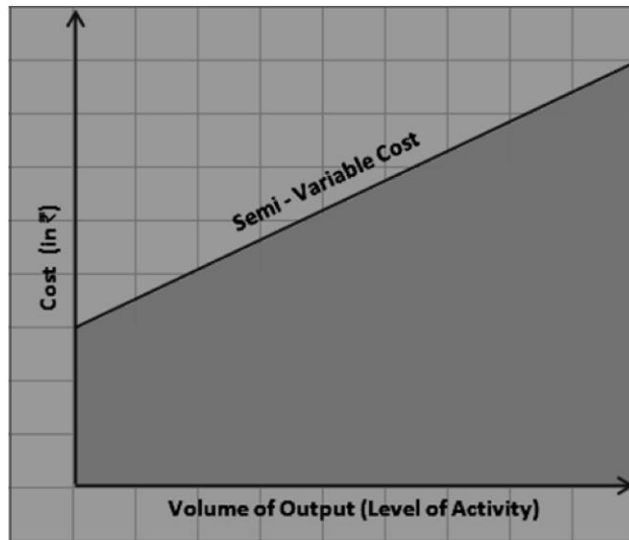


[Fig. 2.7]

Semi-Variable Cost: There are many costs which are neither purely fixed nor purely variable. These costs are semi-variable costs. Semi-variable costs are those costs which vary to some extent with change in output but not in *direct proportion*.

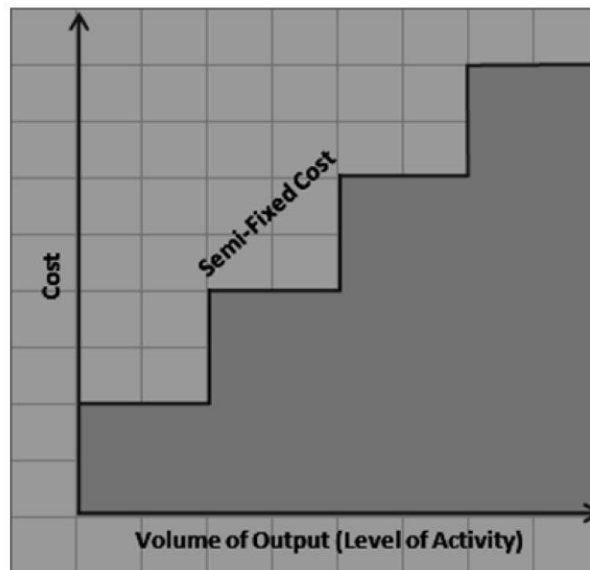
Semi-variable costs include both a fixed and a variable element. In practice, semi-variable costs are very common. *For example*, the cost of providing X-ray service to patients at Apollo Hospital is a semi-variable cost. Fixed costs are depreciation of the X-ray machine, salary of operators and technicians, airconditioning expenses, cost of rent of the space, etc.

Variable costs are X-ray film, power and supplies. Another example, of semi-variable cost is landline telephone charge. A fixed amount must be paid as rental and a variable amount will be charged based on number of calls made.



[Fig. 2.8]

Semi-Fixed Cost or Stepped Fixed Cost : A semi-fixed cost or stepped fixed cost is one where the cost remains fixed within a narrow range of activity but show abrupt and distinct upward change with the increase in output. Example of semi-fixed cost is supervision cost. A supervisor can supervise say 10 workers at a time. The supervision cost will remain same up to 10 workers. The cost will be double if the number of workers exceeds 10. However, it will remain same up to 20 workers. Again, it will increase abruptly when the number of workers will exceed 20 and so on. A *graphical presentation of fixed cost* is given below :



[Fig. 2.9]

2.14 Cost Terms, Concepts and Classifications

Classification on the Basis of Management Decision-Making

Costs are classified into four categories for the management decision-making purposes.

- (1) Differential Costs
- (2) Relevant Costs
- (3) Sunk Costs
- (4) Opportunity Costs

Differential Costs : The concept of differential costs is particularly important for decision making. At the time of making a decision, all alternatives are evaluated on the basis of costs. The differences in the total costs required each of the alternatives is termed as '**Differential Costs**'.

For example, X Ltd. can buy power from CESC Ltd. or can put up a captive plant for its electricity requirement. The cost per unit of producing electricity is ₹ 5 and cost of buying one unit of electricity from CESC is ₹ 4.50. Here differential cost is ₹ 0.50 per unit. Based on this concept, X Ltd's management can take a decision that the company should buy electricity from CESC Ltd. provided other factors remain same.

Relevant Cost : Relevant costs are those costs which will be affected by a decision. Costs that are not affected by the decision are irrelevant to the decision and therefore ignored. *For example*, P Ltd. manufactures three joint products - x_1 , x_2 and x_3 from same process. All the products can be processed further for better price. Hence, further processing cost is relevant but joint cost is irrelevant as it will remain same whether joint products are processed further or not.

This classification of costs assists management to concentrate on costs that will arise when the decision will be taken.

Sunk Costs : Sunk costs are costs which have been incurred in the past and it has nothing to do with the future decision. *For example*, Toyota Motor Co. Ltd. wants to introduce electric car in the metro cities and it has spent some amount of money for market research.

Now, whether the management is going ahead with the project or not, that earlier expenditure on market research has been spent, **Sunk**, in the previous decision to carry out the market research and it has become irrelevant to management's decision.

Opportunity Costs : An opportunity cost is a cost which has not been incurred and paid in cash. It is a 'loss' of earnings or potential benefits arising out of utilising an asset for another purpose.

For example, an office space can be given on rent for ₹ 50,000 per month. The same space can be used for own business. If the office space is used for own business, the opportunity cost per month is ₹ 50,000.

Classification on the Basis of Product Costs and Period Costs

Cost can also be classified as :

- (1) Product Costs; and
- (2) Period Costs

Product Costs : Product costs include all costs that are incurred for acquiring or manufacturing a product. *For example*, cost of battery used in a mobile phone is a product cost. In addition to direct material cost and direct labour cost the manufacturing overhead is also considered as product cost. It is to be noted that product costs are only taken into consideration for a year end stock valuation.

Period Costs : Period costs are those costs which are not included in the product costs. At the time of stock valuation, no part of these costs are taken into consideration. Sales commission, advertisements are good examples of period cost. Period costs are charged to Profit and Loss Account of the period in which they have been incurred.

Illustration 4

Match the following :

(i)	Total Fixed Cost	(1)	What cost should be ?
(ii)	Total Variable Cost	(2)	Incurred cost
(iii)	Unit Variable Cost	(3)	Increases in proportion to output
(iv)	Unit Fixed Cost	(4)	Cost of conversion
(v)	Standard Cost	(5)	What cost are expected to be ?
(vi)	Period Cost	(6)	Decreases with rise in output
(vii)	Actual Cost	(7)	Remains constant in total
(viii)	Labour and Overhead	(8)	Remains constant per unit
(ix)	Incremental Cost	(9)	Cost not assigned to product
(x)	Budgeted Cost	(10)	Added value of a new product

Solution

(i)	Total Fixed Cost	(7)	Remains constant in total
(ii)	Total Variable Cost	(3)	Increases in proportion to output
(iii)	Unit Variable Cost	(8)	Remains constant per unit
(iv)	Unit Fixed Cost	(6)	Decreases with rise in output
(v)	Standard Cost	(1)	What cost should be ?
(vi)	Period Cost	(9)	Cost not assigned to product
(vii)	Actual Cost	(2)	Incurred cost
(viii)	Labour and Overhead	(4)	Cost of conversion
(ix)	Incremental Cost	(10)	Added value of a new product
(x)	Budgeted Cost	(5)	What cost are expected to be ?

Illustration 5

Zuari Furniture Ltd. manufactures furniture, including tables. From the following information classify costs associated with the manufacture of the tables and the general operation of the business.

- The tables are made of teak wood that cost ₹ 4,000 per table.
- The tables are manually manufactured by the carpenters at a wages of ₹ 1,500 per table.
- A factory supervisor supervises the works of the carpenters. The salary of the supervisor is ₹ 1,20,000 per year.
- Four machine hours are required to produce a table. Electricity cost per machine hour is ₹ 10.
- Depreciation cost of the machines (drill, cutter, etc.) used to make the tables totals to ₹ 12,000 per year.
- Salary of the managing director of Zuari Furniture Ltd. is ₹ 2,40,000 per year.
- Sales promotion expenses per year ₹ 10,000.
- Salesmen are paid commission @ ₹ 250 for each table sold.
- Instead of making the tables, Zuari Furniture Ltd. could rent out its factory premises at a rent of ₹ 4,00,000 per year.

2.16 Cost Terms, Concepts and Classifications

Classification to be made as :

- (a) Variable cost
- (b) Fixed cost
- (c) Period costs
- (d) Direct materials
- (e) Direct labour
- (f) Manufacturing overhead
- (g) Direct cost
- (h) Indirect cost
- (i) Sunk cost
- (j) Opportunity cost

Solution

Before solving the question, carefully study the classification of each cost discussed in this Chapter. If you do not understand the logic of classifying a cost into a particular category, read that section of the Chapter again.

Serial Number	Name of the Cost	Variable Cost	Fixed Cost	Period Cost	Direct Materials	Direct Labour	Manufacturing Overhead	Direct Cost	Indirect Cost	Sunk Cost	Opportunity Cost
1.	Cost of teakwood used in a table	✓			✓			✓			
2.	Labour Cost per table	✓				✓		✓			
3.	Salary of Supervisor		✓				✓		✓		
4.	Electricity Cost to produce a table	✓					✓		✓		
5.	Depreciation of tools		✓				✓		✓	✓**	
6.	Salary of Managing Director		✓	✓							
7.	Sales Promotion Expenses		✓	✓							
8.	Commission to Salesmen	✓		✓							
9.	Rental income foregone										✓

** this is a Sunk Cost as the cost incurred for acquiring the equipment cannot be changed by any decision made now or in future.

Illustration 6

Classify the following cost as either product costs or period costs in a manufacturing company :

1. Lubricant used for maintenance of machines.
2. Hire charges for equipments used in the manufacturing process.
3. Factory Supervisor's salaries.
4. Salary paid to the driver of Sales Manager's car.
5. Liquid soap used by the factory workers at the end of a shift, to wash their hands.
6. Salaries of the security staff of the factory.
7. Depreciation on Sales Managers' car.

8. Depreciation on utensils used in the factory canteen.
9. Group insurance premium of factory workers.
10. Sales promotion expenses.

Solution

1. Lubricant used for maintenance of machines is an item of production overhead. It is a **product** cost.
2. Hire charges of equipment used in the manufacturing process is treated as direct expense. It is a **product** cost.
3. Factory supervisor's salary is an item of production overhead. It is a **product** cost.
4. Salary paid to the driver of the sales manager's car is an item of selling and distribution overhead. It is a **period** cost.
5. Liquid soap used by the factory workers for washing hands is an item of production overhead. It is a **product** cost.
6. Salary of the security staff of the factory is an item of production overhead. It is a **product** cost.
7. Depreciation on sales manager's car is an item of selling and distribution overhead. It is a **period** cost.
8. Depreciation on utensils used in the factory canteen is an item of production overhead. It is a **product** cost.
9. Group insurance premium of factory workers is an item of production overhead. It is a **product** cost.
10. Sales promotion expenses is an item of selling and distribution overheads. It is a **period** cost.

THEORETICAL QUESTIONS

1. Define cost, cost centre and cost unit. (Page 2.1, 2.3)
2. Distinguish between cost centre and cost unit. (Page 2.3)
3. What is composite cost units ? Give example. (Page 2.2)
4. Why costs are classified ? State generally accepted rules for classification of cost. (Page 2.6)
5. Explain the meaning of the term 'Sunk Cost' (Page 2.14)
6. Distinguish between 'Product Cost' and 'Period Cost'. (Page 2.14)
7. Distinguish between 'Direct Cost' and 'Indirect Cost'. (Page 2.5)
8. Give examples of each of the following : (a) direct labour; (b) indirect labour; (c) direct materials; (d) indirect materials; (e) direct expenses; (f) indirect expenses.
9. What is Opportunity Cost ? Explain with example. (Page 2.14)
10. Explain the meaning of 'Differential Costs' and 'Relevant Costs'. (Page 2.14)

PRACTICAL QUESTIONS

- 2.1. Below are the different costs that are incurred by various organisations :
 - (a) X-ray film used in the radiology department of Apollo Hospital, Chennai.
 - (b) Commission paid to salespersons at Tata McGraw Hill, New Delhi.
 - (c) The costs of advertising a A.R. Rehman concert in Kolkata.
 - (d) Depreciation on the hotel building of Grand Hotel, Kolkata
 - (e) Corporation tax on Metro Cinema, Kolkata
 - (f) The electricity cost of running a roller coaster at Nicco Park, Kolkata
 - (g) The cost of synthetic materials used to make 'VIP' bags.
 - (h) The cost of transporting 'Sony' televisions to retail shops.
 - (i) Fire insurance premium paid for bottling plant of 'Pepsi Co.'.

You are required to classify each cost into variable or fixed. Give reasons for your answer.

2.18 Cost Terms, Concepts and Classifications

- 2.2. Different costs associated with the operation of a factory are given below : You are required to classify each cost as being either variable or fixed. Also indicate whether cost would be typically be treated as a direct cost or indirect cost.
- (a) Cloth used in making casual shirts.
 - (b) Thread used in making casual shirts.
 - (c) Sugar used in production of soft drinks.
 - (d) Depreciation on bottling plant of soft drinks.
 - (e) Lubricants needed for running the machinery.
 - (f) Salary of security staff of the factory.
 - (g) Electricity used for running the machineries.
 - (h) Salary of worker assembling personal computers.
 - (i) Cost of battery used in mobile phones.
 - (j) Royalty payable to the owners of the patent for manufacture of each motor cycle.

Guide to Answers

Practical Questions

- 2.1. (a) variable cost; (b) variable cost; (c) fixed cost; (d) fixed cost; (e) fixed cost; (f) variable cost; (g) variable cost; (h) variable cost; (i) fixed cost.
- 2.2 (a) variable, direct; (b) variable, indirect; (c) variable, direct; (d) fixed, indirect; (e) variable, indirect; (f) fixed, indirect; (g) variable, indirect; (h) variable, direct; (i) variable, direct; (j) variable, direct.

Chapter 3

Accounting for Materials

Section I : Purchasing, Receiving and Storing

Introduction

Every product, we see and use, is made from a basic raw material or a combination of two or more raw materials. *For example*, a gunny bag is made from jute fibre, a car tyre is made from rubber, steel wire is made from steel, a dining table is made from wood and steel and so on. The jute fibre, rubber, steel and wood are raw materials. For manufacturing organisations, raw materials cost is a major part of the total cost of the product. *For example*, raw material cost is 70% of the total cost of a bag of cement. The investment in inventory of materials represents one of the largest current asset items of the organisation.

In recent years, much emphasis has been given to minimise the cost of materials and to optimise the physical flow of materials into the business and within the business. To keep materials cost at a minimum, safeguarding and accounting for materials is extremely important.

In a manufacturing organisation materials exist in various forms : raw materials in warehouse, materials waiting for processing; raw materials being processed; again, finished goods at the warehouse, in transit, at selling depot / counters, and so on. Therefore, proper *planning* and *control* of materials are two very important tasks of the management.

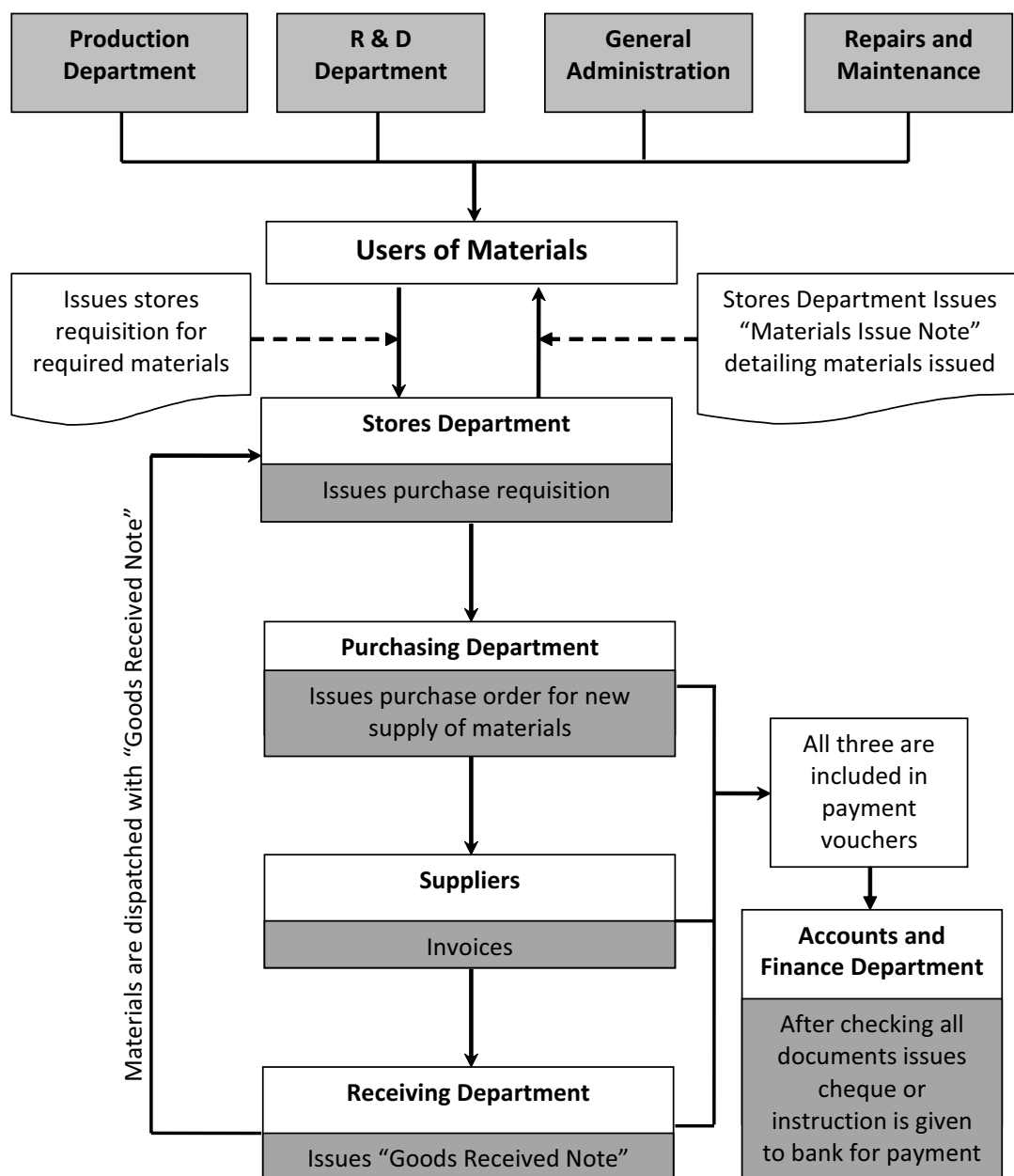
Materials Purchasing Procedures

In a large organisation, the responsibility for purchasing materials is given to the *Purchase Department*. It is headed by a purchaser manager — generally a professional. In smaller organisations, the responsibility for purchasing materials is given to a factory manager or to a foreman or to the departmental heads. In a large organisation, however, an entire department might be required (with proper manpower — technical and non-technical) to manage purchasing activities. This purchase department must buy *right materials in right quantity in right time and in right price*.

Functions of the Purchasing Department

1. receiving purchase requisitions for materials, supplies and equipments from production department, research and development department and other departments;
2. keeping information of various sources of supply;
3. negotiating purchase price, terms and conditions;
4. preparation and placement of purchase orders;
5. follow-up shipping and delivery schedules;
6. keeping coordination between purchasing, receiving, stores and accounts departments;
7. maintaining up-to-date record of suppliers, suitably indexed according to suppliers and materials;
8. keeping latest information in respect of overall supply scenario of the materials;
9. keeping latest information in respect of substitute materials and its price movement in the market.

The Materials 'Cycle'



[Fig. 3.1]

Qualifications of a Purchase Manager

An efficient and successful purchase manager should have the following qualities :

1. He should have a good technical knowledge of the industry.
2. He should be aware of the different materials required by the organisation.
3. He must keep in constant touch with market prices and market tendencies.i.e., demand – supply situation.
4. He should have a working knowledge of Contract Act and Sale of Goods Act.
5. He should be aware of the latest government circulars in respect of import, holding of stock, etc.
6. He should understand the different economic laws.
7. He should have the skill of managing people.
8. He should be computer savvy.
9. He must keep updated database of the vendors, their product line and price list.

In the process of purchase of materials, two most important documents are :

- (i) The Purchase Requisition; and
- (ii) The Purchase Order

The Purchase Requisition

A purchase requisition is a properly approved, written request for purchase of materials, equipments, etc. It is an internal document prepared by the stores or warehouse clerk as and when the stock level is reaching the re-order level. Sometimes, product development department or research and development department employee may prepare purchase requisition for special materials they need. No purchases will be made without duly authorised purchase requisitions. At the time of preparing purchase requisition, care must be taken in respect of quality and quantity of materials to be purchased. The proforma of a purchase requisition is given below:

Form No. : <u>Purchase Requisition</u>		No. 786 Date : 19.9.2017 Date Wanted : 29.9.2017
Ideal Machinery Co. Ltd. 6, Park Street Kolkata - 700 016		
Quantity	Code No.	Description
150	FP-1056	Diesel Fuel Pump - M100
1. Purchase Department		
2. Store Room		
3. Accounts Department		

[Fig. 3.2]

3.4 Accounting for Materials

The purchase requisition must contain the following information :

1. Code number of the material;
2. Catalog number;
3. Brand name (if any);
4. Quantity;
5. Technical specification (if any).

Purchase requisition form / slips should be easily available to each employee who is responsible for its preparation. Generally, it is prepared in 3 copies (using different colour paper). The original copy is sent to Purchase Department. The 1st duplicate copy is retained by the storekeeper in store room file for record. The 2nd duplicate copy is sent to accounts department. Some organisations may prepare more copies according to their need.

The Purchase Order

After receiving purchase requisition, the purchase department selects a supplier from the list of registered vendors. Under other circumstances, different suppliers might be asked to submit their quotations. After considering different factors such as price, quality, reliability of supply, credit terms, etc., a supplier is selected.

After the selection of the supplier, the purchase department prepare a purchase order (shown below). The purchase order is signed by the purchase manager. A purchase order is a written authorisation to a supplier to supply the specified materials at agreed terms and conditions. As a matter of policy, a purchase order must be prepared whether the order is placed over telephone or email.

A typical purchase order will comprise the following :

1. The name and address of the supplier.
2. The date of placing the order.
3. A purchase order number for identification purpose.
4. The quantity required of each separate item.
5. Serial number / catalog number of the material.
6. Description of the material.
7. Method of shipment.
8. The date of delivery.
9. The place of delivery.
10. The total value of the order with VAT or without VAT, etc.

Generally, **5 copies of purchase order** are prepared.

- (a) The original copy is sent to the supplier.
- (b) One copy is retained by the purchase department
- (c) One copy is sent to storeroom for verification. The stores clerk will compare the purchase order with the purchase requisition. If there is any discrepancy, it is brought to the notice of the purchase department.
- (d) One copy is sent to the receiving department to inform the department what is on order and when it will arrive. This procedure allows time for preparation. The receiving departments' copy of purchase order is a **blind copy**. It means that it does not indicate the quantities ordered and its price. A blind copy ensures the independent check of the quantities by the receiving staff.
- (e) Final copy is sent to the accounts department for accounting and audit purpose.

Form No. : Purchase Order To Tata Steel Ltd. Jamshedpur Jharkhand Panjab Tractors Ltd. 6, Hide Road Kolkata - 700 026 Purchase Order No. 9/2017 Date : 19.9.2017				
Ship to : Khidirpur Yard	Ship Via : Truck	Date Wanted 29.9.2017	F.O.B. Kolkata	Terms 2/30
Quantity	Unit	Description	Unit Price	Total Price
50	Sheet	Steel Sheet : 5 ´ 48 ´ 120	₹ 1,000	₹ 50,000
Subject to terms and conditions on reverse side of this Purchase Order. Acct. : 215 Job : Department :				
S.K. Chakraborty Purchase Manager				
1. Supplier				
2. Purchase Department				
3. Store Room				
4. Receiving Department				
5. Accounting Department				

[Fig. 3.3]

Centralised vs. Decentralised Purchasing

An organisation may purchase all the materials through one purchase department or through different purchase departments. In case of a large organisation, with different production facilities at different places, the centralised purchase may not be suitable. **For example**, Tata Motors Ltd. is having factories at 4 places — Jamshedpur, Pune, Panthnagar and Sanand. The requirement of different factories are different. Therefore, centralised purchase may not be economical. In contrast, Tata Steel Ltd. has factory only at Jamshedpur. In its case, centralised purchasing is suitable.

Whether an organisation should follow centralised purchasing system or decentralised purchasing system will be determined by many factors such as :

(1) Type of the product; (2) Nature of the material (e.g., perishable or non-perishable); (3) distance between sources of materials and factory, and so on.

The **advantages of centralised purchasing system** are as follows :

1. Expert purchasing staff can be employed to purchase best quality of materials at affordable price.
2. Full utilisation of different tools and equipments of the purchase department will be possible. Therefore, cost of inspection may be minimum.
3. It will be possible to negotiate better price for the materials because of bulk purchase.
4. The delay in procurement can be avoided as instant approval by higher authority will be possible.
5. It will facilitate the adaption of uniform purchasing policy, procedures and practices.
6. Overhead cost of the purchase department per unit of material will be minimum because of volume.
7. It helps to detect the slow moving and non-moving materials as there will be a close supervision by higher authority.

3.6 Accounting for Materials

8. It will prevent bogus purchases by the dishonest employees as all purchase orders will be approved by the higher authority.
9. Standardisation of materials is facilitated.
10. It facilitates the coordination with different departments such as stores, accounts, etc.

The **advantages of decentralised purchasing system** are as follows :

1. Decentralised purchasing system helps to cut transportation cost when the factory is near to the source of raw materials. **For example**, Modern Food Processing Ltd. has 2 factories — one at Malda, West Bengal processing only mangoes, another one at Solan, Himachal Pradesh, processing only apples. In this case, decentralised purchasing system is advantageous.
2. This system may react faster at the time of emergency requirement of materials.
3. This system is economical when different raw materials are available at different places at different prices. For example, a biscuit factory may purchase wheat from Punjab through their purchase office at Chandigarh and sugar from Uttar Pradesh through their purchase office at Lucknow .
4. This system helps to cut down purchase order processing time to a great extent.
5. This system motivates young managers because of freedom and responsibility.
6. This system reduces lead time to a great extent as the interaction between the purchase manager and the suppliers are direct and frequent.
7. This system facilitates the reduction of wastage and pilferages as the purchase manager directly controls everything.
8. This system facilitates the better coordination between purchase department and production department.
9. This system facilitates the comparison of performance of different production facilities. **For example**, Goodrick Tea Co. Ltd. has many tea gardens in West Bengal and Assam. Decentralised purchasing system will help to evaluate the performances of each tea garden separately.

Just-in-time Purchasing

Under this approach, materials, parts, sub-assemblies are purchased from outside suppliers / vendors only when they are needed. The main objective of this system is to reduce the cost of holding inventories in stock. All types of organisations – such as manufacturing, retail, wholesale, service can use JIT purchasing. The arrangement is made with the suppliers to deliver materials just before each production run / production shift. When this method is adopted, there is no need of maintaining safety stocks, maximum level, minimum level, etc. The basis of this system is that the suppliers are holding stock on behalf of the customers (manufacturers) and ensure that delivery and inspection requirements are met precisely.

The following are the main features of JIT purchasing :

1. **Only a few suppliers** : Suppliers / vendors are selected on the basis of their reliability and past performance. A close relationship is built-up with a small number of suppliers / vendors. Vendors are treated as a part of the entire system.
2. **Long-term contracts negotiated with the suppliers** : Few ultra reliable suppliers are given long-term supply contract at a fixed higher price. Sometimes suppliers are provided with technical know-how.
3. **Supply in small lots** : Materials, parts, sub-assemblies are supplied in small quantities as per requirement.
4. **Assured quality** : Materials, parts are supplied 100% defect-free. There is no scope for 'return'. It is to be noted that few years back, IBM eliminated 95% of the vendors from one of its plants. They brought down the number of vendors to 32 from 640. Therefore, quality assurance is one of the key factors of JIT purchasing system.
5. **Bulk payment** : Payment for invoices are made in bulk. Payment is not made for each invoice.

Advantages of JIT Purchasing System

The following are claimed to be the advantages of JIT purchasing system :

1. Ordering cost will be minimum.
2. No liquid fund is tied up in stock.
3. Loss due to obsolescence will be minimum as no unnecessary material will be ordered and held for a long time.
4. Storing space can be utilised for other productive purposes.
5. Stock holding cost will be minimum, if not nil.
6. Defect rates are reduced, resulting reduction in waste and greater customer satisfaction.

Many companies like Maruti Suzuki Ltd., Toyota, Dell, HP are using JIT purchasing system to remain competitive in an ever-changing business environment.

JIT purchasing system is not free from risk. Too much dependancy on few suppliers may lead to suspension of work. For example, a fire in the factory of the main supplier may disrupt the entire production chain. Such an interruption of supply might be so costly that might completely cancel out or even exceed the benefits that have from the use of JIT purchasing system. In many cases, labour problems in supplier's factory may also hamper the normal production of the customers. The main concern is that the problems or failure on one end of the production chain might be felt on another end.

Materials Purchasing System and Changing Technology

Adoption of new technology may help the organisation to reduce or eliminate the time and paperwork required for the purchase of materials. Using computer networks, the organisation and vendors will be linked directly with each other. The organisation's materials usage information is linked directly with the vendor's computer records. Orders are placed on-line and goods are picked and despatched by the vendors practically automatically. The purchase order and invoices are transmitted electronically between the vendors and organisations. It eliminates the paper processing and mailing time.

Now-a-days, many organisations are using EFT (Electronic Fund Transfer) for payment of vendor's invoices. In this system, the organisation is sending an electronic remittance advice to its bank, in place of sending a cheque to its vendor. The vendor's account is credited automatically through central clearing system.

Receiving of Materials

In big organisations, Receiving Department take the delivery of all materials purchased by the organisation. It consists of a manager / superintendent and employees trained in handling different kinds of materials. When goods are delivered by the carrier of the supplier, it will provide a document called **challan**. This challan (advice note) contains the full details of the quantity and items delivered. Generally, it is prepared in duplicate. After verification, one copy is returned to the carrier duly signed by the receiving authority.

Functions of the Receiving Department

1. To unload and unpack incoming materials.
2. To weigh, count or measure quantities received.
3. To check the quantity received with the purchase order to confirm that quantities and items are both in agreement.
4. To notify the purchasing department of discrepancies (short deliveries perhaps) as soon as possible. It is very important because most suppliers stipulate that any discrepancies must be notified within 72 hours from the time of detection.
5. To send special materials to laboratory for testing where it is necessary.
6. To prepare goods received note (or goods received report) stating the details of goods received.

3.8 Accounting for Materials

7. To notify the transport department and purchase department of any damage in transit.
8. To despatch all material received to different store rooms / factory.

The Goods Received Note (or The Receiving Report)

After receiving and checking the materials, the receiving department prepares **Goods Received Note**. It is an internal document. It shows all details of the shipment, including comment on the condition of the materials received. It is generally prepared in 5 copies. More copies can be prepared according to the need of the organisation.

A typical goods received note will comprise the following :

1. The name of the supplier including address.
2. The purchase order number.
3. The invoice number.
4. The date of receiving the materials.
5. The details of the materials received.
6. The details regarding transportation.
7. The signature of the receiving supervisor.
8. A space for notification of the inspection team.
9. The signature of the inspection in-charge.

Form No. :		Goods Received Note	
		Ideal Machinery Co. Ltd. 6, N.S. Road Kolkata - 700 001	
Received from : MICO Industries Ltd. Bangalore		No. : 455/17 Date Received : 5th Nov., 2017 Purchase Order No. : 20/17 Invoice No. : M1/16	
Shipped via : TCI	Transportation charges Prepaid		Received by :
Quantity Received 150	Quantity Accepted 140	Quantity Rejected 10	Description Diesel Injecting System
Signature of the Receiving Personnel			
Inspection Record			
Quantity Accepted 140	Quantity Returned 10	Reasons for Rejection Ordering Specification is not matching	
1. Original - Supplier		Signature of the Inspector	
2. Receiving Department			
3. Purchase Department			
4. Accounts Department			
5. Store Department			

[Fig. 3.4]

The copies of goods received note will be distributed as follows :

- (a) original copy is sent to the supplier who will attach it with the original invoice at the time of payment of the bill;
- (b) one copy will be retained by the receiving department;
- (c) one copy is sent to purchase department;
- (d) one copy is sent to accounts department;
- (e) final copy is sent to stores department along with the materials.

Material Cost

One of the main objectives of cost accounting is the determination of cost of materials, labour and manufacturing overheads consumed in the production. Determination of raw materials cost is most important because majority portion of the total cost of a product is the raw materials cost.

In this respect, the 'Cost Accounting Standard - 6 (CAS-6) issued by the Council of the Institute of Cost Accountants of India on 'Material Cost' is relevant.

5. Principles of Measurement

5.1. Principle of valuation of receipt of materials:

- 5.1.1 The material receipt should be valued at purchase price including duties and taxes, freight inwards, insurance, and other expenditure directly attributable to procurement (net of trade discounts, rebates, taxes and duties refundable or to be credited by the taxing authorities) that can be quantified with reasonable accuracy at the time of acquisition.
Examples of taxes and duties to be deducted from cost are CGST credits, credit for countervailing customs duty, sales tax set off/ SGST credits and other similar items of credit recovered/ recoverable.
- 5.1.2 Finance costs incurred in connection with the acquisition of materials shall not form part of material cost.
- 5.1.3 Self manufactured materials shall be valued including direct material cost, direct employee cost, direct expenses, factory overheads, share of administrative overheads relating to production but excluding share of other administrative overheads, finance cost and marketing overheads. In case of captive consumption, the valuation shall be in accordance with Cost Accounting Standard 4.
- 5.1.4 Items such as spare parts, stand-by equipment and servicing equipment are recognised as property, plant and equipment when they meet the definition of property, plant and equipment and depreciated accordingly. Otherwise, such items are classified as inventory and recognised in cost as and when these are consumed.
- 5.1.5 Normal loss or spoilage of material prior to reaching the factory or at places where the services are provided shall be absorbed in the cost of balance materials net of amounts recoverable from suppliers, insurers, carriers or recoveries from disposal.
- 5.1.6 Losses due to shrinkage or evaporation and gain due to elongation or absorption of moisture etc., before the material is received shall be absorbed in material cost to the extent they are normal, with corresponding adjustment in the quantity. The adjustment for moisture will depend on whether dry weight is used for measurement.
- 5.1.7 The forex component of imported material cost shall be converted at the rate on the date of the transaction. Any subsequent change in the exchange rate till payment or otherwise shall not form part of the material cost.

3.10 Accounting for Materials

	Explanation: The date on which a transaction (whether for goods or services) is recognised in accounting in conformity with generally accepted accounting principles
5.1.8	Any demurrage or detention charges, or penalty levied by transport or other authorities shall not form part of the cost of materials.
5.1.9	Subsidy/Grant/Incentive and any such payment received/receivable with respect to any material shall be reduced from cost for ascertainment of the cost of the cost object to which such amounts are related.

Summary of Treatment of Different Items in the Determination of Purchase Cost

S.No.	Item	Suggested Treatment
1.	Trade Discount / Quantity Discount	It is to be deducted from the list price of materials to get net cost of materials.
2.	Transportation / Delivery Charges	It is included in the purchase cost. Where necessary, common transportation / delivery charges are to be apportioned.
3.	Cash Discount for prompt payment of invoice	It is not taken into consideration for determining the materials cost as it has no relation with purchase of materials.
4.	Goods and Service Tax (GST)	If the organisation is a ' Registered Dealer ' under GST, GST will be excluded from the cost of the materials as it can be set off against GST collected from sales. If the organisation is not a ' Registered Dealer ', GST is included in the purchase cost.

Treatment of Containers for Materials Purchased*

Treatment of container cost in the cost of material purchased is as under:

Container is non returnable and for which no cost is charged in the invoice:

The container cost is included in the material cost. An estimated residual value of the container may be reduced for ascertainment of material cost, if sold for some value, from time to time. If the value is not so significant, it may be credited to manufacturing overheads.

Container is returnable, but charged in invoice and refunded, when returned:

As refunds are made, the cost of material will be net of the charge for returnable container. Necessary physical controls will be operative. Containers not returned in time may be charged to the entity. The amount so charged by the supplier should be aggregated with manufacturing overheads.

The cost borne by the entity will only be added to the cost of material. If charged value is Rs 100/- per container and return credit is for Rs 40/-, balance Rs 60/- is the cost to be included in material cost.

Container is charged separately in the invoice and not returnable:

This will be included in material cost.

Container sold as scrap:

The value may be reduced from material cost if material is significant, otherwise sale value of scrap be adjusted against manufacturing overheads.

**[As per Guidance Note on Cost Accounting Standard on Material Cost (CAS - 6)]*

Illustration 1

At what price per unit would Part No. A32 be entered in the Stores Ledger, if the following invoice was received from a supplier :

Invoice	₹
200 units Part No. A32 @ ₹ 5	1,000
Less: 20% Discount	<u>200</u>
	800
Add: GST @ 18%	<u>144</u>
	944
Add: Packing Charges (5 non-returnable boxes)	<u>50</u>
	<u>994</u>

Notes :

- (i) A 2% discount will be given for payment in 30 days.
- (ii) GST paid is adjustable with output GST.

[C.U.B.Com. (Hons.) – Adapted]

Solution

Calculation of Cost per Unit	₹
Net Cost (after trade discount) of 200 units	800
Add: Packing Charges	<u>50</u>
Total Cost of 200 units	<u>850</u>

Cost per unit = ₹ 850 / 200 = ₹ 4.25.

Notes :

- (1) It is assumed that 5 non-returnable boxes will not fetch any revenue.
- (2) It is assumed that GST credit will be available in full.

Illustration 2

Modern Manufacturing Company, Kolkata, not registered under GST, purchased a material of 20 tonnes from a mining company. The following data is available for the lot of material purchased :

- (i) Invoice price of material @ ₹ 2,000 per tonne.
- (ii) Trade discount @ 20% on invoice price.
- (iii) CGST @ 9%.
- (iv) SGST @ 9%.
- (v) Freight and Insurance @ 2% of net materials cost after GST.
- (vi) Other charges for delivery @ ₹ 100 per tonne.
- (vii) Cost of containers @ ₹ 20 per box of one quintal.
- (viii) Cost of loading and unloading @ 1% of total cost.

Compute total material purchase cost and cost per tonne to Modern Manufacturing Company.

[C.U.B.Com. (Hons.) – Adapted]

Solution

Computation of Total Cost of Material Purchased (20 tonnes)

Particulars	₹
Invoice price of materials (₹ 2,000 × 20 tonnes)	40,000
Less: Trade discount @ 20% of invoice price	<u>8,000</u>
	32,000
Add: CGST @ 9%	<u>2,880</u>
	34,880
Add: SGST @ 9%	<u>2,880</u>

3.12 Accounting for Materials

	37,760
Add: Freight and Insurance @ 2% of ₹ 37,760	755
	38,515
Add: Other charges for delivery (₹ 100 × 20 tonnes)	2,000
	40,515
Add: Cost of containers (Note 3)	4,000
	44,515
Add: Cost of loading and unloading (Note 4)	450
Total cost of material (20 tonnes)	44,965

Cost per tonne = (₹ 44,965 ÷ 20) = ₹ 2,248.25.

Working Notes :

- (1) GST is payable on net price, i.e., invoice price less trade discount.
- (2) No Input GST credit will be available, being not registered under GST.
- (3) 1 tonne = 10 quintals. Therefore, 20 tonnes = 20 × 10 = 200 quintals.
Containers cost = 200 × ₹ 20 = ₹ 4,000.
- (4) Cost of loading and unloading is 1% of total cost. It means 1% after adding cost of loading and unloading. Therefore, cost of loading and unloading = $\frac{1}{99} \times 44,515 = ₹ 450$ (approx.)

Illustration 3

The following details are available in respect of purchase of 1,250 kg of material 'X'.

- (a) Invoice price – ₹ 20 per kg. and GST – 18%.
- (b) Trade discount – 10% on invoice price.
- (c) Insurance – 1% of aggregate net price.
- (d) Delivery charges – ₹ 250.
- (e) Cost of containers @ ₹ 60 per container for 50 kg of material. Rebate is allowed @ ₹ 40 per container if returned within six weeks, which is a normal feature.
- (f) One container load of material was rejected on inspection and not accepted.
- (g) Cost of unloading and handling @ 0.25% of the cost of materials ultimately accepted.

On the basis of above, you are required to find out the cost of per kg. of material 'X' (Assume that no GST credit will be given.).

Solution

Computation of Landed Cost of Material 'X'

Particulars	₹
Invoice price (1,250 kg × ₹ 20)	25,000
Less: Trade discount 10%	2,500
	22,500
Add: GST @ 18% on ₹ 22,500	4,050
	26,550
Add: Insurance 1% on above	266
	26,816
Add: Delivery charges	250
Add: Cost of containers [₹ 60 (1,250 ÷ 50)]	1,500
	28,566
Less: Cost of materials returned (Note 1)	1,143
	27,423
Add: Cost of unloading and handling @ 0.25%	69
	27,492
Less: Credit of containers returned (Note 2)	960
Total cost of 1,200 kg.	26,532

Cost per kg = (₹ 26,532 ÷ 1,200) = ₹ 22.11.

Working Notes :

- (1) Total cost of 1,250 kg = ₹ 28,566. Cost of rejected containers = $(₹ 28,566 \div 1,250) \times 50 = ₹ 1,143$.
- (2) Total containers returned = $25 - 1 = 24$. Total Rebate = $24 ₹ \times 40 = ₹ 960$.

Illustration 4

The particulars relating to 1,200 kg of a certain raw material purchased by a company during April, 2017 were as follows :

- (a) Lot price quoted by supplier and accepted by the company for placing the purchase order :

Lot up to 1,000 kg	@ ₹ 22 per kg
From 1,001 to 1,500 kg	@ ₹ 20 per kg
From 1,501 to 2,000 kg	@ ₹ 18 per kg
- (b) Trade discount @ 20%
- (c) Additional charge for containers @ ₹ 10 per drum of 25 kg.
- (d) Credit allowed on return of containers @ ₹ 8 per drum.
- (e) GST at 10% on raw material and 5% on drums.
- (f) Total freight paid by the purchaser ₹ 240.
- (g) Insurance at 2.5% (on net invoice value) paid by the purchaser.
- (h) Stores overhead applied at 5% on total purchase cost of material.

The entire quantity was received and issued to production. The containers are returned in due course.

Draw up the suitable statement to show : (i) Total cost of material purchased; and (ii) Unit cost of material issued to production.

[I.C.W.A. (Inter) – Adapted]

Solution Computation of Total Cost of Materials Purchased

Particulars	₹
Cost of raw materials (1,200 @ ₹ 20)	24,000
Less: Trade discount 20%	4,800
	19,200
Add: Charges of container $[(1,200 \div 25) \times ₹ 10]$	480
	19,680
Add: GST on raw materials (10% of ₹ 19,200)	1,920
GST on Container (5% of ₹ 480)	24
Net Invoice Value	21,624
Add: Freight	240
Add: Insurance (2.5% on ₹ 21,624)	541
	22,405
Add: Credits for containers $(48 \times ₹ 8)$	384
	22,021
Add: Stores Overhead (5% on ₹ 22,021)	1,101
Total cost of 1,200 kg	23,122

Cost per Kg. = $(₹ 23,122 / 1,200) = ₹ 19.27$.

Illustration 5

A manufacturer in Surat purchased three chemicals A, B and C from Mumbai. The invoice gave the following information :

	₹
Chemical A : 3,000 kg @ ₹ 4.20 per kg	12,600
Chemical B : 5,000 kg @ ₹ 3.80 per kg	19,000
Chemical C : 2,000 kg @ ₹ 4.75 per kg	9,500
GST @ 5%	2,055
Railway freight	1,000
	<u>44,155</u>

3.14 Accounting for Materials

A shortage of 200 kg in chemical A, of 280 kg in chemical B and of 100 kg in chemical C was noticed due to breakages. At Surat, the manufacturer paid Municipality tax @ ₹ 0.10 per kg. He also paid cartage of ₹ 20 for chemical A, ₹ 63 for chemical B and ₹ 31 for chemical C.

Calculate the stock rate that you would suggest for issue price of chemicals, assuming a provision of 5% towards further deterioration.

Solution **Computation of Total Cost of Materials Purchased**

Particulars	Chemical A ₹	Chemical B ₹	Chemical C ₹
Invoice price	12,600	19,000	9,500
Add: GST @ 5%	630	950	475
Add: Railway freight (on the basis of weight)	300	500	200
Add: Municipality tax @ ₹ 0.10 per kg	300	500	200
Add: Cartage	20	63	31
Total cost of materials purchased (A)	13,850	21,013	10,406

Computation of Quantity of Materials Available for Issue

Particulars	Chemical A (Kg)	Chemical B (Kg)	Chemical C (Kg)
Gross Quantity purchased	3,000	5,000	2,000
Less: Normal loss due to breakage	200	280	100
	2,800	4,720	1,900
Less: 5% provision for deterioration	140	236	95
Quantity available for Sale (B)	2,660	4,484	1,805
Rate per kg (A ÷ B) (₹)	5.2068	4.6862	5.7651

Storing of Materials

After getting delivery of materials from the 'Receiving Department' together with a copy of 'Goods Received Note', it is the duty of the stores department to safeguard the materials. In large organisations, the volume and cost of materials and supplies handled by the stores department are very high. In these organisations, misappropriation of materials and supplies by dishonest employees are very common. Pilferage of materials, deterioration and bad handling of materials and supplies may lead to huge losses. Therefore, it is desirable to provide for the proper control of the materials.

There are many conditions for effective control of materials in Stores Department. Some of these are :

1. **Designated Area of Responsibilities** : In order to be able to exercise effective control, the area of responsibility of the stores department must be well-defined. A competent senior manager should be the in-charge of the department with well-defined responsibility and authority.
2. **Suitable Storage Facilities** : Proper storage facilities are necessary for preventing pilferage and deterioration of materials. *For example*, 'cold storage' facility is required for perishable materials. Similarly, 'safe deposit vault' is necessary for high value materials like gems, gold, etc. Adequate storage facility is required for bulkier items.
3. **Stores Arrangement** : Stores arrangement should be such that all materials can be issued with less effort. It is easier to take a physical inventory when materials are stored in an orderly manner.

Duties of Store-keeper

The main duties of a store-keeper and his team are the following :

1. The store-keeper with his assistants should see that materials delivered to the store room(s) are placed in proper bins, racks and shelves.
2. He should take necessary steps to prevent pilferage of valuable materials which can be easily concealed in the body. It is a good policy to allow only the employees of the stores department to the store room. The employees of the department should issue materials through cage windows or glass windows.

3. He should undertake regular checking of materials to keep employees on alert.
4. He should see that all receipts and issues of materials are entered immediately in the bin cards.
5. He should take necessary steps for proper layout and design of the store room. Proper arrangement of materials in the store room will help to reduce issue time and inspection time.
6. He should see that all materials are issued on the basis of proper '**Materials Requisition Slip**' duly authorized.
7. He should issue 'Purchase Requisition' when the stock level has reached to 'Re-order Level'.
8. He should prepare periodically the list of slow-moving, non-moving and obsolete materials. He should send a report to higher authorities to take necessary action.
9. He should take back excess materials from different departments after proper verification and authorisation.
10. At the end of the day, he should hand over all stores requisitions, material transfer notes and material return notes to costing department to facilitate the records in the stores ledger.

Organisation of Stores Department

Organisation of stores department will depend upon the size of the organisation, the nature of materials used, the production process, number of manufacturing facilities etc. Generally, there are **two** main types of stores organisation :

1. Centralised Stores; and
2. Decentralised Stores.

Centralised Stores: Under centralized stores system, all materials are kept in one location, though there may be more than one store rooms. It is very useful when the production facilities are concentrated in one place rather than scattered in different places. The **main advantages of centralised stores** are :

1. Expert staff can be employed to manage the stores efficiently and economically.
2. Optimum utilisation of space will be possible.
3. It will facilitate the close supervision and tight control over stores.
4. The quickly detection of slow moving, non-moving and obsolete materials will be possible.
5. Full utilisation of different equipments used in the store room, e.g., electronic weighing machines, will be possible.
6. Stores overhead cost per unit of material will be minimum because of volume.
7. It will be possible to purchase costly material handling equipment, e.g., Robot, Frock Lift, etc.
8. It will be economical to use costly advanced software for managing stores.
9. It will facilitate the close coordination between the factory and stores department.
10. To prevent pilferage, better security arrangement can be made, e.g., close circuit T.V. can be installed.
11. Frequent stores checking is facilitated as trained staff will be available easily.
12. It will be possible to reduce clerical cost, stationery cost and recording cost.
13. Normal work of the store room will not be affected if any one is absent from the work as there will be a good number of trained staff.
14. The amount of working capital invested in stock is minimised.

The **disadvantages of centralised stores** are as follows :

1. If the production facilities are scattered, the overall transportation cost of materials will be more.
2. The labour problem in centralized stores may affect the production at different factories.
3. Natural calamity, e.g., flood in the area of centralized stores may stop production at different factories located in different places.
4. There is greater risk of loss by earthquake and fire.
5. There may be inconvenience and delay in issue of materials to different distant production facilities.
6. Transportation problems (internal or external) may cause production stoppage in different facilities.

3.16 Accounting for Materials

Decentralised Stores : Under decentralized stores system, materials are kept at different locations. It is very useful when the production facilities are situated at different distant places. The *main advantages of decentralized stores* are :

1. Production of all factories will not be affected by any natural calamities in any particular area.
2. There will be no delay in supplying materials to factories which are not far from store room.
3. Labour problem in one location may not affect the production of other locations.
4. There is lesser risk of loss by earthquake or fire.
5. It will be possible to manage stores more efficiently as there will be lesser number of materials to be handled.

The *disadvantages of decentralized stores* are many. Some of these are :

1. Optimum utilisation of man and machines will not be possible.
2. Stores overhead cost per unit of material will be more.
3. Close supervision of materials and supplies may not be possible.
4. It may not be possible to use costly material handling equipment.
5. If the materials are to be procured from different store rooms located at different places, the cost of transportation will be more.
6. The cases of misappropriation of materials and supplies by employees will be more.
7. Better security arrangements with the modern gadgets, e.g., CCTV, may not be possible.
8. Overall storing costs may increase manifold.
9. Overall capital investment will increase.
10. If materials are purchased centrally, this system may not work efficiently for lack of coordination between purchasing department and different store rooms located at various places.

Bin Card

When materials are stored in bins, on racks or on shelves, a pre-ruled paper card is also placed in each bin / rack / shelf for the purpose of recording the physical movement of material from that bin / rack / shelf. This card is known as '**Bin Card**'. Bin Card is maintained by the stores department. This bin card is an informal but carefully maintained record showing the quantities of materials received, issue and on hand at all times. It does not record *money value of materials* received / issued / in hand.

It is not a part of the accounting records as such, but very useful for knowing the total quantity of a particular material stored in that particular bin / rack / shelf. The store-keeper use this bin as a tool for material control.

The bin card may be prepared in any size or shape as per the need of the organisation. A typical bin card will contain the following information :

- (i) Code number of material;
- (ii) Location;
- (iii) Description of material;
- (iv) Re-order point, maximum level and minimum level, etc.

Pre-printed paper board is used for bin card. Generally, it consists of five columns :

- (i) Column 1 is used for recording the date of receipt / issue.
- (ii) Column 2 is used for entering the quantity of materials received.
- (iii) Column 3 is used for entering the quantity of materials issued.
- (iv) Column 4 is used for entering the quantity of materials in hand after each issue / receipt.
- (v) Column 5 is used for writing remarks such as goods on order, audit notes, etc.

There may be additional columns for GRN (Goods Received Note) and MRN (Material Requisition Note).

The specimen of a bin card is given below :

Bin Card

Code No. : B110					Re-order Point : 200	
Location : B65					Maximum Level : 1,000	
Description of Material : Diesel Fuel Pump					Minimum Level : 100	
Date	Received		Issued		Balance	Remarks in Hand
	GRN	Quantity	MRN	Quantity		
1.1.17					300	
8.11.17		600			900	
12.11.17				500	400	

At the time of making the entries in the bin card, note the following :

- In the 'Received' section, the entries will be the actual quantity received and the documents used for received entries will be the 'Goods Received Notes'.
- In the 'Issued' section, the entries will be the actual quantity issued and the documents used for issued entries will be the 'Materials Requisition Notes.'

Stores Ledger

A stores ledger is a very vital record which shows the quantities and values of materials received, issued and on hand at all times. It is similar to bin card (particularly heading portion) except that money values are shown. It is a part of the accounting records and it is kept in the cost accounting department. A stores ledger account is maintained for each materials on hand. It is a subsidiary ledger. At the end of the accounting period, the total of stores ledger account should tally with the 'Materials Control Account' in the 'General Ledger'. Now-a-days, most organisations keep Stores Ledger Account in computer. In computerised system, with the help of good software, recording of issues / receipts are very easy. The store-keeper can obtain all information regarding materials by pressing few keys and/or clicking mouse of the computer.

In some small organisation, the stores ledger is maintained in bound volumes or in loose leaf form in binders.

The heading of stores ledger account contain the following information :

- Code number of material;
- Location
- Description of material
- Re-order point, maximum level, minimum level.
- Unit measurement etc.

The body of the stores ledger is ruled like bin card.

There are 5 main columns :

- (1) Date;
- (2) Received;
- (3) Issued;
- (4) Balance; and
- (5) Remarks.

Received column is sub-divided into 4 columns :

(a) GRN No. (Goods received note number); (b) Quantity; (c) Rate; and (d) Amount.

Issued column is also sub-divided into 4 columns :

(a) MRN No. (Materials requisition note number); (b) Quantity; (c) Rate; and (d) Amount.

Balance column is sub-divided into 3 columns :

(a) Quantity; (b) Rate; and (c) Amount.

3.18 Accounting for Materials

The specimen of a Stores Ledger is given below :

Stores Ledger

Code No.					Maximum Level:					Folio:		
					Minimum Level:					Location:		
Description of Materials:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	

Distinction between Bin Card and Stores Ledger

S.No.	Bin Card	S.No.	Stores Ledger
1.	Bin Card is maintained in the stores department by the store-keeper.	1.	Stores Ledger is maintained in the Cost Accounting Department.
2.	It is not a part of the accounting records.	2.	It is part and parcel of accounting records.
3.	In the bin card, receipt / issue of materials are recorded in quantity only. No value or rate of material is recorded.	3.	In the stores ledger, receipts, issues and balance are recorded in details with quantity, rate and value.
4.	In the bin card each and every receipt / issue is recorded individually. For example, material 'X' have been issued 3 times during the day as follows : 1st issue 20 units 2nd issue 30 units 3rd issue 50 units In the bin card, separate entries are made for 20 units, 30 units and 50 units.	4.	In the stores ledger, entries are made in total at the end of the day. Taking the same example, in the stores ledger, one entry for 100 units issued will be made.
5.	In the bin card, record is made for receipt / issue immediately.	5.	In the stores ledger, record is made for issue / receipt at the end of the day.
6.	Transfer of materials from Job to Job or Department to Department is not recorded in bin card.	6.	Inter-departmental transfer of materials appear only in stores ledger for cost accounting purpose.

Justification of Maintaining Bin Cards

Many believes that maintenance of bin cards along with stores ledger is not necessary as it is nothing but duplication of work. However, it is advantageous to maintain both bin cards and stores ledger for the following reasons :

1. Bin card facilitates the physical checking of materials in the bin / rack / shelf. At the time of surprise checking, it can provide readymade figures of materials.
2. Bin cards are maintained by the store-keeper and stores ledger is maintained by the cost accounting department. Two separate records will act as a good internal control system.
3. Bin cards may provide quick data for detecting frauds and misappropriation in the store room.
4. Comparison of figures of bin cards and stores ledger will help to detect errors in recording.
5. Stock-out can be prevented by store-keeper by going through the balance of materials in the bin cards.

Section II : Control of Materials

Specific procedures and methods for controlling materials vary from organisation to organisation, industry to industry. The nature of the product, the size of the organisation, the production complexity etc. are some of the factors involved in material planning and controlling. In general, materials control is achieved through functional organisation, assignment of responsibility and proper accounting system.

Control of Material – Main Considerations

The following are the main requirements for designing an efficient system of material control :

1. It is desirable to centralise the authority for controlling materials. One competent executive should be in charge of materials.
2. There should be well defined areas of responsibility and authority of each stockkeepers. *For example*, storekeeper of raw materials will look after every aspect of raw materials. Similarly, storekeeper of 'purchased parts' will look after purchased parts only.
3. There should be proper cooperation and coordination amongst different departments – such as production, purchasing, receiving, stores, inspection, accounts and finance, cost, etc.
4. All purchases – pencil to plant and equipment, must be made by purchase department only.
5. All materials and other items should be received by the receiving department.
6. No materials should be delivered by the suppliers directly to production department or other departments.
7. There should be a proper system of coding. If it is possible, there should be a **bar code system** for all items for correct and quick capturing of information. Nowadays, in many organisations use of bar code is very common.
8. There should be a proper storage facility to minimise pilferage, damage, theft, etc. The degree of protection required will depend upon the nature and value of the material. If the material is inflammable, proper precaution for fire must be taken. If the material is very costly, it must be stored in a safe vault with close circuit camera supervision.
9. All the materials are to be stored in an **orderly manner** so that minimum time is consumed at the time of issue and inspection of materials.
10. After receiving, all the materials should be placed in their respective bins, racks or other appropriate places as soon as possible. Entries in the bin card are to be made immediately.
11. All materials are to be issued on the basis of authorised **Materials Requisition Slip** only. No person other than storekeeper and his assistants should have access to materials in the store room.
12. There should be a proper and dependable set of accounting records. The records must show quantities received, issued and in hand. A good and **efficient** system of control through records will prevent pilferages by employees.
13. Any excess materials issued for a particular job should be returned to the storekeeper immediately. Such materials should be accompanied by **Materials Return Note** authenticated by the foreman.
14. Any materials transferred from one department to another or from one job to another should be accompanied by a **Materials Transfer Note** authenticated by the foreman.
15. All the materials are to be classified into three categories (A, B and C) based on consumption value of materials. Physical stock taking for 'A' category items should be made frequently by a responsible person from other departments. The physical stock should be compared with the balance in the bin card. Any discrepancy must be reported to the proper authority immediately.
16. Maximum, minimum and reorder levels of stock should be fixed after considering consumption pattern, lead time and nature of materials.
17. There should be an effective **internal control system**.

3.20 Accounting for Materials

18. There should be an efficient system of internal audit.
19. The storekeeper / stores auditor should prepare periodically the list of slow moving, non-moving and obsolete materials. They should send report to the management for taking necessary actions.
20. All materials required for jobs or for the replenishment of storekeeper's stocks, should be purchased on the basis of **Purchase Requisition Form / Slip** issued by the works manager or other responsible executive.
21. Storekeeper should hand over daily all stores requisitions, materials transfer notes, material return notes to the costing department.
22. There should be a system of regular reporting to management in respect of materials consumed, materials in stock, materials discarded, etc.

Tools and Techniques Used for Control of Materials

The tools and techniques generally used for control of materials are :

- (a) ABC Analysis;
- (b) Economic Order Quantity;
- (c) Setting of Various Stock Levels;
- (d) Use of Perpetual Inventory System and Continuous Stock Verification; and
- (e) Use of Control Ratios.

ABC Analysis

In a manufacturing organisation, thousands of materials are used for producing different products. All the materials are not of equal *economic* importance. Some are high-valued items and some are low-valued items. **For example**, a car manufacturing company uses more than 30,000 items (starting from engine, gear box, tyre, fuel injecting system to very small size screws, rubber packing, etc.). The cost of engine, gear box are huge as compared to the cost of screw and rubber packings. It is not possible to control all these 30,000 items with equal importance. That is why, many organisations use *selective control techniques* for control and management of materials. **ABC analysis is one of the selective control techniques, where all materials are classified into three categories — A, B and C on the basis of annual issue value (in terms of money).**

The following steps are taken for classification of different materials into A, B and C categories.

Step 1 : Estimate the future requirement of different materials in units, based on the sales forecast.

Step 2 : Estimate the price per unit of each material.

Step 3 : Calculate the annual usage value of each item by **multiplying projected price per unit with the projected total requirement of the material.**

Step 4 : Arrange the usage value in descending order (i.e., 1st item will be with highest usage value).

Step 5 : Compute for each item, its percentage of the total in terms of **unit**.

$$\frac{\text{Number of unit of that item}}{\text{Total Number of all items}} \times 100$$

Step 6 : Compute for each item its percentage of the total in terms of **usage value**.

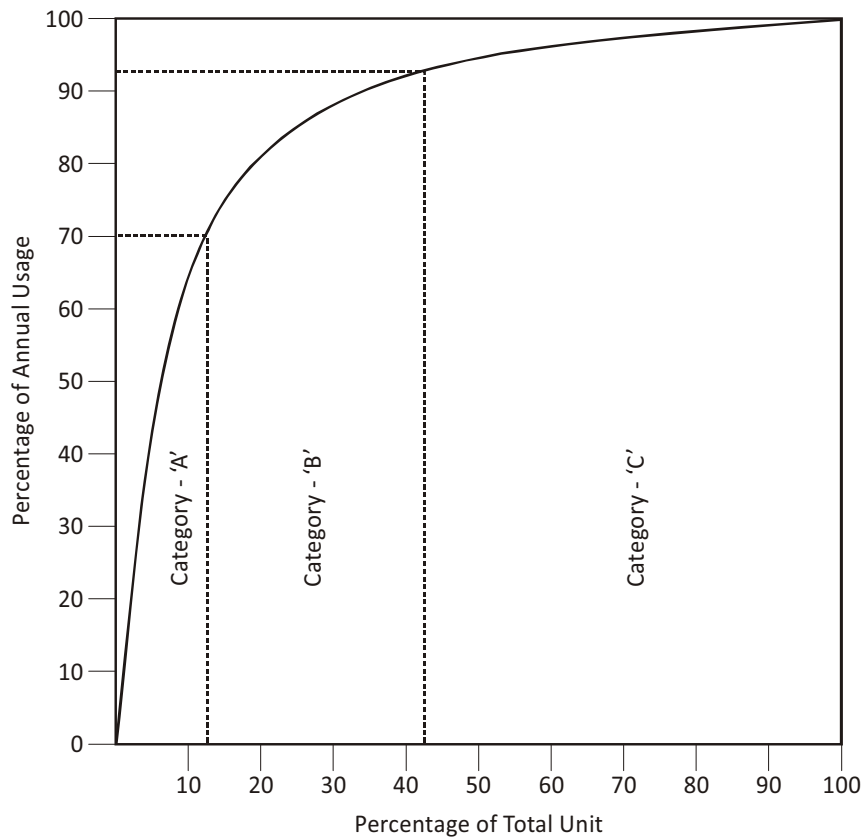
$$\frac{\text{Usage Value of that item}}{\text{Total Usage Value of all items}} \times 100$$

- Step 7 :**
- (i) Classify the items into 'A' category which will account for 60% to 70% of total usage value.
 - (ii) Classify the items into 'B' category which will account for 20% to 30% of the total usage value.
 - (iii) Classify the remaining items as 'C' category.

Example

The following table and graph shows the ABC classification of materials :

Items	Units	% Total Units	Cost per Unit	Total Cost (₹)	% of Total Cost
A	1,000	10	60.00	60,000	60.0
B	200	2	50.00	10,000	10.0
C	1,400	14	7.00	9,800	9.8
D	800	8	10.00	8,000	8.0
E	800	8	5.00	4,000	4.0
F	2,000	20	1.80	3,600	3.6
G	1,600	16	1.75	2,800	2.8
H	2,000	20	0.50	1,000	1.0
I	200	2	4.00	800	0.8
Total	10,000			1,00,000	100.0



[Fig. 3.5]

3.22 Accounting for Materials

After classifying materials into A, B and C categories, the following steps are taken for control of materials.

For 'A' category items :

- (i) These are managed by the **best personnel** available in the materials management department.
- (ii) These are recorded with every details after each receipts and issues strictly.
- (iii) Re-order level is revised frequently according to situations.
- (iv) Economic order quantity is calculated and orders are placed accordingly.
- (v) To minimise investment in materials, the technique of value analysis and variety reduction is done.
- (vi) Continuous stock taking is done.
- (vii) **Minimum** safety stock is maintained.
- (viii) Inventory turnover is calculated periodically.

For 'B' category items :

- (i) These are managed by **middle level** executives.
- (ii) These are recorded with minimum details.
- (iii) Re-order level is not revised very frequently.
- (iv) Orders are placed periodically according to the requirement.
- (v) Periodical stock taking is done.
- (vi) **Moderate** safety stock is maintained.

For 'C' category items :

- (i) These are managed by **lower level** executives.
- (ii) Details recording is not done.
- (iii) Re-order level is set once. It is used for the entire accounting period with no revision.
- (iv) No EOQ is calculated. Orders are placed once or twice in a year after ascertaining consumption pattern.
- (v) Periodical stock taking is done.
- (vi) **High** safety stock level is maintained.

Advantages of ABC Analysis

The following are the advantages of ABC Analysis :

- (i) It is very cost effective. By strictly controlling only 10% items ('A' category), 70% of the value of materials is controlled.
- (ii) It helps to minimise the chance of obsolescence as most valuable items are frequently checked and monitored by the top level executives.
- (iii) Overall inventory management cost is reduced by adoption of EOQ for 'A' category items.
- (iv) Top management time is saved since attention needs to be paid only for 10% — 'A' category item.
- (v) The investment in inventory is minimised through close control of 'A' category items.
- (vi) Purchase department can concentrate on 'A' category items and negotiate better prices with the suppliers.

Economic Order Quantity (EOQ)

EOQ is the order size that minimises the sum of the costs of ordering stock, the costs of holding stock and shortage costs.

Costs of ordering stock are incurred each time an order is placed. These include clerical cost, stationery, postage and some handling and transportation costs. These costs are incurred whenever an order is placed irrespective of the quantity ordered. Cost is same (whether 1 unit or 100 units or 1000 units are ordered). These costs directly vary with the number of orders placed – not by the size of the orders.

Costs of holding stock (carrying cost) are incurred for keeping units in stock throughout the accounting period. It is expressed as a percentage of cost of material or per unit. Holding costs generally consists of :

- (i) Rent of the storage space;
- (ii) Insurance premium paid for the value of the units held in stock;

- (iii) Wages of stores staff;
- (iv) Lighting, heating or airconditioning of the storage space;
- (v) Cost of damages, loss or obsolescence;
- (vi) Opportunity cost of investment in stock;
- (vii) Opportunity cost of space of storage.

Shortage costs result from not having sufficient stock to meet production needs / customers' needs. Some assembly processes are such that work cannot continue if a particular parts is not available. *For example*, in a mobile phone manufacturing factory, the 'microphone' used in the mobile is out of stock. It is not possible to assemble the mobile phone without microphone. A shutdown, in all probability, will lead to certain costs such as:

- (i) Workers wages for idle time;
- (ii) Lost sales resulting in dissatisfied customers;
- (iii) The costs of expediting supply (e.g., air lift at high cost);
- (iv) Loss of discounts on purchase (through bargain);
- (v) Loss of future sales because the dissatisfied customers will advice future customers to buy other manufacturers' products.

Computation of EOQ

There are *three* approaches for computing EOQ :

- (i) Tabular approach;
- (ii) Formula approach
- (iii) Graphical approach.

Tabular Approach : Under this approach, total costs (ordering cost + holding cost + shortage cost) are calculated for different order sizes. The order size, where total costs are minimum is selected as EOQ. Let us consider the following example :

Illustrative Example 1

A company purchases a raw material from a supplier at a cost of ₹ 40 per kg. Total annual demand for this material is 10,000 kg. Cost of placing an order is ₹ 20. Storage and holding cost is ₹ 2.50 per kg for a year. Shortage cost Nil.

Solution

The number of orders to be placed in the year = $\frac{\text{Annual demand}}{\text{Order size}}$.

We know annual demand is 10,000 kg. If the order size is 50 kg, then the number of orders will be $\frac{10,000 \text{ kg}}{50 \text{ kg}} = 200$. Similarly, if the order size is 100 kg, then the number of orders will be $\frac{10,000 \text{ kg}}{100 \text{ kg}} = 100$ and so on. Therefore, number of orders will be 200, 100, 50, 25, 10 and 5 for order sizes of 50 kg, 100 kg, 200 kg, 400 kg, 1,000 kg and 2,000 kg respectively.

To determine the holding costs, we need to make two assumptions :

1. Materials are consumed evenly throughout the year; and
2. No stock exist when each order is received (or any material held are maintained at a constant level throughout the year).

Based on the above assumptions, average stock held is given by the formula : $\frac{\text{Order quantity}}{2}$

It is to be noted that this **average stock figure** will determine the holding cost.

Let us prepare a table for calculating ordering cost, holding cost and total costs for different order sizes.

3.24 Accounting for Materials

Statement Showing Total Cost of Different Order Size

(a) Order Size	50 kg	100 kg	200 kg	400 kg	1,000 kg	2,000 kg
(b) Number of Orders = $\left[\frac{\text{Annual Demand}}{\text{Order Size}} \right]$	200	100	50	25	10	5
(c) Average Stock (kg) = $\left[\frac{\text{Order Quantity}}{2} \right]$	25	50	100	200	500	1,000
(d) Ordering Cost (₹) [(B) × ₹ 20]	4,000	2,000	1,000	500	200	100
(e) Holding Cost (₹) [(c) × ₹ 2.50]	62.50	125	250	500	1,250	2,500
Total Cost [(d) + (e)]	4,062.50	2,125	1,250	1,000	1,450	2,600

↓
**Minimum
total
annual cost**

It is clear from the above table that total ordering cost *plus* holding cost is minimum if the order size is **400 kg**. So, 400 kg. is the EOQ.

Students should note that the above table can be prepared with the help of Microsoft Excel programme.

Formula Approach : The EOQ can also be found by means of a formula that can be derived mathematically:

$$E = \sqrt{\frac{2AO}{H}}$$

where,

E = Economic order quantity (EOQ)

A = Annual demand

O = Ordering cost

H = Holding cost per unit per year

Using the data from the *Illustrative Example 1 (Page 3.23)*, we can directly compute the EOQ as follows :

Given that :

A = Annual demand – 10,000 kg.

O = Order cost – ₹ 20 per order

H = Holding cost per kg for a year – ₹ 2.50

$$\begin{aligned}
 E &= \sqrt{\frac{2AO}{H}} \\
 &= \sqrt{\frac{2 \times 10,000 \times 20}{2.50}} = \sqrt{\frac{4,00,000}{2.50}} = \sqrt{1,60,000} = 400 \text{ kg.}
 \end{aligned}$$

Points to Remember

1. *At the time of calculating EOQ, you should be careful that time periods applied to demand and holding cost are same. It means that if demand is taken for a year, then holding cost is also to be calculated for the year. Similarly, if the demand is taken for a month / quarter, the holding cost per unit for month / quarter is to be calculated.*
In the examination, data may be given for demand for a year but holding cost per unit has been given for a month. In this situation, restate annual demand on a monthly basis or holding cost per unit on a yearly basis.
2. *At EOQ, total ordering cost = Total holding cost*
3. *Purchase cost per unit will remain same irrespective of quantity ordered.*
4. *EOQ is calculated for 'A' category items (as determined by ABC analysis).*

The result of EOQ calculation can also be used for :

- (i) Calculating the number of orders;
- (ii) Frequency of order / time gap between two orders;
- (iii) Total ordering cost; and
- (iv) Total holding cost.

All the above are calculated as follows :

$$(i) \text{Number of Orders} = \frac{\text{Annual demand}}{\text{EOQ}} = \frac{A}{E} = \frac{10,000 \text{ Kg}}{400 \text{ Kg}} = 25 \text{ orders per year}$$

$$(ii) \text{Frequency of Order / Time Gap between Two Orders} = \frac{365 \text{ days}}{\text{Number of Orders}} \\ = \frac{365}{25} = 14.6 \text{ days (say, 15 days)}$$

$$(iii) \text{Total Ordering Cost} = \text{Number of Orders} \times \text{Ordering Cost per Order} = \frac{A}{E} \times O \\ = 25 \times ₹ 20 = ₹ 500$$

$$(iv) \text{Total Holding Cost} = \frac{1}{2} \times \text{EOQ} \times \text{Holding Cost per kg per year} \\ = \frac{E}{2} \times H = \frac{1}{2} \times 400 \times 2.50 = ₹ 500$$

$$(v) \text{Total Annual Cost} = \left(\frac{\text{Annual demand}}{\text{EOQ}} \right) \times (\text{Cost per Order}) + \frac{\text{EOQ}}{2} (\text{Annual holding cost per unit}) \\ = \left(\frac{10,000 \text{ Kg}}{400 \text{ Kg}} \times 20 \right) + \left(\frac{400}{2} \times 2.5 \right) = ₹ 1,000.$$

Total annual cost (total ordering cost *plus* total holding cost) can be calculated with the help of the following formula also :

$$\text{Total Annual Cost} = \sqrt{2 A \times O \times H} = \sqrt{2 \times 10,000 \times 20 \times 2.50} = \sqrt{10,00,000} = ₹ 1,000$$

Mathematical Derivation of the EOQ Formula

It is clear from the table (in page 3.24) that the number of order will reduce with increase in the quantity ordered but holding cost will increase with increase in the quantity ordered. It means **ordering cost varies inversely as holding cost**.

The objective of a firm is to minimize total ordering cost and holding cost. It can be proved mathematically that cost is minimum when **both are equal**.

So, total ordering cost = total holding cost.

$$(i) \text{Total Ordering Cost} = \left(\frac{\text{Annual demand}}{\text{EOQ}} \right) \times \text{Ordering Cost} = \frac{A}{E} \times O$$

$$(ii) \text{Total Holding Cost} = \frac{1}{2} \times \text{EOQ} \times \text{Holding Cost} = \frac{E}{2} \times H$$

$$\text{Therefore, } \frac{A}{E} \times O = \frac{E}{2} \times H$$

$$\text{or, } E^2 H = 2AO$$

$$\text{or, } E^2 = \frac{2AO}{H}$$

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$$\text{or, } E = \sqrt{\frac{2AO}{H}}$$

where,

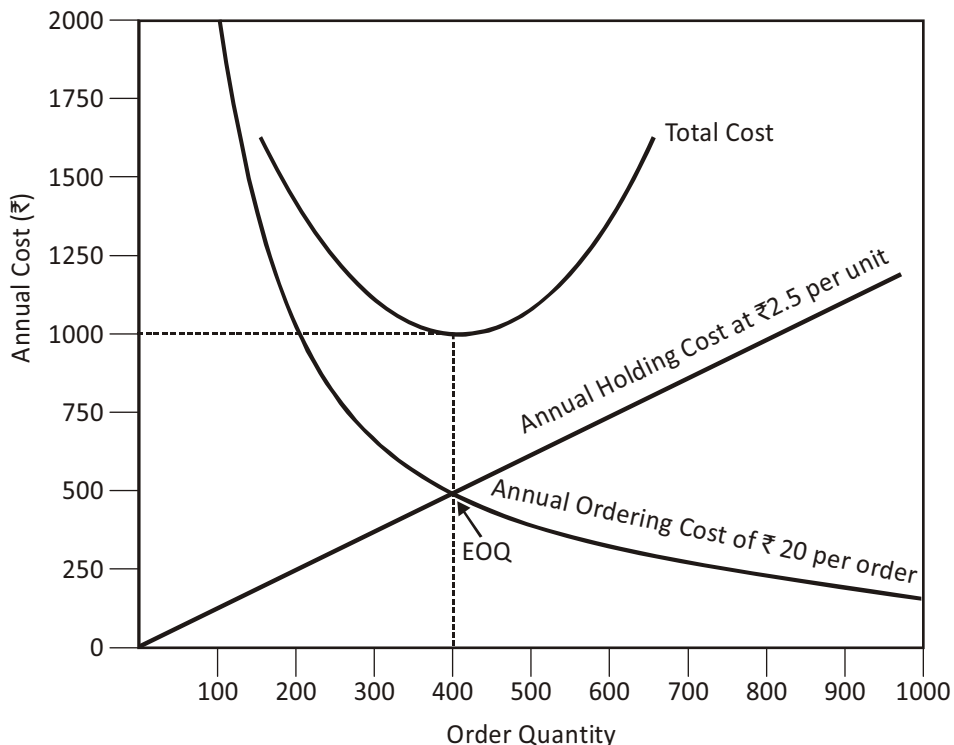
E = Economic Order Quantity (EOQ)

A = Annual Demand

O = Ordering Cost per Order

H = Holding Cost per unit per year

Graphical Approach : The data given in the *Illustrative Example 1* is represented in graphical form in Fig. 3.1 for order size 100 kg to 1,000 kg. The vertical axes represents the relevant annual cost and horizontal axis represents different quantity ordered.



[Fig. 3.6]

It is to be noted that total cost curve is at a minimum when order size is 400 kg. it occurs at the intersecting point of ordering cost curve and holding cost curve. At EOQ **both costs are equal**.

Assumption of EOQ Model

The computation of EOQ is based on a number of key assumptions :

1. The demand is known and it is assumed to be **constant**.
2. Materials are consumed **evenly** throughout the year.
3. The ordering cost per order and holding cost per unit will **remain same** throughout the period.
4. **No stock exist** when each order is received (or any materials held as safety stock are maintained at a **constant level** throughout the period).
5. Lead time (the time gap between placing an order and getting delivery of the same) is known with **certainty**.

Limitations of EOQ Model

1. In case of perishable goods, it is not possible to use this model.
2. Management is much more interested to get bulk discount (through price negotiation) rather than to save inventory holding cost. If the bulk discount is more than holding cost, it is better to buy more. The EOQ model is not effective in such a situation.
3. When the demand for the product is volatile and it cannot be predicted properly, the EOQ model will not be effective in such a situation.
4. In a highly competitive market (e.g., motor car industry), the manufacturers are making arrangements with the vendors to put up their factory near the plant of the manufacturer. Vendors are supplying different items in **no time**. The EOQ model is not effective in this situation.

Illustration 6

A producer has estimated annual purchase requirement of 30,000 units of a material. Unit price of material is ₹ 50. Annual cost of carrying inventory is 20%. Order cost for ordering an order is ₹ 60. Find out Economic Order Quantity (EOQ). [D.U.B.Com. (Hons.) – 2004 (External)]

Solution

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

$$\text{EOQ} = \sqrt{\frac{2 \times 30,000 \times 60}{10}} = \sqrt{3,60,000} = \mathbf{600 \text{ Units}}$$

where,

A = Annual demand = 30,000 units

O = Ordering cost = ₹ 60

H = Inventory carrying cost = 20% of ₹ 50 = ₹ 10

Illustration 7

From the following particulars, find out the Economic Order Quantity (EOQ).

(i) Annual demand	12,000 units
(ii) Ordering cost	₹ 90 per order
(iii) Inventory carrying cost per annum	₹ 15

[C.U.B.Com. (Hons.) – Adapted]

Solution

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = 12,000 units

O = Ordering cost = ₹ 90 per order

H = Inventory carrying cost = ₹ 15

$$\text{EOQ} = \sqrt{\frac{2 \times 12,000 \times 90}{15}} = \sqrt{1,44,000} = \mathbf{379.473 \text{ Units (say) } 380 \text{ units.}}$$

Illustration 8

From the following information, calculate Economic Order Quantity (EOQ) and the number of orders to be placed in one quarter of the year :

(i) Quarterly consumption of material	2,000 kg
(ii) Cost of placing an order	₹ 50
(iii) Cost per unit	₹ 40
(iv) Storage and carrying cost = 8% p.a. (on average inventory)	

[D.U.B.Com. (Hons.) – Adapted]

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Solution

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = $2,000 \times 4 = 8,000$ kg

O = Ordering cost = ₹ 50

H = Inventory carrying cost = ₹ $40 \times 8\% = ₹ 3.20$ per unit p.a.

$$\text{EOQ} = \sqrt{\frac{2 \times 8,000 \times 50}{3.20}} = \sqrt{2,50,000} = 500 \text{ kg.}$$

$$\text{Number of Orders per Quarter} = \frac{\text{Demand for the Quarter}}{\text{EOQ}} = \frac{2,000 \text{ kg}}{500 \text{ kg}} = 4 \text{ Orders}$$

Illustration 9

A manufacturer uses 75,000 units of a particular material per year. The material cost is ₹ 1.50 per unit and carrying cost is estimated to be 25% p.a. of average inventory cost. The cost of placing an order is ₹ 18.

You are required to determine the Economic Order Quantity (EOQ) and frequency of orders p.a.

[C.U.B.Com. (Hons.) – Adapted]

Solution

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = 75,000 units

O = Ordering cost = ₹ 18

H = Inventory carrying cost = 25% of ₹ 1.50 = 0.375

$$\text{EOQ} = \sqrt{\frac{2 \times 75,000 \times 18}{0.375}} = 2,683 \text{ Units (approx.)}$$

$$\text{Frequency of Orders per annum} = \frac{\text{Annual Demand}}{\text{EOQ}} = \frac{75,000 \text{ Units}}{2,683 \text{ Units}} = 28 \text{ Orders (approx.)}$$

Illustration 10

A company manufactures a product having a monthly demand of 2,000 units. For one unit of finished product, 2 kgs. of a particular raw material item is needed. The purchase price of material is ₹ 20 per kg. The ordering cost is ₹ 120 per order and the holding cost is 10% per annum.

Calculate :

- Economic Order Quantity (EOQ); and
- Annual cost of purchasing and storage of raw materials at that quantity.

[D.U.B.Com. (Hons.) – 2004]

Solution

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = $2,000 \times 12 \times 2 \text{ kg} = 48,000 \text{ kg}$

O = Ordering cost = ₹ 120

H = Inventory carrying cost = ₹ $20 \times 10\% = ₹ 2$

$$\text{EOQ} = \sqrt{\frac{2 \times 48,000 \times 120}{2}} = \sqrt{57,60,000} = 2,400 \text{ kg.}$$

$$\text{Annual Cost} = \sqrt{2 \times A \times O \times H} = \sqrt{2 \times 48,000 \times 120 \times 2} = \sqrt{23,040,000} = ₹ 4,800$$

Alternatively,

Annual Cost = Total Ordering Cost plus Total Holding Cost

- (i) Total Ordering Cost = Number of Orders $\times$ Cost per Order = $\frac{48,000}{2,400} \times ₹ 120 = ₹ 2,400$.
- (ii) Total Holding Cost = $1/2 \times \text{EOQ} \times \text{Holding Cost per unit} = 1/2 \times 2,400 \times ₹ 2 = ₹ 2,400$.
- Total Annual Cost = ₹ 2,400 + ₹ 2,400 = ₹ 4,800.

Illustration 11

The following information relating to a type of raw material is available :

(i) Annual demand	2,000 units
(ii) Unit price	₹ 20
(iii) Ordering cost per order	₹ 20
(iv) Store cost	2% p.a.
(v) Interest rate	8% p.a.
(vi) Lead time	Half month

Calculate Economic Ordering Quantity and Annual Inventory Cost of the raw materials.

Solution

- (i) Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$ **where,**
 A = Annual demand = 2,000 Units
 O = Ordering cost of an order = ₹ 20
 H = Inventory carrying cost = ₹ 20 $\times$ (8% + 2%) = ₹ 2

$$\text{EOQ} = \sqrt{\frac{2 \times 2000 \times 20}{2}} = \sqrt{40,000} = 200 \text{ units.}$$

Annual Inventory Cost (excluding item cost) = $\sqrt{2 \times 2000 \times 20 \times 2} = ₹ 400$.

Total Cost

(i) Cost of item = 2,000 $\times$ ₹ 20	₹ 40,000
(ii) Annual inventory cost	<u>400</u>
	<u>40,400</u>

Illustration 12

A manufacturing company uses 20,000 kg of a raw material evenly over a year. The material is purchased for ₹ 25 per kg., the cost of placing an order is ₹ 600 and cost of holding one kg of material in stock for the year is 15% of the purchase price.

You are required to :

- (i) Calculate the Economic order Quantity (EOQ) of the raw material (to the nearest kg.).
- (ii) Calculate the total holding costs of the raw material in the period if order quantity is 3,000 kg and buffer stock is 1,000 kg.

Solution

- (i) Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$ **where,**
 A = Annual demand = 20,000 Kg.
 O = Ordering cost = ₹ 600
 H = Cost of holding per year per unit
 = 15% of ₹ 25 = ₹ 3.75

$$\text{EOQ} = \sqrt{\frac{2 \times 20,000 \times 600}{3.75}} = 2,530 \text{ kg (Approx.)}$$

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- (ii) **Total Holding Cost** = Average Stock × Cost of Holding per kg. per year

$$= \left[\left(\frac{3,000}{2} \right) + 1,000 * \right] = (1,500 + 1,000) \times ₹ 3.75 = ₹ 9,375.$$

**It is to be noted that 1,000 kg safety stock is held constantly throughout the year. At the time of calculating average stock, safety stock should not be divided by 2.*

Illustration 13

ABC Co. buys a lot of 125 boxes which is a three month supply. The cost per box is ₹ 125 and ordering cost is ₹ 250 per order. The inventory carrying cost is estimated at 20% of unit value per annum.

You are required to ascertain :

- The total annual cost of existing inventory policy.
- How much money would be saved by employing economic order quantity ?

[D.U.B.Com. (Hons.) – 2008]

Solution (i)

(a) Total Demand per annum = $\frac{125}{3} \times 12 = 500$ Boxes

(b) Number of Orders = $\frac{\text{Annual Demand}}{\text{Quantity Ordered}} = \frac{500}{125} = 4$ Orders

(c) Total ordering cost p.a. = $4 \times ₹ 250 = ₹ 1,000$

(d) Total carrying cost p.a. = $\frac{1}{2} \times 125 \times 20\% \text{ of } ₹ 125 = ₹ 1,562.50$

Total annual cost (c + d) = ₹ 1,000 + ₹ 1,562.50 = ₹ 2,562.50

Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$ **where,**
A = Annual Demand = 500 boxes
O = Ordering Cost per order = ₹ 250
H = Carrying Cost per unit per annum = ₹ 125 × 20% = ₹ 25.

$$\text{EOQ} = \sqrt{\frac{2 \times 500 \times 250}{25}} = \sqrt{10,000} = 100 \text{ boxes}$$

Total Annual Cost if EOQ is Employed :

	₹
(i) Order Cost = (500 / 100 × ₹ 250)	1,250
(ii) Carrying Cost = (1/2 × 100 × ₹ 25)	1,250
	<u>2,500</u>

Alternatively,

$$\text{Total Annual Cost} = \sqrt{2 \times A \times O \times H} = \sqrt{2 \times 500 \times 250 \times 25} = \sqrt{62,50,000} = ₹ 2,500$$

If EOQ is employed, cost saving will be :

	₹
Total annual cost under present policy	2,562.50
Total annual cost under EOQ	<u>2,500.00</u>
Saving in cost	<u>62.50</u>

It is to be noted that under both the policies, the purchase cost per box will remain same. Therefore, it has been ignored.

Illustration 14

A manufacturing company purchases 24,000 pieces of a component from a sub-contractor at ₹ 500 per piece and uses them in its assembly department, at a steady rate. The cost of placing an order and following it up is ₹ 2,500. The estimated stock holding cost is approximately 1% of the value of average stock held. The company

is at present placing orders which at present vary between an order placed every two months (i.e., six orders p.a.) to one order per annum. Which policy would you recommend ?

[I.C.W.A. (Stage - I) - December, 2001]

Solution

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = 24,000 pieces

O = Ordering cost = ₹ 2,500 per order

H = Holding cost per unit per annum = 1% of ₹ 500 = ₹ 5

$$\text{EOQ} = \sqrt{\frac{2 \times 24,000 \times 2,500}{5}} = 4,899 \text{ pieces}$$

(i) **Annual cost if 4,899 pieces are ordered :**

$$\text{Total Annual Cost} = \sqrt{2 \times A \times O \times H} = \sqrt{2 \times 24,000 \times 2,500 \times 5} = ₹ 24,495$$

(ii) **Total annual cost if 24,000 pieces (i.e., one order) are ordered at a time :** ₹

(a) Total ordering cost = 1 × ₹ 2,500 2,500

(b) Holding cost = $\frac{1}{2} \times 24,000 \times ₹ 5$ 60,000

62,500

(iii) **Total annual cost if 4,000 pieces (i.e., 6 orders) are ordered at a time :**

(a) Total ordering cost = 6 × ₹ 2,500 15,000

(b) Holding cost = $\frac{1}{2} \times 4,000 \times ₹ 5$ 10,000

25,000

Recommendation :

Company should order 4,899 pieces or 4,900 (if rounded off) per order. If this quantity is ordered, the cost will be minimum ₹ 24,495.

Discount on Bulk Purchase

You may have noticed that in all our EOQ calculations, the purchase price of the item *has not been taken into consideration*. This is because it has been assumed that the purchase price will remain the same irrespective of the quantity ordered. In practice, suppliers charge different price for different quantity ordered or allow different discount rates for different quantity ordered. For example :

Ordering Quantity	% of Discount
4,000 kg or less	Nil
Above 4,000 kg but less than 6,000 kg	2%
Above 6,000 kg but less than 10,000 kg	3%
Above 10,000 kg	5%

In this situation, purchase cost may be one of the main (if not only) considerations for determining order sizes.

If more quantities are purchased at a time, the financial effect of discounts will be as follows :

Favourable effects :

1. The items cost will be lower.
2. The inventory carrying cost per unit will be lower.
3. Total ordering cost will be lower because fewer number of orders are to be placed.

Adverse effects :

1. Total inventory carrying cost will be more because more average stock are to be carried.

At the time of calculating EOQ, all these factors are to be taken into consideration.

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The following few *illustrations* will clear the concept.

Illustration 15

Sachin Ltd. furnishes the following information :

- (i) Consumption – 300 units per quarter;
- (ii) Cost per unit ₹ 40;
- (iii) Cost of processing an order ₹ 600;
- (iv) Obsolescence 15% p.a.;
- (v) Insurance on inventory 25% p.a.

Compute :

- (a) Economic Order Quantity;
- (b) Number of orders per year
- (c) Time between two consecutive orders

A supplier offers a discount of 5% on a purchase of 600 units. Should it be accepted ?

[C.U.B.Com. (Hons.) – Adapted]

Solution

$$(a) \text{ Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = $300 \times 4 = 1,200$ units

O = Ordering cost = ₹ 600

H = Holding cost per unit per year

= $(15\% + 25\%)$ of ₹ 40 = ₹ 16

$$\text{EOQ} = \sqrt{\frac{2 \times 1,200 \times 600}{16}} = 300 \text{ units}$$

$$(b) \text{ Number of Orders} = \frac{\text{Annual demand}}{\text{EOQ}} = \frac{1,200}{300} = 4 \text{ orders per year}$$

$$(c) \text{ Time lag between consecutive orders} = \frac{12 \text{ Months}}{\text{Number of Orders}} = \frac{12}{4} = 3 \text{ months}$$

Statement Showing Total Cost at Different Ordering Quantity

Order Size	300 units	600 units
Cost of item $(1,200 \times ₹ 40)$	48,000	48,000
Less: Discount @ 5%	–	2,400
Net Cost of Items	48,000	45,600
Add: Order Cost (Note 1)	2,400	1,200
Add: Carrying Cost (Note 2)	2,400	4,560
Total Cost (including items cost)	52,800	51,360

It is clear from the above calculation that 5% discount should be accepted. Order size will be 600 units per order. The company will save ₹ 1,440 p.a. (₹ 52,800 – ₹ 51,360).

Working Notes :

(1) (a) Total ordering cost if order size is 300 units : $\frac{1,200}{300} \times 600 = ₹ 2,400$

(b) Total ordering cost if order is 600 units : $\frac{1,200}{600} \times 600 = ₹ 1,200$

(2) (a) Total carrying cost if order size is 300 units : $\frac{1}{2} \times 300 \times 16 = ₹ 2,400$

(b) Total carrying cost if order size is 600 units : $\frac{1}{2} \times 600 \times (40\% \text{ of ₹ } 38^*) = ₹ 4,560$
*₹ 40 less 5% discount

Illustration 16

A company manufactures a special product which requires a component 'Alpha'. The following particulars are available for 2010 :

Annual Demand	8,000 units
Cost of placing an order	₹ 200 per order
Cost per unit of 'Alpha'	₹ 400
Carrying cost % p.a.	20%

The company has been offered a discount of 4% on the purchase of 'Alpha' provided the order size is 4,000 components at a time.

Required :

- Calculate Economic Order Quantity.
- Advise whether the discount offer can be accepted.

[D.U.B.Com. (Hons.) - 2011]

Solution

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = 8,000 units

O = Cost of placing an order = ₹ 200

H = Inventory carrying cost = 20% of ₹ 400 = ₹ 80.

$$\text{EOQ} = \sqrt{\frac{2 \times 8,000 \times 200}{80}} = \sqrt{40,000} = 200 \text{ units.}$$

Statement Showing Total Cost at Different Order Quantity

Order Size	200 units	4000 units
Cost of items (8,000 x ₹ 400)	32,00,000	32,00,000
Less: Discount @ 4%	—	1,28,000
Net Cost of Items	32,00,000	30,72,000
Total Ordering Cost (Note 1)	8,000	400
Total Carrying Cost (Note 2)	8,000	1,53,600
	32,16,000	32,26,000

It is clear from the above calculation that 4% discount *should not be accepted*. If the order size is 200 units, the company will save ₹ 10,000 (32,26,000 – 32,16,000).

Working Notes :

(1) Total Ordering Cost

$$(a) \text{ When order size is 200 units} = \frac{8,000}{200} \times 200 = ₹ 8,000$$

$$(b) \text{ When order size is 4,000 units} = \frac{8,000}{4,000} \times 200 = ₹ 400$$

(2) Total Holding Cost

$$(a) \text{ When order size is 200 units} = 1/2 \times ₹ 200 \times ₹ 80 = ₹ 8,000$$

$$(b) \text{ When order size is 4,000 units} = 1/2 \times 4,000 \times ₹ 76.80^* = ₹ 1,53,600.$$

* 20% of (400 – 16)

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Illustration 17

Hitachi (P) Ltd. a tool manufacturing company produces a range of small tools for drilling. The tools are sold in composite sets only. The sets are packed in a plastic storage box which is outsource from another company.

The information and data below relates to the storage box :

Estimated usage for the forthcoming year = 1000 boxes

Basic purchase price of box ₹ 100

Delivery charges per order ₹ 200

Storage costs per box per year ₹ 10

The company is trying to decide the size of order to place with the supplier of the storage boxes and is considering order sizes of 50, 100, 200, 250, 500 and 1,000 boxes.

Requirements :

(a) Prepare a table that shows the total annual :

(i) Delivery costs;

(ii) Storage costs;

(iii) Delivery plus storage costs;

For each of the six order sizes mentioned above.

(b) Use the economic order quantity formula to determine an appropriate order size and compare your results with that seen in (a).

The economic order quantity formula is given as :

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand;

O = Ordering cost

H = Holding cost per unit p.a.

(c) Supplier of the storage boxes now says that it is prepared to offer bulk discount at the following levels:

Less than 250 boxes No discount

250 – 499 boxes 2% discount

500 – 999 boxes 4% discount

1,000 boxes or more 6% discount

Determine whether any of these levels of discount is worth taking.

Solution

Statement Showing Total Delivery Cost, Storage Costs, Delivery plus Storage Cost at Different Order Sizes

(a) Order Size	50 boxes	100 boxes	200 boxes	250 boxes	500 boxes	1,000 boxes
(b) Number of Orders (Note 1)	20	10	5	4	2	1
(c) Average Stock (Note 2)	25	50	100	125	250	500
(d) Ordering Cost (b × ₹ 200)	4,000	2,000	1,000	800	400	200
(e) Storage Cost (c × ₹ 10)	250	500	1,000	1,250	2,500	5,000
Total Cost (d + e) (₹)	4,250	2,500	2,000	2,050	2,900	5,200



Minimum Total
Annual Cost

(b) Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$

where,

A = Annual demand = 1,000 boxes

O = Delivery (ordering) costs = ₹ 200 per order

H = Holding cost per unit per year = ₹ 10

$$EOQ = \sqrt{\frac{2 \times 1,000 \times 200}{10}} = 200 \text{ Boxes}$$

It is clear that 200 boxes are to be ordered because total cost at this level is minimum.

(c) Statement Showing the Effect of Discount on Bulk Purchase

Ordering Quantity (Boxes)	Total Cost (See Table)	Discount (₹)	Net Cost (₹)
200	2,000	Nil	2,000
250 (Note 6)	2,050	2,000 (Note 3)	50
500 (Note 7)	2,900	4,000 (Note 4)	(1,100)
1,000 (Note 8)	5,200	6,000 (Note 5)	(800)

The Company should order 500 boxes per order. If this is done, the net gain of the company will be ₹ 3,100. The calculation is as follows :

Number of Boxes Ordered	200 (EOQ)	500 (Suggested)
(a) Item cost (1,000 × ₹ 100) – No discount	1,00,000	–
Item cost (1,000 × ₹ 96) – after 4% discount	–	96,000
(b) Ordering cost (Delivery charges) – See Table of previous page	1,000	400
(c) Storage cost – See Table of previous page	1,000	2,500
	1,02,000	98,900
Net Gain	–	3,100
	1,02,000	1,02,000

It is assumed that storage cost per unit will remain same irrespective of the order size.

Working Notes :

- (1) Number of orders = Annual Demand / Order Size
- (2) Average stock = Order Size / 2
- (3) 2% of ₹ 100 × 1,000 boxes = ₹ 2,000
- (4) 4% of ₹ 100 × 1,000 boxes = ₹ 4,000
- (5) 6% of ₹ 100 × 1,000 boxes = ₹ 6,000
- (6) 2% discount is available if the order size is between 250 – 499 boxes. To save carrying cost and avail bulk discount (2%), 250 boxes should be ordered.
- (7) 4% discount is available if the order is between 500 – 999 boxes. To save carrying cost and avail bulk discount (4%), 500 boxes should be ordered.
- (8) 6% discount is available if the order is 1,000 boxes or more. To save carrying cost and avail bulk discount (6%), 1,000 boxes should be ordered.

Illustration 18

JP Limited, manufacturer of a special product, follow the policy of EOQ (Economic Order Quantity) for one of its components. The component's details are as follows :

	₹
Purchase price per component	200
Cost of an order	100
Annual cost of carrying one unit in inventory	10% of purchase price
Total cost of carrying inventory and ordering per annum	4,000

3.36 Accounting for Materials

The company has been offered a discount of 2% on the price of the component provided the lot size is 2,000 components at a time.

You are required to :

- Compute the EOQ
- Advise whether the quantity discount offer can be accepted.
(Assume that the inventory carrying cost does not vary according to discount policy).
- Would your advice differ if the company is offered 5% discount on a single order ?

Solution

$$(a) \text{ Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = ? (To be calculated)

O = Ordering cost = ₹ 100

H = Cost of carrying one unit for one year
= 10% of ₹ 200 = ₹ 20

In this problem, annual demand has not been given. However, total cost of ordering and carrying has been given (₹ 4,000).

For calculating total cost of ordering and carrying inventory we can use the following formula :

$$\text{Total Cost of Ordering and Carrying Inventory per annum} = \sqrt{2 \times A \times O \times H}$$

$$\text{or, } 4,000 = \sqrt{2 \times A \times 100 \times 20}$$

$$\text{or, } 4,000 = \sqrt{4,000 A}$$

$$\text{or, } 4,000^2 = 4,000 A$$

$$\text{or, } 4,000 A = 4,000 \times 4,000$$

$$\text{or, } A = \frac{4,000 \times 4,000}{4,000}$$

$$\text{or, } A = 4,000 \text{ units}$$

$$\text{EOQ} = \sqrt{\frac{2 \times 4,000 \times 100}{20}} = 200 \text{ units}$$

(b) Statement Showing Total Cost at Different Ordering Quantity

Order Size	200 units EOQ ₹	2,000 units Proposed ₹
Cost of item (4,000 × ₹ 200)	8,00,000	8,00,000
Less: Discount @ 2%	Nil	16,000
Net Cost of Items	8,00,000	7,84,000
Add: Ordering cost (Note 1)	2,000	200
Add: Carrying cost (Note 2)	2,000	20,000
Total Cost (including item cost)	8,04,000	8,04,200

Advise :

Company should not accept 2% quantity discount as it will result in additional expenditure of ₹ 200 (₹ 8,04,000 – ₹ 8,04,200).

Working Notes :

- (1) (a) Total ordering cost, if order size is 200 units = $(4,000 / 200) \times ₹ 100 = ₹ 2,000$.
 (b) Total ordering cost, if order size is 2,000 units = $(4,000 / 2,000) \times ₹ 100 = ₹ 200$.
- (2) (a) Total carrying cost, if order size is 200 units = $\frac{1}{2} \times 200 \times ₹ 20 = ₹ 2,000$.
 (b) Total carrying cost, if order size is 2,000 units = $\frac{1}{2} \times 2,000 \times ₹ 20$ (Note 3) = ₹ 20,000.
- (3) Generally, inventory carrying cost is changing with the discount policy. However, in this problem it has been given that there will be no change in carrying cost with the change in credit policy. So, the inventory carrying cost per annum per unit will remain ₹ 20.

(c) Total cost if 4,000 units are ordered in a single order :	₹
Item cost $(4,000 \times ₹ 200)$	8,00,000
Less: Discount @ 5%	<u>40,000</u>
	7,60,000
Add: Order cost $(4,000 / 4,000 \times ₹ 100)$	100
Add: Carrying cost $(\frac{1}{2} \times 4,000 \times 20)$	<u>40,000</u>
Total cost (including item cost)	<u>8,00,100</u>

If 5% discount is offered, the company should accept it. Company will save ₹ 3,900 ($₹ 8,04,000 - ₹ 8,00,100$). However, before taking final decision, the following points are to be taken into consideration :

- (i) Chance of obsolescence of the item.
- (ii) Chance of falling in price.
- (iii) Availability of store space.
- (iv) Availability of fund and credit policy.

Illustration 19

A company manufactures a product from a raw material, which is purchased at ₹ 60 per kg. The company incurs a handling cost of ₹ 360 plus freight of ₹ 390 per order. The incremental carrying cost of inventory of raw material is ₹ 0.50 per kg per month. In addition, the cost of working capital finance on the investment in inventory of raw material is ₹ 9 per kg per annum. The annual production of the product is 1,00,000 units and 2.5 units are obtained from one kg of raw material.

Required :

- (i) Calculate the economic order quantity of raw materials.
- (ii) Advise, how frequently should orders for procurement be placed.
- (iii) If the company proposes to rationalize placement of orders on quarterly basis, what percentage of discount in the price of raw materials should be negotiated ?

Solution

$$(i) \text{ Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand for raw materials = $(1,00,000 / 2.5) = 40,000$ kg

O = Cost of placing an order $(₹ 360 + ₹ 390) = ₹ 750$

H = Inventory carrying cost per kg per annum = $(0.50 \times 12 + ₹ 9) = ₹ 15$

$$\text{EOQ} = \sqrt{\frac{2 \times 40,000 \times 750}{15}} = 2,000 \text{ kg}$$

$$(ii) \text{ Number of Orders} = \frac{A}{\text{EOQ}} = \frac{40,000}{2,000} = 20 \text{ Orders}$$

3.38 Accounting for Materials

$$\text{Frequency of Orders} = \frac{365}{\text{Number of Orders}} = \frac{365}{20} = 18 \text{ Days (approx.)}$$

(iii) Percentage of Discount in the Price of Raw Materials to be Negotiated

- (a) Number of orders to be placed as per proposal = 4
 (b) Size of the order = 40,000 kg / 4 = 10,000 kg.
 (c) Total cost of procurement and carrying raw materials per annum: ₹
- | | |
|--|---------------|
| (i) Ordering cost (4 × ₹ 750) | 3,000 |
| (ii) Carrying cost (½ × 10,000 × ₹ 15) | <u>75,000</u> |
| | <u>78,000</u> |
- (d) At EOQ, total cost of procurement and carrying raw materials per annum :
- | | |
|---------------------------------------|---------------|
| (i) Order cost (20 × ₹ 750) | 15,000 |
| (ii) Carrying cost (½ × 2,000 × ₹ 15) | <u>15,000</u> |
| | <u>30,000</u> |

If order is placed on quarterly basis, the extra cost to be incurred = (₹ 78,000 – 30,000) = ₹ **48,000**.

$$\text{Discount to be claimed per kg} = \frac{48,000}{40,000} = ₹ 1.20 \text{ per kg.}$$

$$\% \text{ of discount to be negotiated} = \frac{1.20}{60} \times 100 = 2\%$$

Check :

Statement Showing total Cost at Different Ordering Quantity

Ordering Size	2,000 kg (At EOQ) ₹	10,000 kg (Quarterly) ₹
Cost of materials (40,000 × ₹ 60)	24,00,000	24,00,000
Less: Discount @ 2%	–	48,000
Net Cost of Materials	24,00,000	23,52,000
Add: Ordering Cost	15,000	3,000
Add: Carrying Cost (Note 1)	15,000	75,000
	<u>24,30,000</u>	<u>24,30,000</u>

Note 1 : It is assumed that inventory carrying cost per unit **will not change** with the discount policy.

Illustration 20

The purchase department of your organisation has received an offer of quantity discounts on its order of materials as under :

Price per tone (₹)	Tonnes ordered
1,400	Less than 500
1,380	500 and less than 1,000
1,360	1,000 and less than 2,000
1,340	2,000 and less than 3,000
1,320	3,000 and above

The annual requirement of the material is 5,000 tonnes. The delivery cost per order is ₹ 1,200 and the annual stock holding cost is estimated at 20 per cent of the average inventory.

The purchase department wants you to consider the following purchase options and advise which among them will be most economical ordering quantity, presenting the relevant information at a tabular form.

The purchase quantity options to be considered are 400 tonnes, 500 tonnes, 1,000 tonnes, 2,000 tonnes and 3,000 tonnes.

Solution

Statement Showing Total Cost at Different Order Size

(a) Order Size (Tonnes)	400	500	1,000	2,000	3,000
(b) Number of Orders (Note 1)	12.5	10	5	2.5	1.67
(c) Average Stock (Note 2)	200	250	500	1,000	1,500
(d) Total Ordering Cost (₹) (b × ₹ 1,200)	15,000	12,000	6,000	3,000	2,000
(e) Total Stock Holding Cost (₹) (Note 3)	56,000	69,000	1,36,000	2,68,000	3,96,000
(f) Item Cost (Note 4)	70,00,000	69,00,000	68,00,000	67,00,000	66,00,000
Total (d + e + f) (₹)	70,71,000	69,81,000	69,42,000	69,71,000	69,98,000



Advise to Purchase Department :

At 1,000 tonnes order size, the cost is minimum. Therefore, it is advisable to order **1,000** tonnes per order.

Working Notes :

(1) Number of Orders = $\frac{\text{Annual Requirement}}{\text{Order Size}}$

$$= \frac{5,000}{400} = 12.5; \frac{5,000}{500} = 10; \frac{5,000}{1,000} = 5; \frac{5,000}{2,000} = 2.5; \frac{5,000}{3,000} = 1.67 \text{ Orders}$$

Average Stock = $\frac{\text{Order Size}}{2} = \frac{400}{2} = 200$ tonnes and so on

(2) **Total Stock Holding Cost = Purchase Price × 20% × Average Stock**

- (a) 400 tonnes order size = ₹ 1,400 × 20% × 200 = ₹ 56,000
- (b) 500 tonnes order size = ₹ 1,380 × 20% × 250 = ₹ 69,000
- (c) 1,000 tonnes order size = ₹ 1,360 × 20% × 500 = ₹ 1,36,000
- (d) 2,000 tonnes order size = ₹ 1,340 × 20% × 1,000 = ₹ 2,68,000
- (e) 3,000 tonnes order size = ₹ 1,320 × 20% × 1,500 = ₹ 3,96,000

(3) **Total Item Cost**

- (a) 400 tonnes order size = 5,000 × ₹ 1,400 = ₹ 70,00,000
- (b) 500 tonnes order size = 5,000 × ₹ 1,380 = ₹ 69,00,000
- (c) 1,000 tonnes order size = 5,000 × ₹ 1,360 = ₹ 68,00,000
- (d) 2,000 tonnes order size = 5,000 × ₹ 1,340 = ₹ 67,00,000
- (e) 3,000 tonnes order size = 5,000 × ₹ 1,320 = ₹ 66,00,000

Illustration 21

RST Limited has received an offer of quantity discount on its order of materials as under :

Price per tonne	Tonnes ordered
₹ 9,600	Less than 50
₹ 9,360	50 and less than 100
₹ 9,120	100 and less than 200
₹ 8,880	200 and less than 300
₹ 8,640	300 and above

The annual requirement for the material is 500 tonnes. The ordering cost per order is ₹ 12,500 and the stock holding cost is estimated at 25% of the material cost per annum.

Required :

- (i) Compute the most economical purchase level.
- (ii) Compute EOQ if there are no quantity discounts and the price per tonne is ₹ 10,500.

3.40 Accounting for Materials

Solution

(i) Statement Showing Total Cost at Different Order Size

(a) Order Size (Tonnes)	40	50	100	200	300
(b) Number of Orders (Note 1)	12.5	10	5	2.5	1.6667
(c) Average Stock (Note 2)	20	25	50	100	150
(d) Ordering Cost (b × ₹ 12,500)	1,56,250	1,25,000	62,500	31,250	20,834
(e) Holding Cost (₹) (Note 3)	48,000	58,500	1,14,000	2,22,000	3,24,000
(f) Item Cost (₹) (Note 4)	48,00,000	46,80,000	45,60,000	44,40,000	43,20,000
Total Cost (d + e + f) (₹)	50,04,250	48,63,500	47,36,500	46,93,250	46,64,834

↑
EOQ

At 300 tonnes order size, the total cost is minimum. Therefore, **300 tonnes** is to be ordered per order.

$$(ii) \text{ Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = 500 tonnes

B = Order cost = ₹ 12,500

H = Holding cost per unit p.a. = ₹ 10,500 × 25% = ₹ 2,625

$$\text{EOQ} = \sqrt{\frac{2 \times 500 \times 12,500}{2,625}} = 69 \text{ tonnes}$$

Working Notes :

$$(1) \text{ Number of Orders} = \frac{\text{Annual Requirement}}{\text{Order Size}}$$

$$= \frac{500}{40} = 12.5; \frac{500}{50} = 10; \frac{500}{100} = 5; \frac{500}{200} = 2.5; \frac{500}{300} = 1.667 \text{ Orders}$$

(3) Total Cost = Purchase price × 25% × Average Stock

$$(a) 40 \text{ tonnes order size} = ₹ 9,600 \times 25\% \times 20 = 48,000$$

$$(b) 50 \text{ tonnes order size} = ₹ 9,360 \times 25\% \times 25 = 58,500$$

$$(c) 100 \text{ tonnes order size} = ₹ 9,120 \times 25\% \times 50 = 1,14,000$$

$$(d) 200 \text{ tonnes order size} = ₹ 8,880 \times 25\% \times 100 = 2,22,000$$

$$(e) 300 \text{ tonnes order size} = ₹ 8,640 \times 25\% \times 150 = 3,24,000$$

(4) Total Item Cost

$$(a) 40 \text{ tonnes order size} = 500 \times ₹ 9,600 = 48,00,000$$

$$(b) 50 \text{ tonnes order size} = 500 \times ₹ 9,360 = 46,80,000$$

$$(c) 100 \text{ tonnes order size} = 500 \times ₹ 9,120 = 45,60,000$$

$$(d) 200 \text{ tonnes order size} = 500 \times ₹ 8,880 = 44,40,000$$

$$(e) 300 \text{ tonnes order size} = 500 \times ₹ 8,640 = 43,20,000$$

Production Lot Size / Economic Batch Quantity

When a company is manufacturing a variety of products, it must decide how many units of one particular product should be produced before switching over to another product. *For example*, 'LEO' – manufacturer of toys must decide how many of a particular toy is to be produced in one lot before switching over to another type of toy. Change-over involves some costs, such as :

- (i) Cost of changing setting on machines.
- (ii) Cost of getting different raw materials ready.
- (iii) Cost of changing tools.

All these costs are popularly called as **Set-up Cost**.

After manufacturing the product, it is to be kept as finished stock. Some expenses such as rent, insurance, etc. are incurred. These are similar to '**Inventory Holding Cost**' (used in EOQ formula). If we recapitulate, the **set-up cost** is similar to 'ordering cost' used in EOQ formula. Therefore, the EOQ concept can also be used for determining **Economic lot size / Optimum run size / Economic batch quantity**.

Formula for Determining Economic Lot Size

$$E = \sqrt{\frac{2AS}{H}}$$

where,

E = Economic lot size / Economic batch quantity / Optimum run size

A = Annual production

S = Set-up cost

H = Holding cost per unit per annum

The result of economic lot size can also be used for :

- (i) Calculating the number of production runs;
- (ii) Frequency of production run / interval between two consecutive optimum runs;
- (iii) Total set-up cost; and
- (iv) Total holding cost.
- (V) Total annual cost

All the above are calculated as follows :

$$(i) \text{ Number of Production runs} = \frac{\text{Annual Production}}{\text{Economic Lot Size}}$$

$$(ii) \text{ Frequency of Production run / Interval between Two Consecutive Optimum Runs} \\ = \frac{365 \text{ days}}{\text{Number of Production Runs}}$$

$$(iii) \text{ Total set-up cost} = \text{Number of production runs} \times \text{Cost per set-up}$$

$$(iv) \text{ Total Holding Cost} = 1/2 \times \text{Economic Lot Size} \times \text{Cost per unit per annum}$$

$$(v) \text{ Total Annual Costs}$$

$$= \left(\frac{\text{Annual Production}}{\text{Economic Lot Size}} \right) \times (\text{Cost per set up}) + \left(\frac{\text{Economic Lot Size}}{2} \right) \times (\text{Annual Holding Cost per unit})$$

$$\text{Total Annual Cost} = \sqrt{2 \times A \times S \times H}$$

where,

A = Annual production

S = Set-up cost

H = Inventory holding cost per unit per annum

Illustration 22

Compute the Economic Batch Quantity and total number of batches during the year from the following information:

Average number of units to be produced in a month	2,000 units
Set-up cost per batch	₹ 60
Total cost of production per unit	₹ 5
Annual rate of interest	10% [C.U.B.Com. (Hons.) – 2006]

Solution

$$\text{Economic Batch Quantity (EBQ)} = \sqrt{\frac{2AS}{H}}$$

where,

A = Annual production = 2,000 × 12 = 24,000 units

S = Set-up cost per batch = ₹ 60

H = Holding cost per unit per annum = 5 × 10% = 0.50

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$$EBQ = \sqrt{\frac{2 \times 24,000 \times 60}{0.50}} = 2,400 \text{ units}$$

$$\text{Total Number of Batches p. a.} = \frac{\text{Annual Production}}{EBQ} = \frac{24,000}{2,400} = 10 \text{ Batches}$$

Illustration 23

A Ltd. is committed to supply 24,000 bearings per annum to B Ltd. on a steady basis. It is estimated that it costs 10 paise as inventory holding cost per bearing per month and that the set-up cost per run of bearing manufacture is ₹ 324.

- (i) What should be the optimum run size for bearing manufacture ?
- (ii) What would be the interval between two consecutive optimum runs ?
- (iii) Find out the minimum inventory cost per annum.
- (iv) Assuming that the company has a policy of manufacturing 6,000 bearings per run, how much extra costs the company would be incurring compared to the optimum run suggested in (i) above ?

Solution

$$\text{Optimum Run Size} = \sqrt{\frac{2AS}{H}}$$

where,

A = Annual production = 24,000 bearings

S = Set-up cost = ₹ 324

H = Holding cost per bearing per annum = ₹ 0.10 × 12 = ₹ 1.20

$$\text{Optimum Run Size} = \sqrt{\frac{2 \times 24,000 \times 324}{1.2}} = 3,600 \text{ bearings}$$

$$\text{(iii) Number of Production Runs in a Year} = \frac{\text{Annual production}}{\text{Optimum Run Size}} = \frac{24,000}{3,600} = 6.667 \text{ Runs}$$

$$\text{Interval between Two Consecutive Runs} = \frac{365 \text{ days}}{6.6667} = 54.75 \text{ days (say) } 55 \text{ days}$$

(iii) **Minimum Inventory Cost p.a. :**

$$\text{Total Annual Cost} = \sqrt{2 \times A \times S \times H}$$

where,

A = Annual production = 24,000 bearings

S = Set-up cost = ₹ 324

H = Holding cost per bearing per annum = ₹ 1.20

$$\text{Total Annual Cost} = \sqrt{2 \times 24,000 \times 324 \times 1.2} = ₹ 4,320.$$

(iv) **Total Annual Cost if 6,000 bearings are manufactured per run ₹**

$$\text{(i) Set-up cost} = (24,000 / 6,000) \times ₹ 324 \quad 1,296$$

$$\text{(ii) Inventory holding cost} = 1/2 \times 6,000 \times ₹ 1.20 \quad \underline{3,600}$$

$$\underline{4,896}$$

$$\text{Extra cost would be incurred} = ₹ 4,896 - ₹ 4,320 = ₹ 576$$

Re-order Level and Safety Stock

Re-order level is the point at which an order is placed with the supplier for replenishment of stock. It is dependent upon **three** factors :

- (i) The economic order quantity;
- (ii) Rate of consumption per day / week / month;
- (iii) The **lead period**.

The lead period is the time gap between the date of placing an order and the date of receiving the material in store for use. **For example**, on 1st September, an order was placed for 500 units of a particular component. The component was received by store department on 16th September. Therefore, the lead period is 15 days (1 September – 16 September). Lead period may vary widely depending upon the nature of materials and the supplier's capabilities. Based on past experience, maximum lead period, minimum period and average lead period is fixed by the organisation.

Computation of Re-order Level

If the lead period and consumption of material cannot be predicted certainly, we should fix the re-order level in such a manner that the chance of stock out is minimum. The formula is :

Re-order Level =

Maximum Consumption (per day / week / month) × Maximum Lead Period (in days / weeks / months)

There are many companies which prefer to keep some materials in stock as buffer to meet certain spurt in demand, a delay in delivery due to logistic problem or labour problem in supplier's factory etc. the buffer stock is called **safety stock**.

When a safety stock is maintained by the organisation, the formula for calculation of re-order level is modified as follows :

Re-order Level = Safety stock + (Average / Normal Consumption) × (Average / Normal lead period)

Average / Normal Lead Period =
$$\frac{\text{Maximum Lead Period} + \text{Minimum Lead Period}}{2}$$

Average / Normal Consumption =
$$\frac{\text{Maximum Consumption} + \text{Minimum Consumption}}{2}$$

In examination, if the information has been given for safety stock / minimum stock, then the above formula is to be followed. If the information is not available for safety stock, the first formula is to be adopted.

Maximum Stock Level

Maximum stock level is that level of stock beyond which stock is not allowed to **go up**. Maximum stock level is fixed to give an indication of over-stocking at any point of time. If any over-stocking is detected, a corrective action is taken so that many costs (such cost of finance, obsolescence, storage) can be saved.

Maximum stock level uses the **re-order level as the base**. At the time of calculating maximum level, it is assumed that the supplier delivers the materials in the quickest time and the rate of consumption of materials during that period is also **minimum**. Re-order quantity is added with remaining part of the re-order level to get the figure of maximum stock.

Calculation of Maximum Stock Level

Maximum Stock Level =

Re-order Level – (Minimum Consumption × Minimum Lead Time) + Re-order Quantity

3.44 Accounting for Materials

Factors on which Maximum Stock Level are Dependent

At the time of fixation of maximum stock level, the following factors should be taken into consideration :

1. Re-order **level** is to be determined after considering consumption pattern, delivery pattern and safety stock (if any).
2. Re-order **quantity** (EOQ) is also to be calculated after considering ordering cost, carrying cost and quantity discount etc.
3. Availability of space for storage.
4. Availability of funds.
5. Reliability of supply of materials in time.
6. Nature of material (perishable or not)
7. If the raw materials are available in a particular season, the stock level should be very high (e.g., in case of sugar industry, the stock level is very high during crashing time as compared to other time of the year).
8. Knowledge of consumption pattern is necessary for determining maximum level.
9. Government order in respect of maximum quantity which can be purchased at a time.

Minimum Stock level

Minimum stock level is that level of stock beyond which stock should not fall under **normal** circumstances. Minimum stock level also uses the **re-order level as the base**.

The main purpose of setting minimum stock level is to alert the materials manager to the possibility of stock-out.

When everything is normal (e.g., consumption of materials, delivery time, etc.) minimum stock level allows some margin of safety.

If there is any change in consumption pattern (because of higher demand) or change in delivery schedule (because of strike, accident, flood, fire in the factory of the supplier), the stock level may fall below minimum level which will prompt the management to take necessary action to avoid running out of stock.

Calculation of Minimum Stock Level

Minimum Stock Level = Re-order Level – (Normal / Average Consumption × Normal / Average Lead Time)

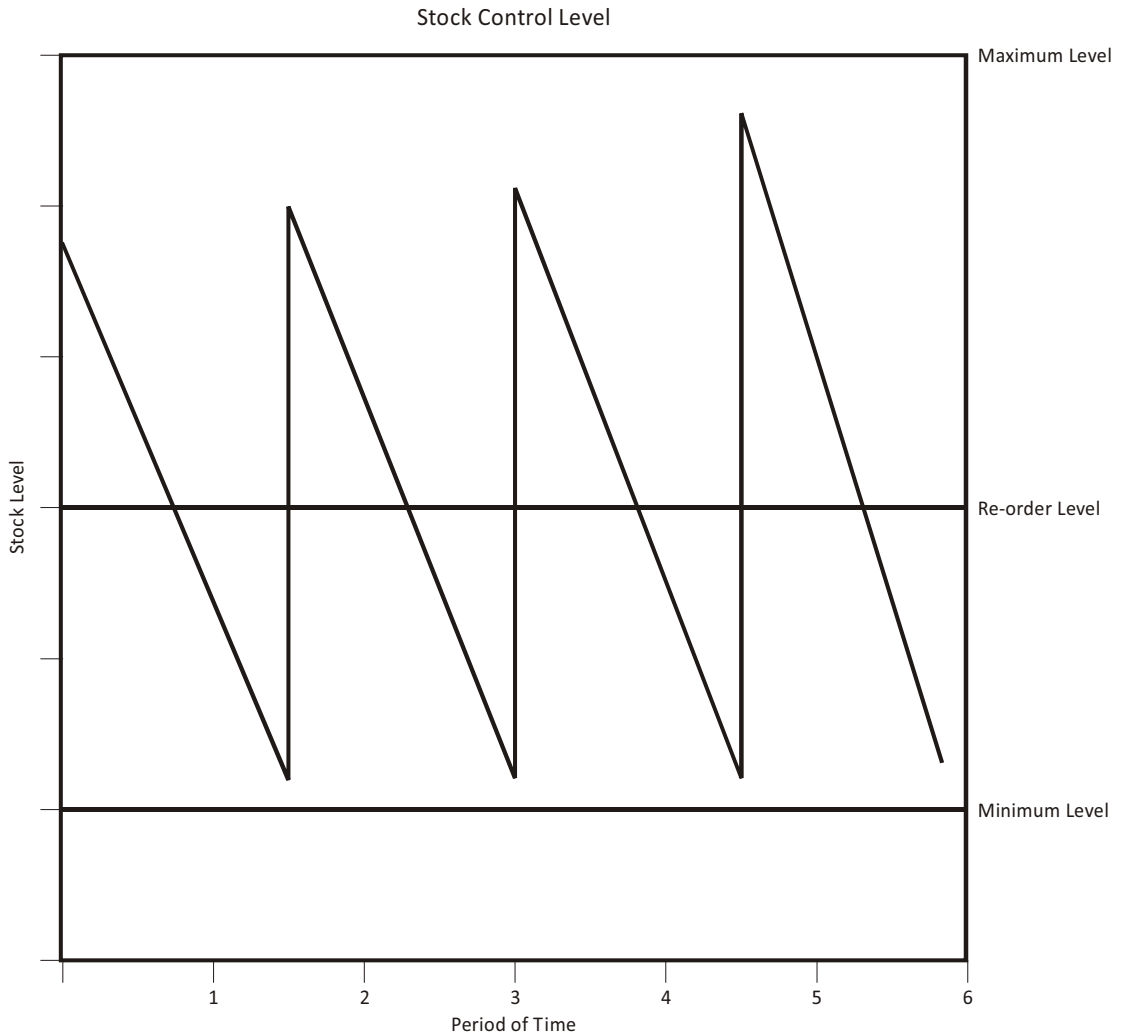
Factors on which Minimum Stock Level are Dependent

At the time of fixation of minimum stock level, the following factors must be taken into consideration:

1. Re-order level is to be determined after considering consumption pattern, delivery pattern and safety stock (if any).
2. Reliability of supply of material in time.
3. Consumption pattern of the material.
4. Chances of acquiring materials from local market.
5. Number of suppliers: If the number of suppliers are more, minimum stock level can be set at lower level.

Students should remember the following points :

1. ***Both maximum stock level and minimum stock level are dependent upon re-order level.***
2. ***Economic order quantity (EOQ) controls the maximum stock level.***
3. ***All the stock levels are not static. They will change with the change in demand of the product.***
4. ***Generally, stock levels are calculated for 'A' category items of materials (as determined by ABC analysis).***
5. ***Maximum level, minimum level and re-order levels are not calculated for special materials which are purchased based on customers specific order.***



[Fig. 3.7]

Average Stock Level

There are two methods of calculating average stock level.

Method 1 : This method is used when *no safety stock* is maintained by the organisation. Here, it is assumed that the consumption of materials and lead time does not vary widely.

Formula for calculation of average stock level is as follows :

$$\text{Average Stock Level} = \frac{\text{Maximum Stock Level} + \text{Minimum Stock Level}}{2}$$

Method 2 : This method is used when *safety stock is maintained* by the organisation. The ordering quantity is known and is same throughout the period. In this case also, it is assumed that consumption of materials and lead period does not vary widely.

3.46 Accounting for Materials

Formula for calculation of average level is as follows :

$$\text{Average Stock Level} = \text{Safety Stock} + \frac{1}{2} \text{ of Reorder Quantity (EOQ) [See Illustration 53]}$$

Illustration 24

The re-order level of material 'M' is 1,600 kg and ordering quantity is 1,400 kg. Lead time and usage are as follows:

Lead time :	Minimum	1 week
	Average	1.5 weeks
	Maximum	2 weeks
Usage :	Minimum	600 kg per week
	Average	700 kg per week
	Maximum	800 kg per week

Calculate maximum stock level and minimum stock level of material 'M'.

Solution

$$\begin{aligned}\text{Maximum Stock Level} &= \text{Re-order level} - (\text{Minimum usage} \times \text{Minimum lead time}) + \text{Re-order quantity} \\ &= 1,600 \text{ kg} - (600 \text{ kg} \times 1) + 1,400 \text{ kg} \\ &= \mathbf{2,400 \text{ kg.}}\end{aligned}$$

$$\begin{aligned}\text{Minimum Stock Level} &= \text{Re-order level} - (\text{Average usage} \times \text{Average lead time}) \\ &= 1,600 \text{ kg} - (700 \text{ kg} \times 1.5) \\ &= \mathbf{550 \text{ kg}}\end{aligned}$$

Illustration 25

In a factory component 'A' is used as follows :

- (i) Normal usage 50 kg per week.
- (ii) Maximum usage 75 kg per week.
- (iii) Re-order quantity 300 kg.
- (iv) Re-order period 4 to 6 weeks.

Calculate for component 'A' :

- (a) Re-order level; (b) Maximum level; (c) Minimum level; and (d) Average stock level.

[C.U.B.Com. (Hons.) – Adapted]

Solution

$$\begin{aligned}\text{(a) Re-order Level} &= \text{Maximum usage} \times \text{Maximum lead period} \\ &= 75 \text{ kg} \times 6 \\ &= \mathbf{450 \text{ kg}}\end{aligned}$$

$$\begin{aligned}\text{(b) Maximum Level} &= \text{Re-order Level} - (\text{Minimum usage} \times \text{Minimum lead period}) + \text{Re-order quantity} \\ &= 450 \text{ kg} - [25 \text{ kg (Note 1)} \times 4] + 300 \text{ kg} \\ &= \mathbf{650 \text{ kg}}\end{aligned}$$

$$\begin{aligned}\text{(c) Minimum Level} &= \text{Re-order Level} - (\text{Normal usage} \times \text{Normal lead period}) \\ &= 450 \text{ kg} - (50 \text{ kg} \times 5) \\ &= \mathbf{200 \text{ kg}}\end{aligned}$$

$$\begin{aligned}\text{(d) Average Stock Level} &= \frac{\text{Maximum Level} + \text{Minimum Level}}{2} \\ &= \frac{650 \text{ kg} + 200 \text{ kg}}{2} = \mathbf{425 \text{ kg}}\end{aligned}$$

Working Notes :

(1) Calculation of minimum usage :

$$\text{Normal usage} = \frac{\text{Maximum Usage} + \text{Minimum Usage}}{2}$$

Or, $2 \times 50 \text{ kg} = 75 \text{ kg} + \text{minimum usage}$

Or, Minimum usage = $100 \text{ kg} - 75 \text{ kg} = \mathbf{25 \text{ kg}}$

$$(2) \text{ Normal Lead Period} = \frac{\text{Maximum Lead Period} + \text{Minimum Lead Period}}{2} = \frac{6 + 4}{2} = \mathbf{5 \text{ weeks}}$$

Illustration 26

A.S. Ltd. produces a product 'RED' using two components X and Y. Each unit of RED requires 0.4 kg of X and 0.6 kg of Y. Weekly production varies from 350 units to 450 units averaging 400 units. Delivery period for both the components is 1 to 3 weeks. The economic order quantity for X is 600 kg and for Y is 1,000 kg.

Calculate :

- (i) Re-order level of X;
- (ii) Maximum level of X; and
- (iii) Minimum level of Y.

[D.U.B.Com. (Hons.) – 2008]

Solution

- (i) Re-order Level of X = Maximum consumption $\times$ Minimum lead time
 $= (450 \text{ units} \times 0.4 \text{ kg}) \times 3$
 $= \mathbf{540 \text{ kg}}$
- (ii) Maximum Level of X = Re-order level – (Minimum consumption $\times$ Minimum lead time) + EOQ
 $= 540 \text{ kg} - [350 \text{ units} \times 0.4 \text{ kg} \times 1] + 600 \text{ kg}$
 $= 540 \text{ kg} - 140 \text{ kg} + 600 \text{ kg}$
 $= \mathbf{1,000 \text{ kg.}}$
- (iii) Minimum Level of Y = Re-order level – (Normal consumption $\times$ Normal lead time)
 $= 810 \text{ kg (Note 1)} - [(400 \text{ units} \times 0.6 \text{ kg}) \times 2 \text{ (Note 2)}]$
 $= 810 \text{ kg} - 480 \text{ kg}$
 $= \mathbf{330 \text{ kg}}$

Working Notes :

(1) Re-order Level of Y = maximum consumption $\times$ Maximum lead time = $(450 \text{ units} \times 0.6 \text{ kg}) \times 3 = \mathbf{810 \text{ kg}}$

$$(2) \text{ Normal Lead Time} = \frac{\text{Maximum Lead Time} + \text{Minimum Lead Time}}{2} = (3 + 1) / 2 = \mathbf{2 \text{ weeks}}$$

Illustration 27

A company manufactures 5,000 units of a product per month. The cost of placing an order is ₹ 100. The purchase price of the raw material is ₹ 10 per kg. The re-order period is 4 to 8 weeks.

The consumption of raw materials varies from 100 kg to 450 kg per week; the average consumption being 275 kg. The carrying cost of inventory is 20% per annum.

You are required to calculate :

- (i) Re-order quantity; (ii) Maximum level; (iii) Minimum level; and (iv) Average level.

[D.U.B.Com. (Hons.) – 2006]

Solution

$$\text{Reorder Quantity} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand $(275 \times 52 \text{ weeks}) = 14,300 \text{ kg.}$

O = Ordering cost = ₹ 100

H = Carrying cost per kg per annum = ₹ 10 $\times$ 20% = ₹ 2

3.48 Accounting for Materials

$$(i) \text{ Reorder Quantity} = \sqrt{\frac{2 \times 14,300 \text{ kg} \times 100}{2}} = \sqrt{14,30,000} = 1,195.82 \text{ kg (say) } \mathbf{1,196 \text{ kg}}$$

$$\text{Re-order Level} = \text{Maximum Consumption} \times \text{Maximum Lead Period} = 450 \text{ kg} \times 8 = \mathbf{3,600 \text{ kg}}$$

$$\begin{aligned} (ii) \text{ Maximum Level} &= \text{Re-order level} - (\text{Minimum consumption} \times \text{Minimum lead time}) + \text{Re-order quantity} \\ &= 3,600 \text{ kg} - (100 \text{ kg} \times 4) + 1,196 \text{ kg} \\ &= 3,600 \text{ kg} - 400 \text{ kg} + 1,196 \text{ kg} \\ &= \mathbf{4,396 \text{ kg}} \end{aligned}$$

$$\begin{aligned} (iii) \text{ Minimum Level} &= \text{Re-order level} - (\text{Normal consumption} \times \text{Normal lead time}) \\ &= 3,600 \text{ kg} - [275 \text{ kg} \times 6 \text{ (Note 1)}] \\ &= \mathbf{1,950 \text{ kg}} \end{aligned}$$

$$\begin{aligned} (iv) \text{ Average Level} &= \frac{\text{Maximum Level} + \text{Minimum Level}}{2} \\ &= \frac{4,396 \text{ kg} + 1,950 \text{ kg}}{2} = \frac{6,346 \text{ kg}}{2} = \mathbf{3,173 \text{ kg}} \end{aligned}$$

Working Note :

$$\begin{aligned} (I) \text{ Normal Lead Time} &= \frac{\text{Maximum Lead Time} + \text{Minimum Lead Time}}{2} \\ &= \frac{8 \text{ weeks} + 4 \text{ weeks}}{2} = \mathbf{6 \text{ weeks}} \end{aligned}$$

Illustration 28

From the following particulars compute :

- (i) Re-order level;
- (ii) Re-order quantity;
- (iii) Average stock level; and
- (iv) Maximum re-order period.

Normal usage – 100 units per day

Minimum usage – 60 units per day

Minimum level – 1,400 units

Re-order period : Normal 25 days, Minimum 20 days.

Maximum usage – 130 units per day

Maximum level – 7,800 units

[C.U.B.Com. (Hons.) – 2007]

Solution

- (i) We know, Minimum Level = Re-order level – (Normal usage × Normal re-order period)
1,400 units = Re-order level – (100 units × 25)
or, Re-order level = 1,400 units + 2,500 units
or, Re-order level = **3,900 units**
- (ii) Maximum level = Re-order level – (Minimum usage × Minimum re-order period) + Re-order quantity
7,800 units = 3,900 units – (60 units × 20) + Re-order quantity
or, 7,800 units = 2,700 units + Re-order quantity
or, Re-order quantity = 7,800 units – 2,700 units
or, Re-order quantity = **5,100 units.**

$$\begin{aligned} (iii) \text{ Average Stock Level} &= \frac{\text{Maximum Level} + \text{Minimum Level}}{2} \\ &= \frac{7,800 \text{ units} + 1,400 \text{ units}}{2} = \mathbf{4,600 \text{ units}} \end{aligned}$$

$$(iv) \text{ Normal Reorder Period} = \frac{\text{Maximum Reorder Period} + \text{Minimum Reorder Period}}{2}$$

$$2 \times 25 \text{ days} = \text{Maximum re-order period} + 20 \text{ days}$$

$$\text{or, } 50 \text{ days} - 20 \text{ days} = \text{Maximum re-order period}$$

$$\text{or Maximum re-order period} = \mathbf{30 \text{ days}}$$

Illustration 29

Re-order quantity of material 'X' is 5,000 kg.; maximum level of 8,000 kg. Minimum usage 50 kg. per hour. Minimum Reorder period is 4 days. Daily working hours in the factory is 8 hours.

You are required to calculate the reorder level of material - 'X'.

Solution

$$\text{Maximum Level} = \text{Reorder Level} - (\text{Minimum consumption} \times \text{Minimum lead period}) + \text{Re-order Quantity}$$

$$8,000 \text{ kg.} = \text{Reorder Level} - (400 \text{ kg} \times 4) + 5,000 \text{ kg.}$$

$$\text{or, } 8,000 \text{ kg.} = \text{Reorder Level} - 1,600 + 5,000 \text{ kg.}$$

$$\text{or, Reorder Level} = 8,000 + 1,600 - 5,000$$

$$\text{or, Reorder Level} = 4,600 \text{ kg.}$$

$$* \text{ Minimum usage per day} = 50 \text{ kg.} \times 8 \text{ hours} = 400 \text{ kg.}$$

Illustration 30

Big Bazar – a large retailer with multiple outlets maintains a central warehouse from where the outlets are supplied. The following information is available for item No. BB105.

Average usage : 350 units per day

Minimum usage : 180 units per day

Maximum usage : 420 units per day

Lead time : 11 – 15 days

Re-order quantity : 6,500 units

Re-order level : 6,300 units

Based on above data, calculate :

(i) Maximum level of stock; and

(ii) Buffer stock / Safety stock

Solution

(i) **Maximum Level of Stock** =

$$\text{Re-order level} - (\text{Minimum usage} \times \text{Minimum lead period}) + \text{Re-order quantity}$$

$$= 6,300 \text{ units} - (180 \times 11) + 6,500$$

$$= 6,300 - 1,980 + 6,500$$

$$= \mathbf{10,820 \text{ units}}$$

We know,

$$\text{Re-order Level} = \text{Safety Stock} + (\text{Average consumption} \times \text{Average lead period}) \text{ (See Page 3.42)}$$

$$\text{Or, Safety Stock} = \text{Re-order Level} - (\text{Average consumption} \times \text{Average lead period})$$

$$\text{Or, Safety Stock} = 6,300 \text{ units} - (350 \text{ units} \times 13 \text{ days})$$

$$= 6,300 \text{ units} - 4,550 \text{ units}$$

$$= \mathbf{1,750 \text{ units}}$$

Alternatively,

Buffer Stock is the minimum stock level.

$$\text{Minimum Level of Stock} = \text{Re-order level} - (\text{Average usage} \times \text{Average lead period})$$

$$= 6,300 \text{ units} - [350 \text{ units} \times 13 \text{ (Note 1)}]$$

$$= 6,300 \text{ units} - 4,550 \text{ units}$$

$$= \mathbf{1,750 \text{ units}}$$

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Working Note :

- (1) Average usage has been given in the question.

$$\text{Average Lead Period} = \frac{\text{Maximum Lead Time} + \text{Minimum Lead Time}}{2} = \frac{11 + 15}{2} = 13 \text{ days}$$

Illustration 31

LP Ltd. purchases its requirements for component ZED at a price of ₹ 800 per unit. Its annual usage of component ZED is 8,760 units. The annual holding cost of one unit of component Zed is 5% of its purchase price and cost of placing an order is ₹ 125.

You are required to calculate :

- The economic order quantity (to the nearest unit).
- Assuming that usage of component ZED is constant throughout the year (365 days) and that the lead time from placing an order to its receipt is 21 days, calculate the stock level (in units) at which an order should be placed.

Solution

(a) Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$

where,

A = Annual demand = 8,760 units

O = Ordering cost = ₹ 125

H = Holding cost per unit of ZED for the year
(5% of ₹ 800) = ₹ 40

$$\text{EOQ} = \sqrt{\frac{2 \times 8,760 \times 125}{40}} = \sqrt{54,750} = 234 \text{ units}$$

- (b) Usage per day = $8,760 \div 365 = 24$ units.

$$\begin{aligned} \text{Re-order level} &= \text{Maximum usage per day} \times \text{Maximum lead period in days} \\ &= 24 \text{ units} \times 21 \text{ (Note 1 \& 2)} \\ &= \mathbf{504 \text{ units.}} \end{aligned}$$

Working Notes :

- Usage of component ZED is constant. Therefore, maximum usage and minimum usage are same.
- It is assumed that lead period is also constant. Therefore, maximum lead period and minimum lead period are same.

Illustration 32

P Ltd is engaged in the manufacture of industrial pumps of a standard description. The company uses about 75,000 valves per annum for its production and the usage is fairly constant at 6,250 valves per month. The valves cost ₹ 1.50 per unit when bought in quantities and carrying cost is estimated to be 20% of average inventory investment on the annual basis. The cost to place an order and process the delivery is ₹ 18. It takes 45 days to receive delivery from the date of an order and a safety stock of 3,200 valves is desired.

You are required to determine :

- (i) the most economical order quantity; and (ii) the re-order point.

[D.U.B.Com. (Hons.) – 2002]

Solution

Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$

where,

A = Annual demand = 75,000 units

O = Ordering cost = ₹ 18

H = Carrying cost per unit p.a. = ₹ 1.50 × 20% = ₹ 0.3

$$EOQ = \sqrt{\frac{2 \times 75,000 \times 18}{0.3}} = \sqrt{90,000} = 3,000 \text{ valves}$$

Re-order Level = Safety Stock + (Normal Consumption × Normal lead period)

Given that :

Safety stock (minimum stock) = 3,200 valves

Normal monthly consumption = 6,250 valves

Normal lead period = 45 days or 1.5 months

Re-order Level = 3,200 valves + (6,250 valves × 1.5 month)
 = 3,200 valves + 9,375 valves
 = **12,575 valves**

Perpetual Inventory System

Perpetual Inventory System is a method of recording materials in stores ledger and bin card after every receipt and issue. It provides and facilitates regular checking. Effective control of materials is possible when there is continuous stock taking system along with perpetual inventory system in operation.

The success of perpetual inventory system depends upon the following factors :

1. Proper maintenance of bin card and stores ledger.
2. Continuous checking of physical quantity of materials in a systematic manner.
3. Detection of discrepancies of materials at the earliest and taking of necessary action after proper investigation.
4. Fixing of responsibilities of the employees at the earliest.

Advantages of Perpetual Inventory System

The following are the advantages of perpetual inventory system :

1. The quantity and value of materials will be available easily. It will facilitate the preparation of interm financial report at the earliest.
2. The up-to-date balance of materials in the bin card facilitate the physical stock counting and detection of discrepancies.
3. It will be easy to detect the re-order point by inspecting bin card or stores ledger. Thus it will prevent the stock out of materials.
4. Availability of up-to-date balance of materials will help to prevent over-stocking. The balance in the stores ledger can be compared any time with the permissible maximum limit to detect excess quantity held.
5. An effective perpetual inventory system will help to reduce investment in inventories.
6. A properly monitored perpetual inventory system reveals the existence of slow moving and non-moving materials at the earliest. It will help to take remedial measures in time.
7. It helps to report up-to-date figures of stock to bank and insurance company as and when required.
8. The discrepancies between the balance in bin card and stores ledger are detected at the earliest and adjusted immediately to avoid confusion.

Physical Inventory

Although the perpetual inventory system provides a up-to-date record of the materials, it is necessary to count periodically each types of materials on hand to detect discrepancies between actual count and balance in the stores ledger.

A physical stock-taking can be carried out in two ways :

- (i) Periodical stock-taking; and (ii) Continuous stock-taking.

3.52 Accounting for Materials

Periodical Stock-taking : Under this plan, physical count of the materials are carried out once at the end of the accounting period. Some companies even shut down completely and the employees count and tally the materials. Normal operation is resumed after the counting is over completely. This plan of stock-taking is suitable when the size of the company is small or the company is doing seasonal business. However, the big companies cannot afford to shut down the production for stock-taking purpose and they go for continuous stock-taking plan.

Stock-taking Procedures

The following steps are followed at the time of taking stock at the year end :

- Step 1 :** Consecutively numbered inventory tags are prepared in advance for all materials in stores. It is used to record description and the quantity of material.
 - Step 2 :** Inventory tags are attached to the materials to be counted, weighed or measured.
 - Step 3 :** After counting, weighing and measuring each material, the concerned clerk or counting crew makes an entry in the inventory tag in respect of the quantity and date.
 - Step 4 :** Inventory sheets are prepared in advance. All the materials to be inventorised are listed on the sheets, usually in the same order as they are physically stored. The location, material code number, description and unit cost are captured from stores ledger.
 - Step 5 :** On the date of inventory, each material is counted, weighed, measured and entered in the inventory sheet by the counting crew. This record is **totally independent of inventory tag record**.
 - Step 6 :** The supervisor checks the quantity recorded in the inventory tag and inventory sheet. The differences are immediately sorted out.
 - Step 7 :** After reconciling the balances, the inventory sheet is sent to a clerk for checking it with the stores ledger balances. the unit cost of material is also checked at this stage.
 - Step 8 :** After thorough checking, the value of each material is calculated and placed in extended column of the inventory sheet.
 - Step 9 :** The extended column is totalled to get the total value of materials on hand.
 - Step 10 :** The difference between the actual physical unit and balance as per stores ledger is reported to proper authority.
 - Step 11 :** The stores ledger is rectified for shortage or overage to reflect actual physical units and value.
- A specimen of Inventory Tag is given below :**

No. 30 Inventory Tag			
Material Name : Fuel Filter		Location : Bin No. 5	
Material Code : F/104		Date : 28.12.2017	
Quantity : 250 pieces			
Date	Received after Count	Issued after Count	Balance
Checked by :			

[Fig. 3.8]

Inventory Sheet					
Sheet No. 1 Location : Factory Building 'B' Listed by :			Date : 31st December, 2017 Checked by : Priced by :		
Tag No.	Material Code	Description	Quantity	Cost per Unit	Extended Total (₹)
30	F/104	Fuel Filter	250 pieces	200	50,000
31	II/105	Insulated wire	200 mts.	20	4,000
32	C/105	Plastic Covers	100 pieces	25	2,500
33	V/110	1/2" Valves	50 pieces	50	2,500
		Total			59,000

[Fig. 3.9]

Continuous Stock-taking : Under this plan, only a few materials are physically counted every day throughout the year. A well-planned schedule is designed so that all materials will be inventorised at least once in a year. Sometimes, valuable materials are counted at the end of every month.

Advantages of Continuous Stock Taking System

The following are the advantages of continuous stock taking system :

1. It is not necessary to stop production for stock taking at the end of the accounting period.
2. Early detection of discrepancies between physical quantity and book quantity will be possible. It will help to prevent some avoidable causes of discrepancies. *For example*, spoilage due to bad storage facility can be prevented.
3. It will prevent the dishonest employees to commit a crime as it may be detected any time.
4. Efficient specialist personnel can be employed throughout the year to perform the stock-taking job.
5. Extra cost by way of overtime can be avoided as the work load of the employees will be distributed evenly throughout the year.
6. A detailed and reliable stock checking will be possible as there is no time limit for stock-taking.
7. It will be possible to prevent the pilferage of valuable materials by increasing the frequency of physical checking.
8. It may help to re-design the entire internal control system.
9. Early detection of discrepancies may alert the employees to take extra care at the time of handling the materials.

Reasons for Materials Shortages and Overages

In spite of all precautions, some differences are bound to occur in inventory record, particularly, when number of materials are large. Some of the reasons for these differences might be the following :

- (i) Placing of material in wrong bin;
- (ii) Incorrect posting of issues and receipts of materials;
- (iii) Failure to post receipts in the stores ledger from 'Goods Received Note' (GRN);
- (iv) Failure to post issues in the stores ledger from 'Materials Requisition Note' (MRN);
- (v) Spoilage due to poor storage facility;
- (vi) Spoilage as a result of natural process;

3.54 Accounting for Materials

- (vii) Shrinkage or expansion due to change in weather;
- (viii) Computation errors in day-to-day posting;
- (ix) Errors arising due to adoption of different units of measurement for receipts and issues. *For example*, materials might be purchased in tonne but issued in kg.
- (x) Failure to complete required paper work at the time of issue. *For example*, in emergency, materials were issued without requisition slip and forgot to prepare it in time.
- (xi) Losses due to breakage or evaporation.
- (xii) Losses due to pilferage by dishonest employees.
- (xiii) Losses due to short-weight or short-measure involving collusion between dishonest employees and suppliers.
- (xiv) Losses due to theft by outsiders for lack of proper security arrangement at storerooms.

Treatment of Material Losses

Materials losses appear as the inevitable consequences of operations. Some accountants classify these losses as 'scrap', 'spoilage', 'defective' and 'waste'. Understanding the meaning of these items is very important for the purpose of its treatment in cost accounting.

In this respect, the definitions given in CAS-6 : '*Cost Accounting Standard on Material Cost*' (revised in 2017) are very important :

1. Scrap

Para 4.10 defines 'scrap' as '*Discarded material having no or insignificant value and which is usually either disposed off without further treatment (other than reclamation and handling) or re-introduced into the process in place of raw material.*'

Accounting Treatment of Scrap

For accounting purpose, scrap should be classified into :

- (i) Normal scrap; and
- (ii) Abnormal scrap

(i) Normal Scrap :

- (a) If the scrap under consideration has a stable value in the scrap market, the net amount recovered is *deducted* from the cost of primary material.
- (b) If the scrap under consideration is reprocessed into useful raw materials for subsequent production of the basic product, the procurement cost of such 'raw material' from the market will be deducted from the cost of the primary material. Net material cost is spread over *good units*.
- (c) If the realisable value of the scrap is very insignificant, then it is treated as *miscellaneous income*. Nothing is deducted from the cost of the primary material.

(ii) Abnormal Scrap : Abnormal scrap is not taken into consideration for calculating the cost of the primary material. Abnormal scrap is valued like primary product. The net amount is 'debited' to Costing Profit and Loss Account.

2. Spoilage

Para 4.12.2 defines 'spoilage' as : '*Production that does not meet the quality requirements or specifications and cannot be rectified economically.*

Spoilage occurs when materials are so damaged in manufacturing process that they are taken away from the process and disposed off in some manner. Spoiled materials cannot be repaired or re-conditioned.

In this case, there is not only a material loss in the product but also a loss of labour and manufacturing overhead already incurred on the material.

Accounting Treatment of Spoilage

For accounting purposes, just like 'scrap', spoilage is also classified as :

- (i) Normal Spoilage
- (ii) Abnormal Spoilage

(i) Normal Spoilage : Normal spoilage is part and parcel of the manufacturing process. *For example*, occasional breaking of precious stones at the time of fitting in an ornament. The spoiled unit may be sold as scrap or seconds (as in hosiery manufacturing). The net amount recovered is deducted from the cost of the primary material. Net material cost is spread over **good units**.

(ii) Abnormal Spoilage : Abnormal spoilage may arise from non-manufacturing events such as floods, fire and earthquakes, etc. Abnormally spoiled items will be valued like normal item. The net cost is charged to Costing Profit and Loss Account.

3. Defective

Para 4.4 defines 'defectives' as **Materials, products or intermediate products that do not meet quality standards. This may include reworks or rejects.**

Defectives can be brought up to the standards by putting in additional resources. It can be sold in the market as normal product. If the defective cannot meet the quality standards even after putting additional resources, then it will be treated as rejects which may be disposed off as waste or sold for salvage value or recycled in the production process.

Accounting Treatment of Defectives

The problem of accounting for defective units is concerned with accounting for **rework cost**.

Normal Defective : If the defective units appear as a normal consequence of productive activity, the re-work costs will be treated as a cost of producing satisfactory products.

Abnormal Defective : The re-work cost of abnormal defective units will be charged to Costing Profit and Loss Account.

4. Waste

Para 4.12.1 defines 'waste' as **Material lost during production or storage and discarded material which may or may not have any value.**

Generally 'waste' results from the disappearance of materials in the manufacturing process (such as evaporation) or quality of the product may deteriorate without disappearance of the quantity of material itself. *For example*, over-burning of the coffee beans at the time of roasting.

Accounting Treatment of Waste

For accounting purposes, waste is also classified as :

- (i) Normal Wastage
- (ii) Abnormal Wastage

(i) Normal Wastage : Normal wastage is part and parcel of manufacturing process. The cost of normal waste unit is borne by good units.

(ii) Abnormal Wastage : It is valued like good unit. Its cost is charged to Costing Profit and Loss Account.

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 33

Calculate : (i) Re-order level, (ii) Maximum level and (iii) Minimum level from the following data :

- Re-order quantity : 7,500 units
- Re-order period : 4 - 6 weeks
- Maximum consumption : 900 units per week
- Minimum consumption : 550 units per week
- Normal consumption : 600 units per week

[C.U.B.Com.(General) - 2008, 2017]

Solution

- (i) Re-order Level = Maximum Consumption $\times$ Maximum Lead Period
 $= 900 \text{ units} \times 6 = \mathbf{5,400 \text{ units}}$
- (ii) Maximum Level = Re-order Level – (Minimum Consumption $\times$ Minimum Lead Period) + Re-order Quantity
 $= 5,400 \text{ units} - (550 \text{ units} \times 4) + 7,500 \text{ units} = \mathbf{10,700 \text{ units}}$
- (iii) Minimum Level = Re-order Level – (Normal Consumption $\times$ Average Lead Period)
 $= 5,400 \text{ units} - (600 \text{ units} \times 5)$
 $= 5,400 \text{ units} - 3,000 \text{ units} = \mathbf{2,400 \text{ units}}$

Illustration 34

The following data is available in respect of a material used in the production of goods for the year 2008 :

- Cost of the material per unit : ₹ 50
- Weekly consumption : 300 units
- Ordering cost per order : ₹ 650
- Stock holding cost : 2% per month (on cost)
- Compute** (assuming 52 weeks) :

- (a) Economic Order Quantity;
- (b) Optimum Number of Orders per Year; and
- (c) Time Lag between two consecutive orders.

[C.U.B.Com.(General) - 2009]

Solution

- (a) Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$ **where,**
 $A = \text{Annual demand} = 300 \times 52 = 15,600 \text{ units}$
 $O = \text{Ordering cost} = ₹ 650 \text{ per order}$
 $H = \text{Inventory carrying cost} = 2\% \times 12 \times ₹ 50 = ₹ 12$

$$\text{EOQ} = \sqrt{\frac{2 \times 15,600 \times 650}{12}} = \sqrt{16,90,000} = \mathbf{1,300 \text{ units}}$$

$$(b) \text{ Optimum Number of Orders} = \frac{\text{Annual Demand}}{\text{EOQ}} = \frac{15,600}{1,300} = 12 \text{ Orders}$$

$$(c) \text{ Time lag between consecutive orders} = \frac{12 \text{ Months}}{\text{Number of Orders}} = \frac{12}{12} = 1 \text{ Month}$$

Illustration 35

A manufacturing company produces a special product 'Sorbina'. The following particulars are available in respect of materials used for manufacturing the product :

Cost of placing an order : ₹ 120.

Annual carrying cost per unit : ₹ 12.

Normal usage 60 units per week.

Maximum usage 90 units per week.

Minimum usage 30 units per week.

Delivery period : 4 - 6 weeks.

A year constitutes 48 weeks.

From the above data, compute :

(a) Re-ordering Quantity; (b) Re-order Stock Level; and (c) Minimum Stock Level.

[C.U.B.Com.(General) - 2010]

Solution

In this problem, annual demand has not been given directly. It has been calculated on the basis of normal usage. Therefore, annual demand = 48×60 units = 2,880 units.

$$(a) \text{ Re-order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}} \quad \text{where,}$$

A = Annual demand = 2,880 units
O = Ordering cost = ₹ 120
H = Annual carrying cost = ₹ 12

$$= \sqrt{\frac{2 \times 2,880 \times 120}{12}} = 240 \text{ units}$$

$$(b) \text{ Re-order Stock Level} = \text{Maximum Usage} \times \text{Maximum Lead Period}$$

$$= 90 \times 6 = 540 \text{ units}$$

$$(c) \text{ Minimum Stock Level} = \text{Re-order Level} - (\text{Normal Usage} \times \text{Average Lead Period})$$

$$= 540 \text{ units} - (60 \times 5)$$

$$= 540 - 300 = 240 \text{ units}$$

Illustration 36

Calculate Economic Order Quantity and Number of Orders from the following information :

Annual Usage : 12,000 units

Order Cost per order : ₹ 400

Cost per unit : ₹ 320

Carrying cost as a percentage of Average Stock : 20% p.a.

[C.U.B.Com.(General) - 2012]

Solution

$$(i) \text{ Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}} \quad \text{where,}$$

A = Annual demand = 12,000 units
O = Ordering cost = ₹ 400
H = Holding cost per unit per annum = 20% of ₹ 320 = ₹ 64

$$\text{EOQ} = \sqrt{\frac{2 \times 12,000 \times 400}{64}} = 387.298 \text{ units (say, 387 units)}$$

3.58 Accounting for Materials

$$(ii) \text{ Number of Orders} = \frac{\text{Annual Demand}}{\text{EOQ}} = \frac{12,000}{387} = \mathbf{31 \text{ Orders}}$$

Illustration 37

A company purchases its annual requirement of raw materials in 6 orders. The purchase manager wants to adopt 'Economic Order Quantity (EOQ) method'.

From the following information, as Cost Accountant of the Company, you are required to give proper advise regarding purchase policy of the Company.

Annual consumption : 36,000 units

Cost of materials per unit : ₹ 1

Order placing cost per order : ₹ 25

Cost of carrying materials : 20% p.a.

[C.U.B.Com.(General) - 2013]

Solution

$$(i) \text{ Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}} \quad \text{where,}$$

A = Annual demand = 36,000 units
O = Ordering cost = ₹ 25
H = Holding cost per unit per annum = 20% of ₹ 1
= ₹ 0.2 per unit

$$\text{EOQ} = \sqrt{\frac{2 \times 36,000 \times 25}{0.2}} = \mathbf{3,000 \text{ units}}$$

(i) Total Annual Cost of 3,000 units ordered :

$$\text{Total Annual Cost} = \sqrt{2 \times A \times O \times H} = \sqrt{2 \times 36,000 \times 25 \times 0.2} = \mathbf{₹ 600}$$

(ii) Total annual cost if 6,000 units (i.e., 6 orders) are ordered at a time :

(a) Total ordering cost = 6×25	150
(b) Holding cost = $1/2 \times 6,000 \times 0.2$	<u>600</u>
	<u>750</u>

Recommendation :

The company should order 3,000 units per order. At present, the total cost is ₹ 750 (excluding item cost). If 3,000 units (EOQ) is ordered, then total cost will be ₹ 600. The company can save ₹ 150.

Illustration 38

A manufacturer uses 200 units of a component every month and he buys them entirely from outside supplier. The order placing and receiving cost is ₹ 100 and annual carrying cost is ₹ 12.

From this set of data, calculate 'Economic Order Quantity' and number of orders.

[C.U.B.Com.(General) - 2014]

Solution

$$(i) \text{ Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}} \quad \text{where,}$$

A = Annual demand = 200 units $\times$ 12 = 2,400 units
O = Ordering cost = ₹ 100
H = Annual carrying cost = ₹ 12

$$\text{EOQ} = \sqrt{\frac{2 \times 2,400 \times 100}{12}} = \mathbf{200 \text{ units}}$$

$$(ii) \text{ Number of Orders} = \frac{\text{Annual Demand}}{\text{EOQ}} = \frac{2,400}{200} = \mathbf{12 \text{ Orders}}$$

Illustration 39

In a factory, component 'P' is used as follows :

Normal usage : 50 kg per week
 Minimum usage : 25 kg per week
 Maximum usage : 75 kg per week
 Reorder quantity : 300 kg
 Reorder period : 4 to 6 weeks

Calculate for component 'P' :

- (i) Re-order Level;
- (ii) Maximum Level; and
- (iii) Minimum Level

[C.U.B.Com.(General) - 2015]

Solution

- (i) Re-order Level = Maximum Usage × Maximum Lead Period
 $= 75 \text{ kg} \times 6 = \mathbf{450 \text{ kg}}$
 - (ii) Maximum Level = Re-order Level – (Minimum Usage × Minimum Lead Period) + Re-order Quantity
 $= 450 \text{ kg} - (25 \times 4) + 300 \text{ kg} = \mathbf{650 \text{ kg}}$
 - (iii) Minimum Level = Re-order Level – (Normal Usage × Normal Lead Period)
 $= 450 \text{ kg} - (50 \text{ kg} \times 5^*)$
 $= 450 \text{ kg} - 250 \text{ kg} = \mathbf{200 \text{ kg}}$
- $$* \frac{\text{Maximum Lead Period} + \text{Minimum Lead Period}}{2} = \frac{4 + 6}{2} = \mathbf{5}$$

Illustration 40

About 200 units are required per quarter and ₹ 100 per order is incurred for placing an order. The annual inventory carrying cost per unit is ₹ 4. The reorder level is 350 units. The minimum usage is 25 units per week and reorder period is 4 to 6 weeks.

Compute EOQ and Maximum Level.

[C.U.B.Com.(General) - 2016]

Solution

- (i) Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$ **where,**
 $A = \text{Annual demand} = 200 \text{ units} \times 4 = 800 \text{ units}$
 $O = \text{Ordering cost} = ₹ 100$
 $H = \text{Inventory carrying cost p.a.} = ₹ 4$

$$\text{EOQ} = \sqrt{\frac{2 \times 800 \times 100}{4}} = \mathbf{200 \text{ units}}$$

$$\begin{aligned} \text{Maximum Level} &= \text{Re-order Level} - (\text{Minimum Consumption} \times \text{Minimum Lead Period}) + \text{EOQ} \\ &= 350 \text{ units} - (25 \times 4) + 200 \text{ units} \\ &= 350 \text{ units} - 100 \text{ units} + 200 \text{ units} \\ &= \mathbf{450 \text{ units}} \end{aligned}$$

[For Honours Candidates Only]**Illustration 41**

KT Ltd. provides you the following information :

- (a) Reorder Level : 64,000 units
 - (b) Reorder Quantity : 40,000 units
 - (c) Minimum Stock Level : 34,000 units
 - (d) Maximum Stock Level : 94,000 units
 - (e) Average lead time in the past has been 2.5 days.
 - (f) The difference between maximum and minimum lead time is 3 days
- Determine the maximum and minimum usage rates and lead times.

[C.U.B.Com.(Hons.) - 2009]

Solution

Let us assume that :

- (i) Maximum usage rate is x and
- (ii) Minimum usage rate is y.

Therefore, the normal usage rate = $\frac{x + y}{2}$

As per the problem, the difference between maximum and minimum lead time = 3 days.

So, Maximum Lead Time = Minimum Lead Time + 3 days

We know, Average Lead Time = $\frac{\text{Maximum Lead Period} + \text{Minimum Lead Period}}{2}$

or, or, 2.5 = $\frac{(\text{Minimum Lead Period} + 3) + \text{Minimum Lead Period}}{2}$

or, 5 = 2 Minimum Lead Time + 3

or, 2 = 2 Minimum Lead Time

or, Minimum Lead Time = 1.

Maximum Lead Time = 3 + 1 = **4 days**.

Maximum Stock Level = Re-order Level – (Minimum Usage Rate × Minimum Lead Period) + Re-order Quantity

or, 94,000 units = 64,000 units – (Minimum usage rate × 1) + 40,000 units

or, 94,000 units = 1,04,000 units – (y × 1)

y = 1,04,000 units – 94,000 units

y = **10,000 units**

Minimum Stock Level = Re-order Level – (Normal Usage × Normal Lead Period)

34,000 units = 64,000 units – $\left(\frac{x + 10,000}{2} \times 2.5\right)$

or, $\frac{x + 10,000}{2} \times 2.5 = 64,000 - 34,000 :$

or, $\frac{x + 10,000}{2} \times 2.5 = 30,000$

or, $x + 10,000 = \frac{30,000 \times 2}{2.5}$

or, $x + 10,000 = 24,000$

or, $x = 24,000 - 10,000$

or, x = **14,000 units**

Therefore,
Maximum Usage Rate = 14,000 units; Minimum Usage Rate = 10,000 units
Maximum Lead Time = 4 days; Minimum Lead Time = 1 day.

Illustration 42

A purchase manager places for his organisation, each time for a lot of 500 kg of raw material. From the following information, find out the amount of profit or loss of the organisation for the said order :

Annual consumption : 1,000 kg
Cost per kg of raw material : ₹ 100
Ordering cost per order : ₹ 400
Inventory carrying cost : 20%

[C.U.B.Com.(Hons.) - 2010]

Solution

(i) Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$ where,
A = Annual consumption = 1,000 kg
O = Ordering cost = ₹ 400
H = Inventory carrying cost = 20% of ₹ 100 = ₹ 20

$$EOQ = \sqrt{\frac{2 \times 1,000 \times 400}{20}} = 200 \text{ kg}$$

Statement Showing the Total Cost of Different Ordering Quantity

Order Size	200 Kg. EOQ (₹)	500 Kg. Present Order Size (₹)
Cost of item (1,000 kg @ ₹ 100)	1,00,000	1,00,000
Ordering cost (Note 1)	2,000	800
Carrying cost (Note 2)	2,000	5,000
Total Cost	1,04,000	1,05,800

Amount of Loss = ₹ 1,05,800 – ₹ 1,04,000 = ₹ 1,800

Working Notes :

(1) Total Ordering Cost = $\frac{A}{EOQ} \times 400$

(a) When the quantity is 200 kg per order, the ordering cost will be $1,000 \div 200 \times 400 = ₹ 2,000$

(b) When the quantity is 500 kg per order, the ordering cost will be $1,000 \div 500 \times 400 = ₹ 800$

(2) Total Carrying Cost = $1/2 \times \text{Ordering Quantity} \times ₹ 20$

(i) When the quantity is 200 kg per order $(1 \div 2) \times 200 \times ₹ 20 = ₹ 2,000$

(ii) When the quantity is 500 kg per order $(1 \div 2) \times 500 \times ₹ 20 = ₹ 5,000$

Illustration 43

From the following particulars, compute :

(i) Re-order level; (ii) Re-order Quantity; (iii) Average Stock Level (iv) Maximum Re-order Period

Normal usage : 100 units per day

Minimum usage : 60 units per day

Maximum usage : 130 units per day

Minimum level : 1,400 units

Maximum level : 7,800 units

Re-order Period : Normal : 25 days, Minimum : 20 days.

[C.U.B.Com.(Hons.) - 2011]

3.62 Accounting for Materials

Solution

$$\text{Normal Reorder Period} = \frac{\text{Maximum Reorder Period} + \text{Minimum Reorder Period}}{2}$$

$$\text{or, } 25 = \frac{\text{Maximum Reorder Period} + 20}{2}$$

$$\text{or Maximum Reorder Period} + 20 = 50$$

$$\text{or, Maximum Reorder Period} = 50 - 20$$

$$\text{or, Maximum Reorder Period} = \mathbf{30 \text{ days}}$$

$$(i) \text{ Reorder Level} = \text{Maximum Usage} \times \text{Maximum Reorder Period}$$

$$\text{Reorder Level} = 130 \text{ units} \times 30 = \mathbf{3,900 \text{ units.}}$$

$$(ii) \text{ Maximum Level} = \text{Reorder Level} - (\text{Minimum Usage} \times \text{Minimum Reorder Period}) + \text{Reorder Quantity}$$

$$\text{or, } 7,800 = 3,900 - (60 \times 20) + \text{Reorder Quantity}$$

$$\text{or, Reorder Quantity} = 7,800 - 3,900 + 1,200 = \mathbf{5,100 \text{ units}}$$

$$(iii) \text{ Average Stock level} = \frac{\text{Maximum Level} + \text{Minimum Level}}{2}$$

$$= \frac{7,800 \text{ units} + 1,400 \text{ units}}{2} = \mathbf{4,600 \text{ units}}$$

$$(iv) \text{ Maximum Reorder Period} = \mathbf{30 \text{ days}}$$

Illustration 44

Pooja Pipes Ltd. uses about 75,000 valves per year and the usage is fairly constant at 6,250 valves per month. The valve costs ₹ 1.50 per unit when brought in large quantities; and the carrying cost is estimated to be 20% of average inventory investment on an annual basis. The cost to place an order and process the delivery is ₹ 18. It takes 45 days to receive delivery from the date of an order and a safety stock of 3,250 valves is desired.

You are required to determine —

(i) the most economic order quantity and frequency of orders;

(ii) the re-order point; and

(iii) the most economical order quantity if the valves cost ₹ 4.50 each instead of ₹ 1.50 each.

[C.U.B.Com.(Hons.) - 2012]

Solution

$$(i) \text{ Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = 75,000 valves

O = Cost of placing an order = ₹ 18

H = Carrying cost per unit per annum = $1.5 \times 20\% = ₹ 0.3$

$$\text{EOQ} = \sqrt{\frac{2 \times 75,000 \times 18}{0.3}} = \mathbf{3,000 \text{ valves}}$$

$$\text{Frequency of Order} = \frac{\text{Annual Demand}}{\text{EOQ}}$$

$$= \frac{75,000}{3,000} = \mathbf{25 \text{ order p.a.}}$$

$$\text{Time gap between two orders} = \frac{365}{25} = \mathbf{14.6 \text{ days or } 15 \text{ days}}$$

(ii) Re-order Point = Safety Stock + (Normal Usage × Normal Lead Period)

$$= 3,250 + (6,250 \times 1.5)$$

$$= \mathbf{12,625 \text{ valves}}$$

(iii) When cost of each valve is ₹ 4.50 then the Economic Order Quantity will be as follows :

$$EOQ = \sqrt{\frac{2 \times 75,000 \times 18}{20\% \text{ of } 4.5}}$$

$$= \sqrt{\frac{27,00,000}{0.9}}$$

$$= \mathbf{1,732 \text{ valves}}$$

Illustration 45

From the following particulars, calculate the best quantity to be ordered :

Ordering quantity (in kg.)	Price per kg. (₹)
Less than 250	10.00
250 and less than 800	9.60
800 and less than 2,000	9.40
2,000 and less than 4,000	9.20
4,000 and above	9.00

The annual requirement of the material is 4,000 kg. Stock holding cost is 20% of average inventory value. Ordering cost per order is ₹ 100.

[C.U.B.Com.(Hons.) - 2013]

Solution

Statement Showing Total Cost at Different Order Size

(a) Order Size		200 kg	250 kg	800 kg	2000 kg	4000 kg
(b) Number of Orders		20	16	5	2	1
(c) Average Stock		100 kg	125 kg	400 kg	1,000 kg	2,000 kg
(d) Total Ordering Cost	(₹)	2,000	1,600	500	200	100
(e) Total Stock Holding Cost (Note 2)	(₹)	200	240	752	1,840	3,600
(f) Item Cost	(₹)	40,000	38,400	37,600	36,800	36,000
	(₹)	42,200	40,240	38,852	38,840	39,700

Best ordering quantity = **2,000 kg.**

↑
EOQ

Working Notes :

(1) Number of Orders = Annual Requirement ÷ Order Size

(i) $4,000 \div 200 = \mathbf{20 \text{ orders}}$; (ii) $4,000 \div 250 = \mathbf{16 \text{ orders}}$;

(iii) $4,000 \div 800 = \mathbf{5 \text{ orders}}$; (iv) $4,000 \div 2,000 = \mathbf{2 \text{ orders}}$

(2) Total Stock Holding Cost = Purchase Price × 20% × Average Stock

(a) 200 Kg. order size = $10 \times 20\% \times 100 = \mathbf{₹ 200}$

(b) 250 Kg. order size = $9.60 \times 20\% \times 125 = \mathbf{₹ 240}$

(c) 800 Kg. order size = $9.40 \times 20\% \times 400 = \mathbf{₹ 752}$

(d) 2,000 Kg. order size = $9.20 \times 20\% \times 1,000 = \mathbf{₹ 1,840}$

(e) 4,000 Kg. order size = $9 \times 20\% \times 2,000 = \mathbf{₹ 3,600}$

3.64 Accounting for Materials

Illustration 46

JK Ltd. furnished the following details of its manufacturing operation during 2013 :

Average monthly demand of the material — 3,000 kg

Ordering cost per order : ₹ 400

Inventory carrying cost : 20% per annum

Cost of materials : ₹ 100 per kg

Normal usage : 700 kg per week

Minimum usage : 500 kg per week

Maximum usage : 1000 kg per week

Lead time to supply : 4 to 6 weeks

Compute : (i) Maximum Stock Level and (ii) Minimum Stock Level

[C.U.B.Com.(Hons.) - 2014]

Solution

$$(a) \text{ Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual demand = 36,000 kg

O = Ordering cost per order = ₹ 400

H = Inventory carrying cost per unit per annum
= ₹ 20% × ₹ 100 = ₹ 20

$$\text{EOQ} = \sqrt{\frac{2 \times 36,000 \times 400}{20}} = 1,200 \text{ kg}$$

(b) Reorder Level = Maximum Usage × Maximum Lead Time

$$= 1,000 \times 6 = 6,000 \text{ kg.}$$

(i) Maximum Stock Level = Re-order Level – (Minimum Usage × Minimum Lead Time) + Re-order Quantity

$$= 6,000 \text{ kg} - (500 \text{ kg} \times 4) + 1,200 \text{ kg}$$

$$= 5,200 \text{ kg}$$

(ii) Minimum Stock Level = Re-order Level – (Normal Usage × Normal Lead Time)

$$= 6,000 - (700 \text{ kg} \times .5^*)$$

$$= 2,500 \text{ kg}$$

$$* (4 + 6) \div 2 = 5$$

Illustration 47

The purchase manager of X Ltd buys its annual requirement of materials of 36,000 units in six instalments.

Each unit cost is ₹ 1.00 and the ordering cost is ₹ 25.00 per order. The stock holding cost is 20% p.a. of unit value.

You are required to ascertain —

(a) What is the annual inventory cost under the existing inventory policy of the purchase manager ?

(b) How much money would be saved by employing the economic order quantity ?

[C.U.B.Com.(Hons.) - 2015]

Solution (a) Statement Showing Annual Inventory Cost Under Existing Inventory Policy

Particulars		₹
(i)	Item Cost (36,000 kg × ₹ 1)	36,000
(ii)	Ordering Cost (36,000 ÷ 6,000 × 25)	150
(iii)	Inventory Carrying Cost per annum (1/2 × 6,000 × 0.2)	600
Total cost		36,750

(b) Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$ **where,**
 A = Annual demand = 36,000 kg
 O = Ordering cost per order = ₹ 25
 H = Inventory carrying cost = ₹ 20% × ₹ 1 = ₹ 0.2

$$EOQ = \sqrt{\frac{2 \times 36,000 \times 25}{0.2}} = 3,000 \text{ units}$$

Statement Showing Annual Inventory Cost Under EOQ

Particulars	₹
(i) Item Cost (36,000 kg × ₹ 1)	36,000
(ii) Ordering Cost (36,000 ÷ 3,000 × 25)	300
(iii) Inventory Carrying Cost per annum (1/2 × 3,000) × 0.2	300
Total cost	36,600

If Economic Order Quantity is employed, the company will save ₹ 150 (₹ 36,750 – ₹ 36,600)

Illustration 48

XYZ Ltd. manufactures 2,000 units of a product per month.

The purchase price of the raw materials is ₹ 10.00 per kg. The consumption of raw material varies from 100 kg to 400 kg per week. The re-order period is 4 - 8 weeks. The average (normal) consumption per week of the raw material is 250 kg. The cost of placing an order is ₹ 130.00, carrying cost of inventory is 20% per annum.

You are required to calculate :

- Re-order Quantity
- Re-order Level
- Maximum Level
- Minimum Level

[C.U.B.Com.(Hons.) - 2016]

Solution

(i) Re-order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$ **where,**
 A = Annual demand = 2,000 × 12 = 24,000 kg
 O = Ordering cost for placing an order = ₹ 130
 H = Inventory carrying cost = ₹ 10 × 20% = ₹ 2

$$EOQ = \sqrt{\frac{2 \times 24,000 \times 130}{2}} = 1,766 \text{ kg}$$

(ii) Reorder Level = Maximum Usage × Maximum Lead Time
 = 400 × 8 = **3,200 kg**

(i) Maximum Level = Re-order Level – (Minimum Usage × Minimum Lead Time) + Re-order Quantity
 = 3,200 kg – (100 × 4) + 1,766
 = **4,566 kg**

(ii) Minimum Level = Re-order Level – (Normal Usage × Normal Lead Time)
 = 3,200 – (250 kg × 6)
 = **1,700 kg**

SPECIAL PROBLEMS

Illustration 49

From the details given below, calculate :

- (i) Reordering Level
- (ii) Maximum Level
- (iii) Minimum Level
- (iv) Danger Level

Reordering quantity is to be calculated on the basis of following information :

Cost of placing a purchase order is ₹ 20.

Number of units to be purchased during the year is 5,000.

Purchase price per unit inclusive of transportation cost is ₹ 50.

Annual cost of storage per unit is ₹ 5.

Details of lead time : Average 10 days, Maximum 15 days, Minimum 6 days.

For emergency purchase 4 days

Rate of consumption : Average : 15 units per day, Maximum : 20 units per day.

[D.U.B.Com. (Hons.) - Adapted]

Solution

$$\text{Re-order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual consumption = 5,000 units

O = Cost of placing a Purchase Order = ₹ 20

H = Annual Cost of Storage = ₹ 5

$$\text{EOQ} = \sqrt{\frac{2 \times 5,000 \times 20}{5}} = \mathbf{200 \text{ units}}$$

- (i) Reorder Level = Maximum Consumption × Maximum Lead Time
= 200 × 15 = **300 units**
- (ii) Maximum Level = Re-order Level – (Minimum Consumption × Minimum Lead Time) + Re-order Quantity
= 300 units – (10 units* × 6) + 200 units
= 300 units – 60 units + 200 units
= **440 units**

*** Calculation of Minimum Consumption**

$$\text{Average Consumption} = \frac{\text{Maximum Consumption} + \text{Minimum Consumption}}{2}$$

or, $15 \times 2 = 20 + \text{Minimum Consumption}$

or, Minimum Consumption = 30 – 20

or, Minimum consumption = 10 units.

- (iii) Minimum Level = Re-order Level – (Normal Consumption × Average Lead Time)
= 300 units – (15 × 10)
= **150 units**
- (iv) Danger Level = Average Consumption × Reorder Time in Emergency Condition
= 15 × 4 days
= **60 units**

Illustration 50

Material B is used in the manufacture of product X and several other products. Total yearly requirement of material B is 1,20,000 litres, used evenly over the year.

The cost of ordering stock and holding stock are as follows :

- (i) Order cost per order ₹ 900
- (ii) Holding cost per litre per annum ₹ 6

A safety stock of 2,500 litres of material B is held and average lead time is 1.5 weeks.

Calculate for material B :

- (i) Economic Order Quantity
- (ii) Re-order Level (assuming 1 year = 50 weeks)
- (iii) Total annual cost of ordering stock
- (iv) Total annual cost of holding stock.

[C.A. (Inter) - Adapted]

Solution

(i) Economic Order Quantity (EOQ) = $\sqrt{\frac{2AO}{H}}$ **where,**
 A = Annual demand = 1,20,000 litres
 O = Cost of placing an order = ₹ 900
 H = Holding Cost per litre per annum = ₹ 6

$$EOQ = \sqrt{\frac{2 \times 1,20,000 \times 900}{6}} = 6,000 \text{ litres}$$

- (ii) **Re-order Level** = Safety Stock + (Normal consumption × Average lead period)

Given that :

Safety stock = 2,500 litres

Weekly consumption = 1,20,000 ÷ 50 = 2,400 litres

Average lead period = 1.5 weeks

Re-order Level = 2,500 litres + (2,400 litres × 1.5 weeks) = **6,100 litres.**

- (iii) **Total Annual Cost of Ordering Stock**

Number of orders = 1,20,000 litres ÷ 6,000 litres = **20 orders**

Total Ordering Cost = 20 × ₹ 900 = **₹ 18,000.**

- (iv) **Annual Holding Cost**=

$[(1/2 \times \text{Ordering Quantity}) + \text{Safety Stock}] \times \text{Holding Cost per litre per annum}$

= $[(1/2 \times 6,000 \text{ litres}) + 2,500 \text{ litres}] \times ₹ 6 = ₹ 33,000$

Illustration 51

ZEE is a product manufactured out of three raw materials: M, N and Q. Each unit of ZEE requires 10 kg, 8 kg and 6 kg of M, N and Q respectively. The re-order levels of M and N are 15,000 kg and 10,000 kg respectively while the minimum level of Q is 2,500 kg. the weekly production of ZEE varies from 300 to 500 units, while the weekly average production is 400 units.

You are required to compute :

- (i) the Minimum Stock Level of M; (ii) the Maximum Stock Level of N; (iii) the Re-order level of Q.

The following additional data are given :

	M	N	Q
Re-order quantity (in kg)	20,000	15,000	20,000
Delivery (in weeks)			
Minimum	2	4	3
Average	3	5	4
Maximum	4	6	5

[I.C.W.A. (Stage - I) - Adapted]

3.68 Accounting for Materials

Solution

(i) **Minimum Stock Level of M**

$$\begin{aligned}\text{Minimum Stock Level} &= \text{Re-order Level} - (\text{Average Consumption} \times \text{Average Lead Time}) \\ &= 15,000 \text{ kg} - [(400 \text{ units} \times 10 \text{ kg}) \times 3] \\ &= 15,000 - 12,000 \text{ kg} = \mathbf{3,000 \text{ kg}}\end{aligned}$$

(ii) **Maximum Stock Level of N**

$$\begin{aligned}\text{Maximum Stock Level} &= \text{Re-order Level} - (\text{Minimum Consumption} \times \text{Minimum Lead Time}) \\ &\quad + \text{Re-order Quantity} \\ &= 10,000 \text{ kg} - [(300 \text{ units} \times 8 \text{ kg}) \times 4] + 15,000 \text{ kg} \\ &= 10,000 \text{ kg} - 9,600 \text{ kg} + 15,000 \text{ kg} = \mathbf{15,400 \text{ kg}}\end{aligned}$$

(iii) **Re-order Level of Q**

$$\begin{aligned}\text{Re-order Level} &= \text{Maximum Consumption} \times \text{Maximum Lead Time} \\ &= (500 \text{ units} \times 6 \text{ kg}) \times 5 = \mathbf{15,000 \text{ kg}}\end{aligned}$$

Illustration 52

The quarterly production of a company's product which has a steady market is 20,000 units. Each unit of a product requires 0.5 kg of raw material. The cost of placing one order for raw material is ₹ 100 and the inventory carrying cost is ₹ 2 per annum. The lead time for procurement of raw material is 36 days and a safety stock of 1,000 kg of raw material is maintained by the company. The company has been able to negotiate the following discount structure with the raw material supplier :

Order Quantity (Kg)	Discount (₹)
Upto 6,000	NIL
6,000 – 8,000	400
8,000 – 16,000	2,000
16,000 – 30,000	3,200
30,000 – 45,000	4,000

You are required to :

- Calculate the re-order point taking 30 days in a month.
 - Prepare a statement showing the total cost of procurement and storage of raw material after considering the discount of the company elects to place one, two, four or six orders in a year.
 - State the number of orders which the company should place to minimize the costs after taking EOQ also into consideration.
- [C.A. (Inter) - Adapted]*

Solution

- (i) **Re-order Point (Level)** = Safety Stock + [Normal Consumption per day × Normal Lead Time in days]
= 1,000 kg + [(40,000 / 360) (Note 1) × 36 days] (Note 2)
= 1,000 kg + 4,000 kg = **5,000 kg**

Statement Showing the Total Cost of Procurement and Storage of Raw Materials

	1	2	4	6
(a) Number of Orders				
(b) Quantity Ordered (Kg)	40,000	20,000	10,000	6,666.66
(c) Average Stock (Kg)	20,000	10,000	5,000	3,333.33
(d) Total Procurement Cost (₹) (a × ₹ 100)	100	200	400	600
(e) Inventory Carrying Cost (₹) (c × ₹ 2)	40,000	20,000	10,000	6,667
Total Cost (d + e) (Note 3) (₹)	40,100	20,200	10,400	7,267
Less: Discount (₹)	(4,000)	(3,200)	(2,000)	(400)
Net Total Cost (₹)	36,100	17,000	8,400	6,867

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2AO}{H}}$$

where,

A = Annual Demand = 40,000 kg

O = Ordering Cost = ₹ 100 per order

H = Inventory Carrying Cost = ₹ 2 per annum

$$\text{EOQ} = \sqrt{\frac{2 \times 40,000 \times 100}{2}} = 2,000 \text{ kg}$$

$$\text{Number of Orders} = \frac{A}{\text{EOQ}} = \frac{40,000}{2,000} = 20 \text{ Orders}$$

$$\begin{aligned} \text{Total Minimum Cost of Procurement and Carrying p.a.} &= \sqrt{2 \times A \times O \times H} \\ &= \sqrt{2 \times 40,000 \times 100 \times 2} \\ &= ₹ 4,000* \end{aligned}$$

Alternatively, the total cost of procurement and carrying per annum can be calculated as follows :

(i) Ordering (Procurement) Cost = 20 × ₹ 100	2,000
(ii) Carrying Cost (1/2 × 2,000 × ₹ 2)	*2,000
	<u>4,000</u>

* Excluding inventory carrying cost for 1,000 kg safety stock. If it is included, ₹ 2,000 will be added with each figure.

Working Notes :

- (1) (a) Production per quarter = 20,000 units
Production per annum = 4 × 20,000 units = 80,000 units
- (b) Raw materials required per annum = 80,000 × 0.5 kg = **40,000 kg.**
- (c) Number of days in a year = 30 × 12 months = **360 days.**
- (2) (a) Usage of raw material is steady. Therefore, maximum usage and minimum usage are same.
- (b) Lead period is constant. Therefore, maximum and minimum lead period are also same.
- (3) Inventory carrying cost for 1,000 kg safety stock has not been included. If it is included, ₹ 2,000 will be added with each figure.

Illustration 53

A company uses three raw materials A, B and C for a particular product for which the following data applies :

Raw Material	Usage per unit of Product (Kg)	Re-order Quantity (Kg)	Price per Kg ₹	Delivery period (in weeks)			Re-order Level (Kg)	Minimum Level (Kg)
				Minimum	Average	Maximum		
A	10	10,000	0.10	1	2	3	8,000	?
B	4	5,000	0.30	3	4	5	4,750	?
C	6	10,000	0.15	2	3	4	?	2,000

Weekly production varies from 175 to 225 units, averaging 200 units of the said product. What would be the following quantities :

- (i) Minimum Stock of A
- (ii) Maximum Stock of B
- (iii) Re-order Level of C
- (iv) Average Stock Level of A

3.70 Accounting for Materials

Solution

(i) **Minimum Stock of A**

$$\begin{aligned}\text{Minimum Stock Level} &= \text{Re-order Level} - (\text{Average Consumption} \times \text{Average Lead Period}) \\ &= 8,000 \text{ kg} - [(200 \times 10 \text{ kg}) \times 2] = \mathbf{4,000 \text{ kg}}\end{aligned}$$

(ii) **Maximum Stock of B**

$$\begin{aligned}\text{Maximum Stock Level} &= \text{Re-order Level} - (\text{Minimum Consumption} \times \text{Minimum Lead Period}) \\ &\quad + \text{Re-order Quantity} \\ &= 4,750 \text{ kg} - [(175 \times 4 \text{ kg}) \times 3] + 5,000 \text{ kg} \\ &= 4,750 \text{ kg} - 2,100 \text{ kg} + 5,000 \text{ kg} = \mathbf{7,650 \text{ kg}}\end{aligned}$$

(iii) **Re-order Level of C**

$$\begin{aligned}\text{Re-order Level} &= \text{Maximum Consumption} \times \text{Maximum Lead Period} \\ &= (225 \times 6 \text{ kg}) \times 4 \\ &= 1,350 \text{ kg} \times 4 \\ &= \mathbf{5,400 \text{ kg}}\end{aligned}$$

Alternatively,

$$\begin{aligned}\text{Re-order Level} &= \text{Minimum Stock} + (\text{Average Consumption} \times \text{Average Lead Period}) \\ &= 2,000 \text{ kg} + [(200 \times 6) \times 3] \\ &= 2,000 \text{ kg} + 3,600 \text{ kg} \\ &= \mathbf{5,600 \text{ kg}}\end{aligned}$$

(iv) **Average Stock Level of A**

$$\begin{aligned}\text{Average Stock Level} &= \text{Minimum Stock Level} + \frac{1}{2} \text{ of Re-ordering Quantity} \\ &= 4,000 \text{ kg (see above)} + (\frac{1}{2} \text{ of } 10,000 \text{ kg}) \\ &= \mathbf{9,000 \text{ kg}}\end{aligned}$$

Alternatively,

$$\begin{aligned}\text{Average Stock Level} &= \frac{\text{Maximum Level} + \text{Minimum Level}}{2} \\ &= \frac{16,250 \text{ kg (Note 1)} + 4,000 \text{ kg (See above)}}{2} \\ &= \mathbf{10,125 \text{ kg}}\end{aligned}$$

Working Note :

(1) **Maximum Stock Level of A** = Re-order Level – (Minimum Consumption × Minimum Lead Period)
+ Re-order Quantity
= 8,000 kg – [(175 × 10) × 1] + 10,000 kg
= **16,250 kg**

Section III : Issuing Materials

Materials Requisition

Materials are purchased and stored for the purpose of issuing in future. No material is issued from storeroom without a written 'form' / 'slip' called '**Materials Requisition**' / '**Stores Requisition**'. It is a written order to the storekeeper to issue required quantity of specified materials or supplies to the place / department designated or to deliver the materials to the person presenting an authorised requisition. Materials requisition is generally prepared by the foreman, a group leader, an authorised employee of production / planning department. The materials / stores requisition indicates the description of material, code number, the job number to which it is to be charged. (In the case of indirect material, the department's name is given to which it is to be charged.); the quantity and the place of delivery.

After receiving duly authorised materials / stores requisition, the storekeeper issues the materials to the workshop or other departments and makes the necessary entry in the '**Issue column**' of the stores ledger.

Each of the items of material requisition are priced according to the method of pricing followed for the issue of materials (e.g., FIFO, Weighted Average, etc.). It is to be noted that in a computerised environment, all these are done through appropriate software.

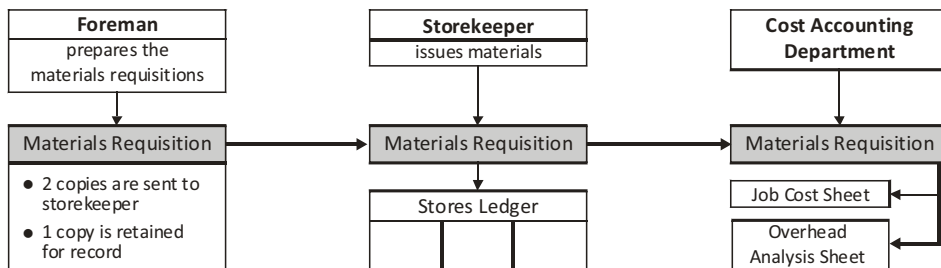
The specimen of a Material / Stores Requisition is given below :

Materials Requisition				
Delivered to : Machine Dept.			No. 92	
Charged to : Job No. 109			Date : 19 January, 2018	
Code No.	Description	Quantity	Rate (₹)	Total Amount (₹)
IR/109	3/4" Copper Pipe	20 M		
Delivered by :		Received by :		Approved by :

Materials Requisition is prepared in **triplicate**. Original and 1st copy goes to storekeeper. The last copy is retained by the issuer for record. After issuing the materials, the storekeeper retains the duplicate copy for his record and original copy is sent to stores clerk for filling-in the cost per unit column and total cost column. The stores clerk enters the necessary information in the stores ledger.

After making entry in the stores ledger, the original materials requisition is sent to costing department for making necessary entry in the job order card or on the overhead analysis sheet.

The following diagram will show the flow of 'Materials Requisition' related to issue of materials.



[Fig. 3.9]

Bill of Materials

Generally, a separate material requisition is prepared for each issue of material as well as for each kind of material. This process of issue is time consuming but simple. Some organisations, especially, assembly type organisations, prepare a master list of materials required for a product or job. This master list of materials is called Bill of Materials. Using CIMA terminology, a bill of materials is a '*specialisation of the materials and parts required to make a product.*'

The bill of materials is master requisition to be used by the store-keeper as a blanket authorisation to issue materials as listed on this bill of materials. This is very useful, where production methods are standardised and all the materials can be delivered as a single issue to the production department. In many cases, pre-printed bill of materials is used to promote efficiency and accuracy.

In some cases, the bill of materials is prepared in such a way that store-keeper are instructed to deliver materials according to the need of the production department.

Bill of materials is prepared to the Planning Department on the basis of orders received. It is usually prepared in quadruples. Copies are sent to the following departments :

- (a) Stores department;
- (b) Cost Accounts department;
- (c) Production Control department.

The proforma of a Bill of Materials is given below :

Bill of Materials							
Purchase Order No. : M/CHOC/201					No. 94		
Deoartmnent Authorised :					Date : 19 January, 2018		
Sl. No.	Code No.	Description	Qty.	Date of Issue and Qty. Issued		Rate ₹	Amount ₹
				Date	Quantity		
Approved by :		Received by :		Delivered by :			

Advantages of Using Bill of Materials are the following :

1. It helps to save time through eliminating the necessity of writing individual materials requisition for each item.
2. It acts as a blanket authorisation to issue materials by the store-keeper.
3. The job of the stores personnel is reduced as the entire materials are issued at a time.
4. It facilitates the calculation of cost of the product / job.
5. It helps the stores department to arrange materials in advance. It also provides advance intimation to all concerned.
6. It helps to control the usage of materials as standard quantities are only issued to users.

Limitations :

1. Bill of materials can not be used when production process is not standardised.
2. Bill of materials is rather a slow medium for posting into stores ledger.
3. Bill of materials is not suitable when products are produced in different quantities and in different models.

Pricing the Issues of Materials

The cost of each individual item of material is calculated by the stores department on the basis of documents received (e.g., invoice, transporter's bill, purchase order and other supporting documents). Each receipt increases the balance on hand and the new balance is calculated.

Materials are purchased on regular basis at different prices. A difficulty that arises with material issues is the assignment of rate with each issue. *For example*, one material AX-105 has been purchased during the month of November at the following rates (after considering incidental expenses) :

- On 5.11.2017 : 200 units @ ₹ 500 per unit
- On 10.11.2017 : 100 units @ ₹ 520 per unit
- On 25.11.2017 : 300 units @ ₹ 490 per unit
- On 26.11.2017 : 200 units were issued for Batch No. 50/10.

In this case, what price should be assigned for the issue of 200 units ? It can be issued @ ₹ 500 per unit or ₹ 490 per unit or at any other rate.

There are *many* methods of pricing the issue of materials. These are :

1. FIFO (First in, First out);
2. LIFO (Last in, First out);
3. Simple Average;
4. Weighted Average;
5. Specific Identification;
6. Base Stock;
7. Periodic Simple Average;
8. Periodic Weighted Average;
9. Standard Price; and
10. Replacement Cost.

Factors for Selecting a Particular Method

The following factors are to be taken into consideration for selecting a method of pricing issues :

1. **Nature of the material** : If the material is homogeneous in nature, 'specific identification' method is not suitable. In such a situation, FIFO or Weighted Average method is suitable.
2. **Cost of material per unit** : If the cost per unit is high, the FIFO method is suitable.
3. **Fluctuation in the market price and its range** : If fluctuation in the price is very wide, the weighted average method (perpetual) is very much suitable.
4. **Nature of contract with the suppliers** : If the contract for supply of material at fixed rate is for a long period, any method can be adopted (excepting specific identification method).
5. **Frequency of purchase** : If materials are purchased very frequently, the weighted average method (perpetual) is very much suitable.
6. **The policy of the management** : If the management want to value closing stock at current market prices, the FIFO method is very much suitable.
7. **Volume of material purchased in one order** : If the lot size is large and easily identifiable, the FIFO method or weighted average method is suitable.
8. **Change in accounting policy of the company** : If the management decides to change the accounting policy of the company to accommodate the change in the nature of the business.
9. **The applicability of Indian Accounting Standard – 2** : If AS-2 : **Valuation of Inventories** is applicable, then any one of the *three* methods (i) specific identification method; (ii) FIFO method; or (iii) weighted average method is suitable. It is to be noted that in such a situation LIFO method cannot be adopted.
10. **Chances of obsolescence** : If there is high chance of obsolescence because of technological change, FIFO method is the most suitable method of pricing the issue.

3.74 Accounting for Materials

1. FIFO (First in, First out) Method

Under this method of pricing issues, materials are issued at actual cost. This method assumes that items **received first** are the **first to be issued** and the issue price will be the cost at which these items were placed in stock. **Taking the example of AX-105 (page 3.73)**, the issue price of 200 units on 26.11.2017 will be @ ₹ 500 (the rate of first purchase). The value of issue will be $(200 \times ₹ 500) = ₹ 1,00,000$. In this method materials are issued in strict chronological order.

Advantages of FIFO Method

The following are claimed to be the advantages of FIFO method :

1. It is very simple to operate, particularly when frequency of purchase is less.
2. The materials are issued in a logical and systematic manner. It ensures that materials are issued at **actual cost**.
3. The value of closing stock will be at par with **current market price**.
4. This method facilitates the identification of cost with physical units.
5. No profit or loss arises by using this method as materials are issued at actual cost and not at estimated cost or standard cost.
6. It is an accepted method of valuation of inventories as per **AS-2 : Valuation of Inventories**.

Limitations

The limitations of FIFO method are the following :

1. The operation of this method may not remain simple, if the purchases are frequent and price is fluctuating widely.
2. At the time of rising prices, this method may lead to disclose **higher profit** as cost of goods sold will be less (because of old price).
3. This method will not work properly when materials of different rates are received on the same date.
4. The cost of consecutive similar jobs may vary widely, simply because the previous job was charged with lower rate of material.
5. When materials are purchased in small quantities and issued at large quantities, at the time of issue more than one prices have to be adopted.

Illustration 54

Record the following transactions in the Stores Ledger Account using FIFO method of pricing issues :

2017

March	1	Balance in hand	3,000 units @ ₹ 20 each
	2	Purchased	2,000 units @ ₹ 22 each
	3	Issued	1,500 units
	5	Purchased	2,000 units @ ₹ 23 each
	10	Issued	1,500 units
	15	Issued	2,000 units
	20	Purchased	2,000 units @ ₹ 24 each
	31	Issued	1,500 units

Solution**Stores Ledger Account
[FIFO]**

Code No

Maximum Level:

Folio:

Description of Material:

Minimum Level:

Location:

Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2017												
Mar. 1									3,000	20	60,000	Op. stock
2		2,000	22	44,000					3,000	20	60,000	
									2,000	22	44,000	
									5,000		1,04,500	
3						1,500	20	30,000	1,500	20	30,000	
									2,000	22	44,000	
									3,500		74,000	
5		2,000	23	46,000					1,500	20	30,000	
									2,000	22	44,000	
									2,000	23	46,000	
									5,500		1,20,000	
10						1,500	20	30,000	2,000	22	44,000	
									2,000	23	46,000	
									4,000		90,000	
15						2,000	22	44,000	2,000	23	46,000	
20		2,000	24	48,000					2,000	23	46,000	
									2,000	24	48,000	
									4,000		94,000	
31						1,500	23	34,500	500	23	11,500	
									2,000	24	48,000	
									2,500		59,500	Cl. stock

Shortage of Material

In many cases the **physical** quantity may not tally with the **bin card** quantity. The discrepancy may be detected any time. As and when it is detected it must be adjusted in the **bin card** and in the **Stores Ledger Account**. In the bin card, it will be recorded by reducing the balance of the material. Generally, it is recorded with red ink.

In the Stores Ledger Account, it is recorded as an **issue** (following the method of pricing issues) and balance column is reduced to equal the verified count. The value of the shortage of materials may be debited to Materials Adjustment Account and credited to Materials Control Account. The Materials Adjustment Account is ultimately transferred to Manufacturing Overhead Account at the end of the period.

Surplus of Material

In rare case, the physical quantity may be more than the balance shown in the bin card and in the Stores Ledger Account. This surplus is also to be adjusted by making an entry in the bin card and in the receipts column of the stores ledger. The rate for this entry will be as per **last purchase rate**. The balance column being increased to agree with the actual count.

The surplus is debited to Materials Control Account and credited to Materials Adjustment Account. Materials Adjustment Account balance is transferred to Manufacturing Overhead Account at the end of the period.

3.76 Accounting for Materials

Illustration 55

From the following information write up a Stores Leder Account using FIFO method :

2017

January 1	Opening Balance 24,000 kg @ ₹ 7.50 per kg	13	Issued 24,000 kg
2	Purchased 44,000 kg. @ ₹ 7.60 per kg	18	Issued 25,000 kg
3	Issued 10,000 kg.	22	Purchased 50,000 kg. @ ₹ 8.00 per kg
5	Issued 16,000 kg	28	Issued 20,000 kg
12	Purchased 10,000 kg. @ ₹ 7.80 per kg	31	Issued 22,000 kg

On 24th January, 2017 a shortage of 200 kg was noticed in stock-taking.

Solution

Stores Ledger Account [FIFO]

Code No					Maximum Level:				Folio:			
					Minimum Level:				Location:			
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Kg)	Rate (₹)	Amount (₹)	MRN	Quantity (Kg)	Rate (₹)	Amount (₹)	Quantity (Kg)	Rate (₹)	Amount (₹)	
2017 Jan. 1									24,000	7.5	1,80,000	Op. stock
2		44,000	7.6	3,34,400					24,000	7.5	1,80,000	
									44,000	7.6	3,34,400	
									68,000		5,14,400	
3						10,000	7.5	75,000	14,000	7.5	1,05,000	
									44,000	7.6	3,34,400	
									58,000		4,39,400	
5						14,000	7.5	1,05,000				
						2,000	7.6	15,200	42,000	7.6	3,19,200	
						16,000		1,20,200				
12		10,000	7.8	78,000					42,000	7.6	3,19,200	
									10,000	7.8	78,000	
									52,000		3,97,200	
13						24,000	7.6	1,82,400	18,000	7.6	1,36,800	
									10,000	7.8	78,000	
									28,000		2,14,800	
18						18,000	7.6	1,36,800				
						7,000	7.8	54,600	3,000	7.8	23,400	
						25,000		1,91,400				
22		50,000	8	4,00,000					3,000	7.8	23,400	
									50,000	8.0	4,00,000	
									53,000		4,23,400	
24						*200	7.8	1,560	2,800	7.8	21,840	*Shortage
									50,000	8.0	4,00,000	
									52,800		4,21,840	
28						2,800	7.8	21,840				
						17,200	8.0	1,37,600	32,800	8.0	2,62,400	
						20,000		1,59,440				
31						22,000	8.0	1,76,000	10,800	8.0	86,400	Cl. stock

2. LIFO (Last in, First out) Method

Under this method of pricing issues, materials are also issued at actual cost. This method assumes that ***last items purchased*** are the ***first to be issued*** and the issue price will be the cost at which these items were placed in stock. The balance on hand being priced at the cost of the earliest purchases.

For example, one material AS-105 has been purchased during the month of November at the following rates (after considering incidental charges) :

On 5.11.2017 : 200 units @ ₹ 500

On 10.11.2017 : 100 units @ ₹ 520

On 25.11.2017 : 300 units @ ₹ 490

On 26.11.2017 : 200 units were issued for Batch No. 50/17

Under LIFO method, on 26.11.2017, 200 units will be issued @ ₹ 490 (the last purchase price). The amount of issue will be $200 \times ₹ 490 = ₹ 98,000$.

Stores records are kept in the similar way as we do in case of FIFO method. The point to remember is that materials are issued at a price of ***most recent purchase***.

Advantages of LIFO Method

The following are claimed to be the advantages of LIFO method :

1. It is very simple to operate like FIFO method. It is very convenient when number of purchase orders are less.
2. The materials issued in a logical and systematic manner. It ensures that materials are issued at ***actual cost***.
3. At the time of rising prices, the most recent purchases are charged to products / operations.

Limitations of LIFO Method

The following are the limitations of LIFO method :

1. Like FIFO method, operation of this method may become difficult if the number of purchases are frequent and price is fluctuating widely.
2. ***AS-2 : 'Valuation of Inventories'*** does not support this method of stock valuation.
3. At the time of falling prices, the materials cost charged to products will be less and the higher unrealised profit will be shown in the account.
4. Like FIFO method, the cost of consecutive similar jobs may vary widely simply because the previous job was charged with higher rate of materials.
5. When materials are purchased in small quantities and issued at large quantities, at the time of issue, more than one price have to be adopted.
6. This method is inconsistent with physical movement of goods and its price. In almost all industries, goods move physically on FIFO basis.
7. The closing stock does not represent ***current*** market price. There may be oldest price stock. At the time of falling prices, value of stock is to be written down as the market price is lower than cost price.

3.78 Accounting for Materials

Illustration 56

Prepare Stores Ledger Account taking information of *Illustration 54*. Use LIFO method of pricing issues.

Solution

Stores Ledger Account

[LIFO]

Code No					Maximum Level:					Folio:		
					Minimum Level:					Location:		
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2010												
Mar. 1									3,000	20	60,000	Op.Stock
2		2,000	22	44,000					3,000	20	60,000	
									2,000	22	44,000	
									5,000		1,04,000	
3						1,500	22	33,000	3,000	20	60,000	
									500	22	11,000	
									3,500		71,000	
5		2,000	23	46,000					3,000	20	60,000	
									500	22	11,000	
									2,000	23	46,000	
									5,500		1,17,000	
10						1,500	23	34,500	3,000	20	60,000	
									500	22	11,000	
									500	23	11,500	
									4,000		82,500	
15						500	23	11,500				
						500	22	11,000				
						1,000	20	20,000	2,000	20	40,000	
						2,000		42,500				
20		2,000	24	48,000					2,000	20	40,000	
									2,000	24	48,000	
									4,000		88,000	
									2,000	20	40,000	
31						1,500	24	36,000	500	24	12,000	
									2,500		52,000	Cl. Stock

Illustration 57

From the following information, prepare Stores Ledger Account as per LIFO and FIFO methods :

Jan. 1, 2003	Received	1,000 units	@ ₹ 1 per unit
Jan. 10, 2003	Received	260 units	@ ₹ 1.05 per unit
Jan. 20, 2003	Issued	700 units	
Jan. 21, 2003	Received	400 units	@ ₹ 1.15 per unit
Jan. 22, 2003	Received	300 units	@ ₹ 1.25 per unit
Jan. 23, 2003	Issued	620 units	
Jan. 24, 2003	Issued	240 units	
Jan. 25, 2003	Received	500 units	@ ₹ 1.10 per unit
Jan. 26, 2003	Issued	380 units	

[D.U.B.Com. (Hons.), 2005]

Solution

**Stores Ledger Account
[LIFO]**

Code No Maximum Level: Folio:
Minimum Level: Location:
Description of Material: Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2003												
Jan. 1		1,000	1.00	1,000					1,000	1.00	1,000	
10		260	1.05	273					1,000	1.00	1,000	
									260	1.05	273	
									1,260		1,273	
20						260	1.05	273				
						440	1.00	440	560	1.00	560	
						700		713				
21		400	1.15	460					560	1.00	560	
									400	1.15	460	
									960		1,020	
22		300	1.25	375					560	1.00	560	
									400	1.15	460	
									300	1.25	375	
									1,260		1,395	
23						300	1.25	375	560	1.00	560	
						320	1.15	368	80	1.15	92	
						620		743	640		652	
24						80	1.15	92				
						160	1.00	160	400	1.00	400	
						240		252				
25		500	1.10	550					400	1.00	400	
									500	1.10	550	
									900		950	
26						380	1.10	418	400	1.00	400	
									120	1.10	132	
									520		532	Cl. Stock

**Stores Ledger Account
[FIFO]**

Code No Maximum Level: Folio:
Minimum Level: Location:
Description of Material: Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2003												
Jan. 1		1,000	1.00	1,000					1,000	1.00	1,000	
10		260	1.05	273					1,000	1.00	1,000	
									260	1.05	273	
									1,260		1,273	

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20					700	1.00	700	300	1.00	300	
								260	1.05	273	
								560		573	
21	400	1.15	460					300	1.00	300	
								260	1.05	273	
								400	1.15	460	
								960		1033	
22	300	1.25	375					300	1.00	300	
								260	1.05	273	
								400	4.15	460	
								300	1.25	375	
								1,260		1,408	
23					300	1.00	300	340	1.15	391	
					260	1.05	273	300	1.25	375	
					60	1.15	69				
					620		642	640		766	
24					240	1.15	276	100	1.15	115	
								300	1.25	375	
								400		490	
25	500	1.10	550					100	1.15	115	
								300	1.25	375	
								500	1.10	550	
								900		1,040	
26					100	1.15	115	20	1.25	25	
					280	1.25	350	500	1.10	550	
					380		465	520		575	Cl. Stock

Illustration 58

From the following information prepare Stores Ledger Card under LIFO and FIFO system. Calculate the value of Closing Stock under both the systems.

Jan. 1	Opening Stock	200 pieces @ ₹ 2.00 each	22	Issue	150 pieces
5	Purchases	100 pieces @ ₹ 2.20 each	25	Issue	100 pieces
10	Purchases	150 pieces @ ₹ 2.40 each	27	Issue	100 pieces
20	Purchases	120 pieces @ ₹ 2.50 each	28	Issue	200 pieces

[D.U.B.Com. (Hons.), 2006]

Solution

Stores Ledger Account [LIFO]

Code No

Maximum Level:

Folio:

Description of Material:

Minimum Level:

Location:

Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Pcs.)	Rate (₹)	Amount (₹)	MRN	Quantity (Pcs.)	Rate (₹)	Amount (₹)	Quantity (Pcs.)	Rate (₹)	Amount (₹)	
2006												
Jan. 1									200	2.00	400	Op.stock
5		100	2.20	220					200	2.00	400	
									100	2.20	220	
									300		620	
									200	2.00	400	
10		150	2.40	360					100	2.20	220	
									150	2.40	360	
									450		980	

20		120	2.50	300				200	2.00	400	
								100	2.20	220	
								150	2.40	360	
								120	2.50	300	
								570		1,280	
22					120	2.50	300	200	2.00	400	
					30	2.40	72	100	2.20	220	
								120	2.40	288	
					150		372	420		908	
25					100	2.40	240	200	2.00	400	
								100	2.20	220	
								20	2.40	48	
								320		668	
27					20	2.40	48	200	2.00	400	
					80	2.20	176	20	2.20	44	
					100		224	220		444	
28					20	2.20	44				
					180	2.00	360	20	2.00	40	Cl. Stock
					200		404				

**Stores Ledger Account
[FIFO]**

Code No Maximum Level: Folio:
 Description of Material: Minimum Level: Location:
 Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Pcs.)	Rate (₹)	Amount (₹)	MRN	Quantity (Pcs.)	Rate (₹)	Amount (₹)	Quantity (Pcs.)	Rate (₹)	Amount (₹)	
2006	Jan. 1 5	100	2.20	220					200	2.00	400	Op. stock
									200	2.00	400	
									100	2.20	220	
									300		620	
10	150	2.40	360					200	2.00	400		
								100	2.20	220		
								150	2.40	360		
								450		980		
20	120	2.50	300					200	2.00	400		
								100	2.20	220		
								150	2.40	360		
								120	2.50	300		
22								570		1,280		
								50	2.00	100		
								100	2.20	220		
								150	2.40	360		
								120	2.50	300		
								420		980		
25								50	2.00	100		
								50	2.20	110		
								120	2.50	300		
					100		210	320		770		

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27					50	2.20	110	100	2.40	240	
					50	2.40	360	120	2.20	300	
					100		470	220		540	
28					100	2.40	240				
					100	2.50	250	20	2.50	50	Cl. Stock
					200		490				

Illustration 59

From the following receipts and issues of materials during the month of January, 2018 prepare Stores Ledger Account according to LIFO method :

2018

- Jan. 2 Received 500 units @ ₹ 10 per unit
5 Received 250 units @ ₹ 11 per unit.
8 Issued 300 units
10 Received 400 units @ ₹ 12 per unit.
13 Issued 250 units.
20 Received 100 units @ ₹ 11 per unit.
28 Issued 400 units.

On 1st January, 2010 stock in hand was 200 units valued @ ₹ 9 per unit.

[D.U.B.Com. (Hons.), Adapted]

Solution

Stores Ledger Account [LIFO]

Code No					Maximum Level:					Folio:		
					Minimum Level:					Location:		
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2018	Jan. 1 1 5 8 10 13	500	10	5,000					200	9	1,800	Op. Stock
									200	9	1,800	
									500	10	5,000	
									700		6,800	
		250	11	2,750			200	9	1,800			
						500	10	5,000				
						250	11	2,750				
						950		9,550				
		250 50 300	11 10	2,750 500 3,250		200	9	1,800				
						450	10	4,500				
						650		6,300				
		400	12	4,800						200	9	
	450				10					4,500		
	400				12					4,800		
	1,050									11,100		
	250	12	3,000					200	9	1,800		
								450	10	4,500		
								450	12	1800		
								800		8,100		

20		100	11	1,100					200	9	1,800	
									450	10	4,500	
									150	12	1,800	
									100	11	1,100	
									960		9,200	
28					100	11	1,100		200	9	1,800	
					150	12	1,800		300	10	3,000	
					150	10	1,500					
					400		4,400		500		4,800	Cl. Stock

3. Simple Average Method

Under this method, rate for issue of material is calculated by taking into consideration *all* the rates of material physically in hand. That rate is used for issuing materials unless there is any new purchase or any material (whose rate was considered for calculating average rate) has been exhausted. After every purchase a new rate is calculated. All rates of material are taken into consideration *ignoring the quantity of material in stock*. This method is suitable where materials are purchased in uniform lot quantities.

Advantages of this method are :

1. It is very simple to operate.
2. All the rates are taken into consideration for calculating the average rate of issue. Therefore, material cost of two consecutive jobs will not vary widely.

Disadvantages of this method are :

1. Materials are not charged at actual cost. Therefore, true profit cannot be ascertained.
2. *AS-2 : 'Valuation of Inventories'* does not support this method of stock valuation.
3. Materials are not issued at *actual cost*.
4. Inclusion of high price material in the process of averaging, may lead to absurd value of stock in hand.

For example, 100 units were there in stock at the beginning of January @ ₹ 60 each. On 10th January, 1,000 units were purchased @ ₹ 40 each. On 25th January, 950 units were issued by using simple average method. In this case, the closing will show a *negative value* which is not correct.

Calculation has been shown as follows :

Opening balance : 1st January	100 units @ ₹ 60 each	6,000
Purchases 10th January	1,000 units @ ₹ 40 each	40,000
	<u>1,100</u>	<u>46,000</u>

Issue : 25th January 950 units @ ₹ 50 $(60 + 40 / 2) = 47,500$. In the stock there are 150 units but value is $(₹ 46,000 - ₹ 47,500) = (-) ₹ 1,500$.

Illustration 60

The following transactions took place in respect of an item of material :

Date	Receipts (Unit)	Rates (₹)	Issue (Unit)
2.3.2001	200	2.00	—
10.3.2001	300	2.40	—
15.3.2001	—	—	250
18.3.2001	250	2.60	—
20.3.2001	—	—	200

Record the above transactions in the stores ledger, pricing the issues at simple average rate.

[D.U.B.Com. (Hons.), 2003]

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Solution

Stores Ledger Account [Simple Average]

Code No					Maximum Level:				Folio:			
					Minimum Level:				Location:			
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2001												
Mar. 2		200	2.00	400					200	2.00	400	
10		300	2.40	720					200	2.00	400	
									300	2.40	720	
									500		1,120	
15						250	2.20	550	250		570	
18		250	2.60	650					500		1,220	
20						200	2.50	500	300		720	Cl. Stock

Working Notes :

Calculation of Rate of Issue

- (i) Issue of 15 March : $[(₹ 2.00 + ₹ 2.40) / 2] = ₹ 2.20$
(ii) Issue of 20 March $[(₹ 2.40 + ₹ 2.60) / 2] = ₹ 2.50$. In this case, it is to be noted that the rate of ₹ 2.00 has not been taken into consideration as physically there is no material in hand at the time of issue.

Illustration 61

The following transactions took place in respect of Material 'MP-6' in the store of a manufacturing company in the month of November, 2001 :

Opening stock : 400 units @ ₹ 15 per unit.

Purchased on 11.11.2001 : 8,000 units @ ₹ 10 per unit.

Issued on 19.11.2001 – 7,800 units.

The company follows 'Simple Average Method' for pricing material issues. What is the value of closing stock of materials on 19.11.2001 ?

[C.U.B.Com. (Hons.) – 2002]

Solution

Stores Ledger Account [Simple Average]

Code No				Maximum Level:				Folio:				
				Minimum Level:				Location:				
Description of Material:				Re-order Level								
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2001												
Nov. 1									400	15	6,000	Op. Stock
11		8,000	10	80,000					400	15	6,000	
									8,000	10	80,000	
									8,400		86,000	
19						7,800	12.50	97,500	600		(11,500)	

The value of closing stock = (–) ₹ 11,500.

4. Weighted Average Method

Under this method, the average rate for issuing material is calculated by taking into consideration the **total value and total quantity in hand**. Every time a receipt is entered in the Stores Ledger Account, a new average cost is calculated. This method is widely used in practice particularly by those organisations which desire to spread total costs evenly over all the materials in hand.

To calculate the weighted average rate, the procedure is :

- A. **Add** quantity purchased to quantity in hand.
- B. **Add** value of materials purchased to value of materials in hand.
- C. **Divide** B by A to get weighted average rate.

This weighted average rate is used to value the next issue to production and also closing stock. A new weighted average rate is calculated when new purchases are received.

Advantages of Weighted Average Method

The following are claimed to be the advantages of Weighted Average Method :

1. This method is very suitable when price fluctuation is very wide. **For example**, in case of agricultural products, price is very low at the time of harvesting but after 4/5 months price is very high.
2. This method facilitates the spreading of total cost (high / low) evenly over all materials in hand.
3. This is an acceptable method for valuing inventory under **AS-2 : 'Inventory Valuation'**.
4. The cost of two consecutive batches / jobs will not vary. Therefore, the pricing of product will be easier and consistent.

Disadvantages of Weighted Average Method

The following are claimed to be the disadvantages of Weighted Average Method :

1. Calculation of weighted average rate is tedious.
2. The rate for issue of material may not reflect the current market price of the material, which may lead to under-costing or over-costing of batches or jobs.
3. The value of closing stock may not reflect the current market price.

Illustration 62

Prepare Stores Ledger from the following using weighted average method of pricing :

1.2.2017 Opening stock 200 units costing ₹ 2,000.

Receipts				Issues	
3.2.2017	300 units @ ₹ 12 per unit			2.2.2017	100 units
5.2.2017	100 units @ ₹ 16 per unit			4.2.2017	200 units
8.2.2017	200 units @ ₹ 13 per unit			7.2.2017	200 units
				9.2.2017	100 units

[D.U.B.Com. (Hons.) – Adapted]

Solution

Stores Ledger Account [Weighted Average]

Code No					Maximum Level:				Folio:			
					Minimum Level:				Location:			
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2017												
Feb. 1									200	10	2,000	Op. Stock
2						100	10	1,000	100	10	1,000	

3.86 Accounting for Materials

3		300	12	3,600					400	11.8	4,600	
4						200	11.5	2,300	200	11.5	2,300	
5		100	16	1,600					300	13	3,900	
7						200	13	2,600	100	13	1,300	
8		200	13	2,600					300	13	3,900	
19						100	13	1,300	200	13	2,600	Cl. Stock

Illustration 63

With the help of the following information, prepare the Stores Ledger Card based on the weighted average method of pricing issues :

2010

- Sept. 1 Opening balance 24,000 kg @ ₹ 7,500 per tonne.
 1 Purchase 44,000 kg @ ₹ 7,600 per tonne.
 1 Issue 10,000 kg.
 5 Issue 16,000 kg.
 12 Issue 24,000 kg.
 13 Purchase 10,000 kg @ ₹ 7,800 per tonne.
 18 Issue 24,000 kg.
 22 Purchase 50,000 kg. @ ₹ 8,000 per tonne.
 28 Issue 30,000 kg.
 30 Issue 22,000 kg.

[I.C.W.A. (Inter) – Adapted]

Solution

In this problem, the price of material has been given in tonne but quantity purchased / issued in kg. Therefore, cost per kg is to be calculated first. The procedure is :

$$\text{Average Price per kg.} = \frac{\text{Cost per tonne}}{1,000 \text{ kg.}}$$

For example, opening stock rate per kg. = ₹ 7,500 ÷ 1,000 kg = ₹ 7.50.

Stores Ledger Account [Weighted Average]

Code No					Maximum Level:				Folio:			
					Minimum Level:				Location:			
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Kg)	Rate (₹)	Amount (₹)	MRN	Quantity (Kg)	Rate (₹)	Amount (₹)	Quantity (Kg)	Rate (₹)	Amount (₹)	
2017												
Sept. 1									24,000	7.50	1,80,000	Op. Stock
1		44,000	7.60	3,34,400					68,000	7.56	5,14,400	
1						10,000	7.56	75,647	58,000	7.56	4,38,753	
5						16,000	7.56	1,21,035	42,000	7.56	3,17,718	
12						24,000	7.56	1,81,553	18,000	7.56	1,36,165	
13		10,000	7.8	78,000					28,000	7.65	2,14,165	
18						24,000	7.65	1,83,570	4,000	7.65	30,595	
22		50,000	8	4,00,000					54,000	7.97	4,30,595	
28						30,000	7.97	2,39,219	24,000	7.97	1,91,376	
30						22,000	7.97	1,75,428	2,000	7.97	15,948	Cl. Stock

Working Notes :

(1) Weighted average rate for September 1 issue :

Opening stock	24,000	kg and value	₹ 1,80,000
Add: Purchases	<u>44,000</u>	kg and value	<u>₹ 3,34,400</u>
	68,000		5,14,400

Cost per kg. = (₹ 5,14,400) / (68,000 kg.) = ₹ 7.56470.
 Value of issue = 10,000 kg × ₹ 7.56470 = ₹ 75,647.

(2) Weighted average rate after purchases of 13th September :

Stock in hand	18,000	kg and value	₹ 1,36,165
Add: Purchases	<u>10,000</u>	kg and value	<u>₹ 78,000</u>
	28,000		2,14,165

Average price per kg. = (₹ 2,14,165) / (28,000 kg) = ₹ 7.64875.

(3) Value of issue of 18th September :

24,000 kg × ₹ 7.64875 = ₹ 1,83,570.

(4) Weighted average rate after purchase of 22nd September :

Stock in hand	4,000	kg and value	₹ 30,595
Add: Purchases	<u>50,000</u>	kg and value	<u>₹ 4,00,000</u>
	54,000		4,30,595

Average Price per kg = (₹ 4,30,595) / (54,000 kg) = ₹ 7.97398.

5. Specific Identification Method

This method of pricing of issues are adopted where it is possible to keep the identity of the individual material in stock. At the time of issue of material, exact price is charged to job(s). Where materials are homogeneous in nature, this method is not suitable at all. However, this method can be employed effectively when non-standardised materials have to be purchased to meet a customer's specifications. The organisations which are operating on a job order basis, generally use this method of pricing issues.

Advantages of Specific Identification Method

The following are claimed to be the advantages of Specific Identification Method :

1. This method is very easy to operate when materials are not homogeneous.
2. Under this method exact cost is charged to the job / product.
3. **AS-2 : 'Valuation of Inventories'** recognise this method for valuation of stock.
4. This method is free from the effect of fluctuation in prices of the materials.

Disadvantages of Specific Identification Method

The following are claimed to be the disadvantages of Specific Identification Method :

1. This method is not suitable for homogeneous materials. **For example**, a steel manufacturing company cannot adopt this method because all the raw materials are homogeneous.
2. This method is not suitable for big organisations manufacturing standard product in high volume. **For example**, a cell phone manufacturing company which is manufacturing different models of all phones cannot adopt this method.
3. For small value items, if this method is adopted, the cost of costing will be more than the benefit derived.

6. Base Stock Method

This method is used by such organisations which always keep minimum stock / safety stock in hand. These stocks are not issued in normal situation. In emergency, it is used but filled in at the earliest opportunity. In this method, a fixed minimum stock of the material is always carried **at original cost**. The operation of this method is very similar to FIFO method. Materials are issued after retaining that minimum quantity in stock. However, other methods such LIFO and Weighted Average can also be adopted for issuing materials.

3.88 Accounting for Materials

Advantages of Base Stock Method

The following are claimed to be the advantages of Base Stock Method :

1. It is easy to operate.
2. Materials are issued at actual cost.
3. This method facilitate the identification of cost with physical unit.

Disadvantages of Base Stock Method

The following are claimed to be the disadvantages of Base Stock Method :

1. When materials are purchased in small quantities and issued at large quantities at the time of issue more than one price have to be adopted.
2. The cost of consecutive similar jobs may vary widely, simply because the previous job was charged with different rate of material.
3. Frequent purchases and wide fluctuations of price may lead to tedious calculation.

Illustration 64

Prepare Stores Ledger under three different methods from the following information related to raw material 'X'. Also calculate the cost of total issue and value of closing stock.

01.01.18	Balance	100 units @ ₹ 1.00 p.u. (Base stock) and 500 units @ ₹ 6.00 p.u.
03.01.18	Receipt	1000 units @ ₹ 5.00 p.u.
04.01.18	Issue	800 units
10.01.18	Receipt	1000 units @ ₹ 7.00 p.u.
11.01.18	Issue	900 units

[C.U.B.Com. (Hons.) – Adapted]

Solution

The following three methods have been taken into consideration :

(a) FIFO Method; (b) LIFO Method; and (c) Weighted Average Method.

Stores Ledger Account [Base Stock – FIFO]

Code No					Maximum Level:				Folio:						
					Minimum Level:				Location:						
Description of Material:					Re-order Level										
Date	Received				Issued				Balance			Remarks			
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)				
2018	1	1,000	5.00	5,000					100	1.00	100	Op. Stock			
Jan.									500	6.00	3,000				
									600		3,100				
									100	1.00	100				
									500	6.00	3,000				
									1,000	5.00	5,000				
									1,600		8,100				
									100	1.00	100				
									300	5.00	1,500		700	5.00	3,500
									800		4,500		800		3,600
	10	1,000	7.00	7,000					100	1.00	100				
									700	5.00	3,500				
									1,000	7.00	7,000				
									1,800		10,600				

11					700	5.00	3,500	100	1.00	100	
					200	7.00	1,400	800	7.00	5,600	
					900		4,900	900		5,700	Cl. Stock

(i) **Cost of total issue** = ₹ 4,500 + ₹ 4,900 = ₹ **9,400**.

(ii) **Closing Stock** = ₹ **5,700** [100 units @ ₹ 1.00 (base stock) and 800 units @ ₹ 7.00 per unit]

Stores Ledger Account
[Base Stock – LIFO]

Code No					Maximum Level:				Folio:			
					Minimum Level:				Location:			
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2018 Jan. 1									100	1.00	100	
									500	6.00	3,000	
									600		3,100	Op. Stock
3		1,000	5.00	5,000					100	1.00	100	
									500	6.00	3,000	
									1,000	5.00	5,000	
									1,600		8,100	
4						800	5.00	4,000	100	1.00	100	
									500	6.00	3,000	
									200	5.00	1,000	
									800		4,100	
10		1,000	7.00	7,000					100	1.00	100	
									500	6.00	3,000	
									200	5.00	1,000	
									1,000	7.00	7,000	
									1,800		11,100	
11						900	7.00	6,300	100	1.00	100	
									500	6.00	3,000	
									200	5.00	1,000	
									100	7.00	700	
									900		4,800	Cl. Stock

(i) **Cost of total issue** = ₹ 4,000 + ₹ 6,300 = ₹ **10,300**.

(ii) **Closing Stock** = ₹ **4,800**.

Stores Ledger Account
[Base Stock – Weighted Average]

Code No					Maximum Level:				Folio:			
					Minimum Level:				Location:			
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2008 Jan. 1									100	1.00	100	
									500	6.00	3,000	
									600		3,100	Op. Stock

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3	1,000	5.00	5,000					100	1.00	100
								1,500	5.33	8,000
								1,600		8,100
4				800	5.33	4,267		100	1.00	100
								700	5.33	3,733
								800		3,833
10	1,000	7.00	7,000					100	1.00	100
								1,700	6.31	10,733
								1,800		10,833
11				900	6.31	5,682		100	1.00	100
								800	6.31	5,051
								900		5,151
										Cl. Stock

(i) **Cost of total issue** = ₹ 4,267 + ₹ 5,682 = ₹ 9,949.

(ii) **Closing Stock** = ₹ 5,151.

Tutorial Note :

It is to be noted that, at the time of calculating weighted average, the value and quantity of base stock of materials are not taken into consideration. It is kept as it is from the beginning to the end of the period.

7. Periodic Simple Average

Under this method, average rate is calculated at the end of certain period, e.g., a week, a fortnight or a month. The rate of all materials received during this period are taken into consideration. It is to be noted that at the time of calculation of average rate, the opening stock rate will not be taken into consideration as it is not related to this current period.

$$\text{Periodic Simple Average Price} = \frac{\text{Total Price of Materials}}{\text{Number of Prices}}$$

Advantages of Periodic Simple Average

The following are claimed to be the advantages of Periodic Simple Average :

1. This method is extremely simple to operate as the rate for material issue will be calculated at the end of a certain period.
2. This method is free from the effect of last year's rate of material.
3. The effect of fluctuation in price, during a period, is spreaded over all the materials issued during that period.
4. This method is suitable for process industries, which are seasonal in nature. **For example**, in sugar industries, this method can be employed suitably.
5. All the rates are taken into consideration for calculating the average rate of issue. Therefore, material cost of two consecutive jobs will not vary at all.

Limitations of Periodic Simple Average

The following are claimed to be the limitations of Periodic Simple Average :

1. Price cannot be assigned immediately on issue of materials as the rate is calculated at the end of the period.
2. The calculation of average rate may not remain simple where there are numerous materials. Too much work at a time (i.e., at the end of the period) may lead to errors in calculation.
3. It is not possible during the period to ascertain the value of materials in hand. It may hamper the proper controlling of the material cost.

4. Materials are not charged out at actual cost. Therefore, true profit can not be ascertained.
5. Inclusion of high price material in the process of averaging may lead to absurd value of stock in hand (e.g., negative value).

Illustration 65

The following information is provided by Sunrise Industries for the fortnight of April, 2017 :

Material Exe :

Purchases		Issues	
1.4.2017	100 units at ₹ 5 per unit	6.4.2017	250 units
5.4.2017	300 units at ₹ 6 per unit	10.4.2017	400 units
8.4.2017	500 units at ₹ 7	14.4.2017	500 units
12.4.2017	600 units at ₹ 8		

Calculate using periodic simple average method of pricing issues :

- (a) the value of materials consumed during the period; and (b) the value of stock of materials on 15.4.2017.

Solution

Stores Ledger Account [Periodic Simple Average]

Code No					Maximum Level:				Folio:			
					Minimum Level:				Location:			
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2017												
April 1		100	5	500					100	5	500	
5		300	6	1,800					400		2,300	
6						250			150			
8		500	7	3,500					650			
10						400			250			
12		600	8	4,800					850			
14						500			350			
		1,500	26	10,600		1,150	6.5	7,475			3,125	Cl. Stk

Notes :

$$(1) \text{ Periodic Simple Average Price} = \frac{\text{Total Price of Materials}}{\text{Number of Prices}} = \frac{26}{4} = ₹ 6.50.$$

$$(a) \text{ Value of Closing Stock} = \text{Receipts} - \text{Issues} \\ = ₹ 10,600 - ₹ 7,475 = ₹ 3,125.$$

$$(b) \text{ Value of Materials Consumed during the Period} = 1,150 \text{ units @ } ₹ 6.50 = ₹ 7,475.$$

8. Periodic Weighted Average Method

Under this method, a weighted average rate is calculated at the end of a certain period, e.g., a week, a fortnight, or a month. At the time of calculating the weighted average rate, the total value of materials purchased during the period is divided by the total quantity of materials. It is to be noted that opening stock value and quantity will not be taken into consideration.

$$\text{Period Weighted Average Rate} = \frac{\text{Total Price of Materials Received}}{\text{Total Quantity of Materials Received}}$$

Advantages of Periodic Weighted Average Method

The following are claimed to be the advantages of Periodic Simple Average :

1. It is very simple to operate because weighted average rate is calculated once at the end of the period.
2. This method is free from last year's value of materials.

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- The effect of fluctuations in price, during a period, is spreaded over all the materials issued during that period.
- At the time of calculating average rate all the quantity and value are taken into consideration. Therefore, the material cost charged to different jobs will not vary at all.

Limitations of Periodic Weighted Average Method

The following are claimed to be the limitations of Periodic Simple Average :

- Materials are not charged out at actual cost. Therefore, true profit cannot be calculated.
- Profit or loss on issue of materials is incurred due to approximations.
- Price cannot be assigned immediately on issue of material as the rate is calculated at the end of the period.
- It is not possible to ascertain the value of material in hand any time during the period. This may hamper the proper controlling of material cost.

Illustration 66

Taking information of *Illustration 65*, calculate :

- value of materials consumed during the period; and
- the value of stock of materials on 15.4.2017.

Use weighted average method of pricing issues.

Solution

Stores Ledger Account [Periodic Weighted Average]

Code No				Maximum Level:				Folio:				
				Minimum Level:				Location:				
Description of Material:				Re-order Level								
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2017												
April 1		100	5	500					100	5	500	Cl. Stk.
5		300	6	1,800					400		2,300	
6						250			150			
8		500	7	3,500					650			
10						400			250			
12		600	8	4,800					850			
14						500			350		2,473	
		1 500		10 600		1 150	7 066	8 127				

Notes :

(a) **Value of Materials Consumed** = 1,150 units @ ₹ 7.0666 = ₹ 8,127.

(b) **Value of Closing Stock** = 350 units @ 7.0660 = ₹ 2,473.

Alternatively, Value of Closing Stock = Receipts – Issues = ₹ 10,600 – ₹ 8,127 = ₹ 2,473

9. Standard Cost Method

Under this method, materials are issued at a pre-determined, budgeted or estimated price. Closing stock is also valued at standard cost. A pre-determined / standard price is ascertained after considering many factors such as:

- The future price movement of the material.
- The quality of materials to be purchased to avail quantity discount.
- The nature of material.
- The transportation and handling cost of materials.

Advantages of Standard Cost Method

The following are claimed to be the advantages of Standard Cost Method :

1. It will facilitate the charging of materials to all products / jobs at an uniform rate.
2. It will help to check the efficiency of buying materials.
3. By adopting this method, the cost of materials can be managed in a better way.
4. It is very easy to operate as only one rate is used for pricing the issues.

Limitations of Standard Cost Method

The following are claimed to be the limitations of Standard Cost Method :

1. Accurate determination of standard price / budgeted price is very difficult.
2. Materials are not issued at actual cost. Therefore, the profit cannot be calculated.
3. AS-2 : Valuation of Inventories does not support this method of valuation.
4. The closing value may not reflect the current market price.
5. If the standard price is set at a higher level, the purchase department may be tempted to buy the materials at higher price. The company will be at backfoot at the time of pricing the final product.

Illustration 67

Taking information from **Illustration 65** prepare Stock Ledger Account using standard cost method. Assume the standard rate is ₹ 7.00.

Solution

Stores Ledger Account [Standard Cost]

Code No					Maximum Level:				Folio:			
					Minimum Level:				Location:			
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2017												
April 1		100	5	500					100	5	500	
5		300	6	1,800					400		2,300	
6						250	7	1,750	150		550	
8		500	7	3,500					650		4,050	
10						400	7	2,800	250		1,250	
12		600	8	4,800					850		6,050	
14						500	7	3,500	350		2,550	Closing
		1,500		10,600		1,150		8,050				Stock

The following should be noted :

1. If the issue price (standard price) is more than the actual price, the closing stock is **under-valued**. On 6th April the value of stock is ₹ 550 as per Stores Ledger Account but the value of stock at standard cost = $150 \times ₹ 7 = ₹ 1,050$.
2. If the actual price of material is more than standard price, the stock will be **over-valued**. The value of closing stock on 14th April as per Stores Ledger = ₹ 2,550 but at standard price, value of stock should have been $350 \times ₹ 7 = ₹ 2,450$.

To determine whether or not the purchase has been made efficiently, the following formula can be used :

$$(\text{Actual Receipts} \times \text{Standard Rate}) - \text{Actual Amount Paid} \\ = (1,500 \text{ units} \times ₹ 7) - ₹ 10,600 = ₹ 10,500 - ₹ 10,600 = ₹ 100.$$

The ₹ 100 represents the inefficiency in purchasing. The expected cost of material for the period was ₹ 10,500 but actually, ₹ 10,600 has been paid. It should be noted that this ₹ 100 has inflated the value of closing stock in the Stores Ledger Account.

9. Replacement Cost Method

Nowadays many raw materials are traded in the commodity exchanges. *For example*, crude oil, gold, silver, cotton, pulses, sugar, etc. Many manufacturing organisations which are consuming these items in their production process use the 'quoted price' of the exchanges for the purpose of pricing the issues. This is done on the assumption that the next replacement purchase price will be the quoted price.

This method of pricing issues is known as **Replacement Cost Method**. The idea behind replacement cost is to ensure that the resultant product cost reflects the current, latest materials cost.

Advantages of Replacement Cost Method

The following are claimed to be the advantages of Replacement Cost Method :

1. It is easier to operate as the quotation of different materials can be obtained by clicking the mouse.
2. It facilitates the correct pricing of the product as the latest material price is taken into consideration.

Limitations of Replacement Cost Method

The following are claimed to be the limitations of Replacement Cost Method :

1. There may be a time gap between the consumption date and replacement date. Therefore, quoted price may not match the replacement price.
2. In many cases 'spot price' and 'quoted price' vary widely. In this situation it is difficult to depend on this method.

Which Method of Pricing Issues to be Adopted ?

There is no one best method suitable to all situations. Some methods are suitable for some industries but may not be suitable for other industries. Whatever method is adopted, it should be used consistently from period to period. The selected method should reflect the current market situation and it should be consistent with the accounting policy of the company. It should facilitate the preparation of financial statements for reporting of true and fair view of the organisation's financial position and performance.

At the time of selecting the method, the requirement of the Cost Accounting Standards are also to be taken into consideration. In general, most of the organisations use FIFO or LIFO or Weighted Average.

Requirement of Cost Accounting Standard (CAS - 6)

Para 5.2.1 of CAS-6 states that "**Issues shall be made using appropriate assumptions on cost flow**, e.g., First In First Out, Last In First Out, Weighted Average Rate. The method of valuation shall be followed on a consistent basis."

It should be noted that Financial Statements (Balance Sheet, Profit and Loss Account and Cash Flow Statement) prepared by the limited companies are required to comply with accounting standards. The standard that deals with stock is **AS-2 : 'Valuation of Inventories'**. This standard states that stock should always be valued at cost or NRV (Net Realisable Value) whichever is lower.

Some of the methods discussed in this chapter do not meet this requirement, so they cannot be used to arrive at the stock values reported in the Financial Accounts.

AS-2 "Valuation of Inventories" recognise only following three methods :

- (1) FIFO Method;***
- (2) Weighted Average Method; and***
- (3) Specific Identification Method.***

Other methods such as LIFO, Simple Average, etc. are not recognised by the Account Standard (AS-2).

Return of Materials from Factory to Stores

In many organisations, it is a common practice to issue more materials than the exact requirement. This is done to compensate the normal loss or spoilage of materials. After the completion of the job / operation, the excess materials are returned to stores along with **Materials Return Note**. On the basis of materials return note, the cost of the unused materials is debited to Materials Control Account and due credit is given to respective WIP / Job Account.

In the Stores Ledger Account, it is re-entered in the receipt column as a part of the old stock and accordingly, it is to be priced. At the time of next issue, it is to be treated as **oldest** stock. Many authors treat it as a new material and accordingly treat it at the time of issue. However, *the 1st method is much more logical and throughout this chapter, it has been adopted.*

Specimen of Materials Returned Note is given below :

Materials Returned Note				
Returned by :			No. 90	
Credit : Job No.			Date : 19 January, 2018	
Quantity	Code No.	Description	Rate (₹)	Amount(₹)
2	FP/201	FUEL-PUMP		
Reasons for return :			Authorised by :	

Materials Return to Vendors (Suppliers)

Materials are returned to vendors for different reasons such as defective, excess, not as per order, etc. When materials are returned to vendors (suppliers), the cost of materials is removed from the Materials Control Account by passing the following entry :

Vendors Account Dr.
 To Materials Control Account

In the Stores Ledger Account, the cost of the material is removed by entering the cost in the issue column - using the original rate at which it was purchased. Many organisations enter such return to vendor in the receipts column as a negative figure. The logic of such entry is cancellation of purchase and actually it is not exactly issue of material. When the returned materials are replaced by the vendor, it is treated as new material and treated as **new receipt**.

Illustration 68

From the following particulars, prepare Stores Ledger Account by using LIFO method.

- 2017
- April 1 Stock in hand 500 units at ₹ 20 per unit.
 3 Issued 200 units.
 3 Purchased 150 units at ₹ 22 per unit.
 4 Issued 100 units.
 5 Purchased 200 units at ₹ 25 per unit.
 6 Issued 300 units.
 6 Returned to store 10 units (Issued on April 4).
 7 Issued 100 units.
 8 Issued 50 units.

On April 10, it was noticed that there is a shortage of 10 units.

[B.Com. (Hons.), Delhi – Adapted]

3.96 Accounting for Materials

Solution

Stores Ledger Account [LIFO]

Code No

Maximum Level:

Folio:

Minimum Level:

Location:

Description of Material:

Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Units)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2017												
April 1									500	20	10,000	
3						200	20	4,000	300	20	6,000	
3		150	22	3,300					300	20	6,000	
									150	22	3,300	
									450		9,300	
4						100	22	2,200	300	20	6,000	
									50	22	1,100	
									350		7,100	
5		200	25	5,000					300	20	6,000	
									50	22	1,100	
									200	25	5,000	
									550		12,000	
6						200	25	5,000				
						50	22	1,100				
						50	20	1,000	250	20	5,000	
						300		7,100				
6		10	22	220					250	20	5,000	
									10	22	220	
									260		5,220	
7						10	22	220				
						90	20	1,800	160	20	3,200	
						100		2,020				
8						50	20	1,000	110	20	2,200	
10						10	20	200	100	20	2,000	Shortage

Illustration 69

Prepare a Stores Ledger Account from the following details using LIFO method of pricing the issue of materials:
2017

April 1	Opening Balance	10,850 kg @ ₹ 130 per kg.
2	Purchased	20,000 kg @ ₹ 134 per kg.
3	Issued	6,750 kg to production.
5	Issued	8,500 kg to production
6	Received back	550 kg from production being surplus
7	Purchased	17,550 kg @ ₹ 128 per kg.
8	Issued	11,250 kg to production
9	Physical stock verification revealed a loss of	250 kg
10	Issued	8,950 kg to production
12	Issued	6,300 kg to production
16	Purchased	10,000 kg @ ₹ 132 per kg
18	Issued	7,750 kg to production

[I.C.W.A. (Inter) – Adapted]

Solution

**Stores Ledger Account
[LIFO]**

Code No

Maximum Level:

Folio:

Minimum Level:

Location:

Description of Material:

Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Kg)	Rate (₹)	Amount (₹)	MRN	Quantity (Kg)	Rate (₹)	Amount (₹)	Quantity (Kg)	Rate (₹)	Amount (₹)	
2017												
April 1									10,850	130	14,10,500	
2		20,000	134	26,80,000					10,850	130	14,10,500	
									20,000	134	26,80,000	
									30,850		40,90,500	
3						6,750	134	9,04,500	10,850	130	14,10,500	
									13,250	134	17,75,500	
									24,100		31,86,000	
5						8,500	134	11,39,000	10,850	130	14,10,500	
									4,750	134	6,36,500	
									15,600		20,47,000	
5		550	134	73,700					10,850	130	14,10,500	
									5,300	134	7,10,200	Returned
									16,150		21,20,700	
7		17,557	128	22,46,400					10,850	130	14,10,500	
									5,300	134	7,10,200	
									17,550	128	22,46,400	
									33,700		43,67,100	
8						11,250	128	14,40,000	10,850	130	14,10,500	
									5,300	134	7,10,200	
									6,300	128	8,06,400	
									22,450		29,27,100	
9						250	128	32,000	10,850	130	14,10,500	Shortage
									5,300	134	7,10,200	
									6,050	128	7,74,400	
									22,200		28,95,100	
10						6,050	128	7,74,400	10,850	130	14,10,500	
						2,900	134	3,88,600	2,400	134	3,21,600	
						8,950		11,63,000	13,250		17,32,100	
12						2,400	134	3,21,600				
						3,900	130	5,07,000	6,950	130	9,03,500	
						6,300		8,28,600				
15		10,000	132	13,20,000					6,950	130	9,03,500	
									10,000	132	13,20,000	
									16,950		22,23,500	
16						7,750	132	10,23,000	6,950	120	9,03,500	
									2,250	132	2,97,000	
									9,200		12,00,500	

3.98 Accounting for Materials

Illustration 70

AT Ltd. furnishes the following stores transactions for September, 2017 :

Sept. 1	Opening balance	25 units value ₹ 162.50
4	Issues Req. No. 85	8 units
6	Receipts from B & Co. GRN No. 26	50 units @ ₹ 5.75 per unit
7	Issues Req. No. 97	12 units
10	Returns to B & Co.	10 units
12	Issues Req. No. 108	15 units
13	Issues Req. No. 110	20 units
15	Receipts from M & Co. GRN No. 33	25 units @ ₹ 6.10 per unit
17	Issues Req. No. 121	10 units
19	Received replacement from B & Co. GRN No. 38	10 units
20	Returned from department material of B & Co. MRR No. 4	5 units
22	Transfer from Job 182 to Job 187 in the dept MTR 6	5 units
26	Issues Req. No. 146	10 units
29	Transfer from Dept. A to Dept. B MTR 10	5 units
30	Shortage in stock taking	2 units

Solution

Stores Ledger Account [FIFO]

Code No				Maximum Level:				Folio:				
				Minimum Level:				Location:				
Description of Material:				Re-order Level								
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Unit)	Rate (₹)	Amount (₹)	MRN	Quantity (Unit)	Rate (₹)	Amount (₹)	Quantity (Unit)	Rate (₹)	Amount (₹)	
2017												
Sept. 1									25	6.50	162.50	
4					85	8	6.50	52.00	17	6.50	110.50	
6	26	50	5.75	287.50					17	6.50	110.50	
									50	5.75	287.50	
									67		398.00	
7					97	12	6.50	78	5	6.50	32.50	
									50	5.75	287.50	
									55		320.00	
10						10	5.75	57.50	5	6.50	22.50	
									40	5.75	230.00	
									45		262.50	
12					108	5	6.50	32.50				
						10	5.75	57.50	30	5.75	172.50	
						15		90.00				
13					110	20	5.75	115.00	10	5.75	57.50	
15	33	25	6.10	152.50					10	5.75	57.50	
									25	6.10	152.50	
									35		210.00	
17					121	10	5.75	57.50	25	6.10	152.50	
19	38	10	5.75	57.50					25	6.50	152.50	
									10	5.75	57.50	
									35		210.00	

Return
to B & Co.

20	4	5	5.75	28.75					5	5.75	28.75	Note 3
									25	6.10	152.50	
									10	5.75	57.50	
									40		238.75	
26					156	5	5.75	28.75	20	6.10	122.00	
						5	6.50	32.50	10	5.75	57.50	
						10		61.25	30		179.50	
30						2	6.10	12.20	18	6.10	109.80	Shortage
									10	5.75	57.50	
									28		167.30	

Working Notes :

- (1) The materials received as replacement from B & Co. on 19.9.2010 will be treated as fresh supply. However, rate will be the original rate, i.e., ₹ 5.75 per unit.
- (2) The material return to B & Co. on 10.9.2010 will be shown on the issue column.
- (3) Return from departmental material on 20.9.2010 will be treated as oldest material. This material will be issued at the earliest (under FIFO method).
- (4) Transfer of material from one job to another job will not affect the stores ledger accounting. Receiving Job 187 will be debited and Job 182 will be credited.
- (5) Transfer of material from Dept. A to Dept. B will not affect the Stores Ledger Account. Dept. B will be debited and Dept. A will be credited.

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 71

From the following particulars, prepare Stores Ledger for the month of March, 2008 under FIFO method :

- 2008 March 1 Opening stock 100 units @ ₹ 12 each.
 4 Purchased 50 units @ ₹ 14 each.
 6 Issued 80 units.
 9 Received from Department 'X' 30 units @ ₹ 10.
 13 Returned to Supplier 10 units from the material purchased on 4th March.
 15 Transferred to Department 'Y' 50 units.
 19 Purchased 60 units @ ₹ 15
 24 Shortage detected 10 units.
 30 Transferred to Department 'Z' 60 units.

[C.U.B.Com. (General) – 2008]

Solution

**Stores Ledger Account
[FIFO]**

Code No

Maximum Level:

Folio:

Minimum Level:

Location:

Description of Material:

Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Unit)	Rate (₹)	Amount (₹)	MRN	Quantity (Unit)	Rate (₹)	Amount (₹)	Quantity (Unit)	Rate (₹)	Amount (₹)	
2008												
March 1		100	12	1,200					100	12	1,200	Opening Stock
4		50	14	700					100	12	1,200	
									50	14	700	
									150		1,900	

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6					80	12	960	20	12	240	
								50	14	700	
								70		940	
9	30	10	300					20	12	240	
								50	14	700	
								30	10	300	
								100		1,240	
13					10	14	140	20	12	240	
								40	14	560	
								30	10	300	Returned to supplier
								90		1,100	
15					20	12	240	10	14	140	
					30	14	420	30	10	300	Transfer to Y Dept.
					50		660	40		440	
19	60	15	900					10	14	140	
								30	10	300	
								60	15	900	
								100		1,340	
24					10	14	140	30	10	300	
								60	15	900	Shortage
								90		1,200	
30					30	10	300				
					30	15	450	30	15	450	Cl. Stock
					60		750				

Illustration 72

The following transactions took place in respect of a material in the store of a manufacturing company in the month of December 2008.

Year	Date	Particulars	Units	Unit Cost (₹)
2008	December 1	Purchases	600	4.00
	4	Purchases	300	4.20
	6	Issues	500	—
	10	Purchases	700	4.40
	15	Issues	800	—
	20	Purchases	300	5.00
	23	Issues	100	—

Prepare a Stores Ledger applying Weighted Average Method in pricing of material issues on the basis of above information.

[C.U.B.Com. (General) – 2009]

Solution

**Stores Ledger Account
[Weighted Average]**

Code No					Maximum Level:				Folio:			
Description of Material:					Minimum Level:				Location:			
					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Unit)	Rate (₹)	Amount (₹)	MRN	Quantity (Unit)	Rate (₹)	Amount (₹)	Quantity (Unit)	Rate (₹)	Amount (₹)	
2008												
Dec. 1		600	4	2,400					600	4	2,400	
4		300	4.20	1,260					600	4	2,400	
									300	4.20	1,260	
									900		3,660	
6						500	4.067	2,033	400	4.067	1,627	
10		700	4.40	3,080					400	4.067	1,627	
									700	4.40	3,080	
									1,100		4,707	
15						800	4.279	3,423	300	4.279	1,284	
20		300	5	1,500					300	4.279	1,284	
									300	5	1,500	
									600		2,784	
23						100	4.64	464	500	4.64	2,320	Cl. Stock

Working Notes :

$$\text{Weighted Average Rate} = \frac{\text{Total Value Before Issue}}{\text{Total Quantity Before Issue}}$$

$$\text{December 6 : } \frac{3,660}{900} = ₹ 4.067$$

$$15 : \frac{4,707}{1,100} = ₹ 4.279$$

$$23 : \frac{2,784}{600} = ₹ 4.64$$

Illustration 73

The following are the details supplied by XYZ Ltd. in respect of its raw materials for the month of December, 2010:

Date	Units	Amount	Issues (units)
1.12.10	2,000	12,000	—
	(opening)		
10.12.10	1,000	8,000	—
15.12.10	—	—	2,500
20.12.10	2,000	18,000	—
30.12.10	—	—	2,200

On 31.12.2010, a shortage of 100 units was found. Find the values of issues and resulting stocks on different dates using (a) FIFO; and (b) Simple Average Method.

3.102 Accounting for Materials

Solution

In this problem, the values of issues and resulting stock are to be calculated. **Preparation of Stores Ledger is not required.**

(a) Calculation of Value of Issues (FIFO Method)

Date	Particulars	Qty. (Units)	Rate (₹)	Amount (₹)
15.12.2010	Issued (out of Opening Stock)	2,000	6	12,000
	Issued (out of Purchase of Stock of 10.12.2010)	500	8	4,000
		2,500		16,000
30.12.2010	Issued (Out of Purchase of 10.12.2010)	500	8	4,000
	Issued (out of Purchase of 20.12.2010)	1,700	9	15,300
		2,200		19,300
31.12.2010	Shortage	100	9	900

Value of Closing Stock (FIFO Method)

Opening Stock	2,000 units
Purchased (10.12.2010)	1,000 units
Purchased (20.12.2010)	<u>2,000 units</u>
	<u>5,000 units</u>
Issued (15.12.2010)	2,500 units
Issued (30.12.2010)	2,200 units
Shortage (31.12.2010)	<u>100 units</u>
	<u>4,800 units</u>

Closing Stock 200 units (5,000 units – 4,800 units). It is to be valued at the latest rate, i.e., ₹ 9 per unit. Therefore, **the value of Closing Stock** will be : $200 \times ₹ 9 = ₹ 1,800$.

(b) Calculation of Value of Issue (Simple Average)

Date	Particulars	Qty. (Units)	Rate (₹)	Amount (₹)
15.12.2010	Issued (Note 1)	2,500	7.00	17,500
30.12.2010	Issued (Note 2)	2,200	8.50	18,700
31.12.2010	Shortage (Note 3)	100	9.00	900

Closing Stock of 200 units will be valued at ₹ 9 per unit. Therefore, **the value of Closing Stock** will be : $200 \times ₹ 9 = ₹ 1,800$.

Working Notes :

(1) Rate of Issue = $\frac{6 + 8}{2} = ₹ 7$ (2) Rate of Issue = $\frac{8 + 9}{2} = ₹ 8.50$ (3) Rate for Shortage = ₹ 9.

Illustration 74

From the information for the month of March 2011, prepare Stores Ledger Account using appropriate method:

March	1	Opening Stock	100 units @ ₹ 10 per unit
	4	Received materials	50 units @ ₹ 12 per unit
	6	Issues	80 units
	9	Received	30 units @ ₹ 14 per unit
	13	Return to Suppliers	10 units (out of 4th March Purchases)
	15	Issues	50 units
	19	Received	60 units @ ₹ 15 per unit
	30	Issues	60 units

Solution

The price of the material is increasing. Therefore, the FIFO method is most suitable in this situation.

**Stores Ledger Account
[FIFO]**

Code No				Maximum Level:				Folio:				
Description of Material:				Minimum Level:				Location:				
				Re-order Level								
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Unit)	Rate (₹)	Amount (₹)	MRN	Quantity (Unit)	Rate (₹)	Amount (₹)	Quantity (Unit)	Rate (₹)	Amount (₹)	
2011									100	10	1,000	Op. Stock
Mar. 1									100	10	1,000	
4		50	12	600					50	12	600	
									150		1,600	
6						80	10	800	20	10	200	Returned to supplier
									50	12	600	
									70		800	
9		30	14	420					20	10	200	
									50	12	600	
									30	14	420	
									100		1,220	
13						10	12	120	20	10	200	
									40	12	480	
									30	14	420	
									90		1,100	
15						20	10	200	10	12	120	
						30	12	360	30	14	420	
						50		560	40		540	
19		60	15	900					10	12	120	
									30	14	420	
									60	15	900	
									100		1,440	
30						10	12	120				Cl. Stock
						30	14	420				
						20	15	300	40	15	600	
						60		840				

Illustration 75

The following details are supplied by J.K. Corporation in respect of its raw materials :

Date	Receipts		Issues	
	Unit (Kg)	Price/Unit (₹)	Unit (Kg)	
01.12.12 (opening)	2,000	5.00	—	
07.12.12	1,000	6.00	—	
10.12.12	—	—	2,500	
15.12.12	2,000	6.50	—	
31.12.12	—	—	2,200	

On 31.12.12 a shortage of 100 units was found. Find the value of closing stock using LIFO method of stock valuation.

3.104 Accounting for Materials

Solution

J. K. Corporation Calculation of Value of Closing Stock Using LIFO Method

Opening Stock	2,000 kg.
Purchased (7.12.2012)	1,000 kg.
Purchased (15.12.2012)	<u>2,000 kg.</u>
	<u>5,000 kg.</u>
Issued (10.12.2012)	2,500 kg.
Issued (31.12.2012)	2,200 kg.
Shortage (31.12.2012)	<u>100 kg.</u>
	<u>4,800 kg.</u>

Closing Stock = (5,000 – 4,800) = 200 kg.

1st Issue of 2,500 Kg. on 10.12.2012 was made as follows (under LIFO Method) :

1,000 @ 6.00 = ₹ 6,000

1,500 @ 5.00 = ₹ 7,500

2,500 ₹ 13,500

After 1st Issue, there were (3,000 – 2,500) = 500 kg. @ ₹ 5 per kg.

Before, 2nd Issue on 31.12.2012, stock was 2,500 kg. The break-up was as follows :

500 kg. @ ₹ 5

2,000 kg. @ ₹ 6.50

2,500 kg.

2nd Issue of 2,200 kg. on 31.12.2012 was made as follows (under LIFO Method) :

2,000 kg. @ 6.50

200 kg. @ ₹ 5

2,200 kg.

Closing Stock on 31.12.2012 was 2,500 – 2,200 = 300 kg. @ ₹ 5.

After shortage of 100 kg., the balance materials were : 200 kg. @ ₹ 5.

Therefore, the value of Closing Stock = 200 × ₹ 5 = ₹ **1,000**.

Illustration 76

From the following particulars, write up Stores Ledger using FIFO method :

2014 January	1	Opening stock	1000 units @ ₹ 10
	5	Received	500 units @ ₹ 11
	10	Issued	1200 units
	12	Received	800 units @ ₹ 11.50
	20	Returned from Department	100 units @ ₹ 11
	25	Issued	500 units
	28	Shortage	10 units
	30	Issued	200 units

Solution

**Stores Ledger Account
[FIFO]**

Code No					Maximum Level:				Folio:			
Description of Material:					Minimum Level:				Location:			
					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Unit)	Rate (₹)	Amount (₹)	MRN	Quantity (Unit)	Rate (₹)	Amount (₹)	Quantity (Unit)	Rate (₹)	Amount (₹)	
2014 Jan. 1									1,000	10	10,000	Op. Stock
5	500	11	5,500						1,000	10	10,000	
									500	11	5,500	
									1,500		15,500	
10						1,000	10	10,000				Returned from Dept.
						200	11	2,200	300	11	3,300	
						1,200		12,200				
12		800	11.50	9,200					300	11	3,300	
									800	11.50	9,200	
									1,100		12,500	
20		100	11	1,100					400	11	4,400	
									800	11.50	9,200	
									1,200		13,600	
22						400	11	4,400				
						100	11.50	1,150	700	11.50	8,050	
						500		5,500				
28						10	11.50	115	690	11.50	7,935	Shortage
30						200	11.50	2,300	490	11.50	5,635	Cl. Stock

Tutorial Note :

Returned from Department will be treated as 'old' material and is to be valued accordingly.

Illustration 77

The following are the details supplied by J.K. Corporation in respect of its raw materials for the month of December, 2014 :

Date	Receipts		Issues (units) (Kg)
	Units (Kg)	Price per unit (₹)	
1.12..2014	2,000 (opening)	5.00	
7.12.2014	1,000	6.00	
10.12.2014			2,500
15.12.2014	2,000	6.50	
31.12.2014			2,200

On 31.12.2014 a shortage of 100 units was found.

Find out the values and resulting stock of different dates using (i) LIFO; and (ii) Simple Average Method.

[C.U.B.Com. (General) – 2015]

Solution

The requirement of the question is to find out the values and resulting stock of different dates. Therefore, the preparation of Stores Ledger will help to find out the stock at different dates.

3.106 Accounting for Materials

Stores Ledger Account [LIFO]

Code No				Maximum Level:				Folio:				
				Minimum Level:				Location:				
Description of Material:				Re-order Level								
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Kg)	Rate (₹)	Amount (₹)	MRN	Quantity (Unit)	Rate (₹)	Amount (₹)	Quantity (Kg)	Rate (₹)	Amount (₹)	
2014									2,000	5.00	10,000	Op. Stock
Dec. 1									2,000	5.00	10,000	
7		1,000	6.00	6,000					1,000	6.00	6,000	
									3000		16,000	
10						1,000	6.00	6,000	500	5.00	2,500	
						1,500	5.00	7,500				
						2,500		13,500				
15		2,000	6.50	13,000					500	5.00	2,500	
									2,000	6,50	13,000	
									2,500		15,500	
31						2,000	6.50	13,000	300	5.00	1,500	
						200	5.00	1,000				
						2,200		14,000				
31						100	5.00	500	200	5.00	1,000	Cl. Stock

Stores Ledger Account [Simple Average Method]

Code No					Maximum Level:				Folio:			
					Minimum Level:				Location:			
Description of Material:					Re-order Level							
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Kg)	Rate (₹)	Amount (₹)	MRN	Quantity (Unit)	Rate (₹)	Amount (₹)	Quantity (Kg)	Rate (₹)	Amount (₹)	
2014									2,000	5.00	10,000	Op. Stock
Dec. 1												
		1,000	6.00	6,000					2,000	5.00	10,000	
7									1,000	6.00	6,000	
									3000		16,000	
						2,500	5.50	13,750	500		2,250	
10												
15		2,000	6.50	13,000					500	6.00	2,250	
									2,000	6.50	13,000	
									2,500		15,250	
						2,200	6.25	13,750	300		1,500	
31						100	6.25	625	200		875	
31												

Working Notes :

(1) Rate of issue on 10th December, 2014 = $\frac{5 + 6}{2} = ₹ 5.50$.

(2) After 1st issue on 10th December, 2014, physical stock was 500 Kg. The rate was ₹ 6.

Rate of issue on 31st December = $\frac{6 + 6.50}{2} = ₹ 6.25$.

Illustration 78

The following information are available in respect of receipts and issues of materials in a factory during March, 2016:

March	1	Purchased	2,000 units @ ₹ 10	6	Issued	600 units
	10	Purchased	1,000 units @ ₹ 12	15	Issued	1,200 units
	18	Issued	300 units	22	Purchased	1,200 units @ ₹ 11
	27	Issued	1,300 units	30	Purchased	800 units @ ₹ 13

Prepare a Stores Ledger Account assuming that a base stock of 300 units @ ₹ 10 per unit is maintained and the FIFO method is applied.

[C.U.B.Com. (General) – 2016]

Solution

**Stores Ledger Account
[Base Stock – FIFO]**

Code No				Maximum Level:				Folio:				
				Minimum Level:				Location:				
Description of Material:				Re-order Level								
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Unit)	Rate (₹)	Amount (₹)	MRN	Quantity (Unit)	Rate (₹)	Amount (₹)	Quantity (Unit)	Rate (₹)	Amount (₹)	
2016									300	10	3,000	Base Stk.
Mar. 1		2,000	10	20,000					300	10	3,000	
1									2,000	10	20,000	
									2,300		23,000	
6						600	10	6,000	300	10	3,000	
									1,400	10	14,000	
									1,700		17,000	
10		1,000	12	12,000					300	10	3,000	
									1,400	10	14,000	
									1,000	12	12,000	
									2,700		29,000	
15						1,200	10	12,000	300	10	3,000	
									200	10	2,000	
									1,000	12	12,000	
									1,500		17,000	
18						200	10	2,000	300	10	3,000	
						100	12	1,200	900	12	10,800	
						300		3,200	1,200		13,800	
22		1,200	11	13,200					300	10	3,000	
									900	12	10,800	
									1,200	11	13,200	
									2,400		27,000	
27						900	12	10,800	300	10	3,000	
						400	11	4,400	800	11	8,800	
						1,300		15,200	1,100		11,800	
30		800	13	10,400					300	10	3,000	
									800	11	8,800	
									800	13	10,400	
									1,900		22,200	

3.108 Accounting for Materials

Illustration 79

From the following particulars, prepare the Stores Ledger Account for the month of March, 2016 adopting LIFO method :

2016 March

1	Opening Stock	500 kgs @ ₹ 5 per kg
4	Issued	200 kgs
9	Issued	150 kgs
12	Purchased	400 kgs @ ₹ 6 per kg
18	Issued	300 kgs
21	Purchased	500 kgs @ ₹ 7 per kg
28	Returned from job	50 kgs
30	Issued	300 kgs

There was a shortage of stock of 10 kgs on 22 March, 2016.

[C.U.B.Com. (General) – 2017]

Solution

Stores Ledger Account [LIFO]

Code No				Maximum Level:				Folio:				
				Minimum Level:				Location:				
Description of Material:				Re-order Level								
Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Kg.)	Rate (₹)	Amount (₹)	MRN	Quantity (Kg.)	Rate (₹)	Amount (₹)	Quantity (Kg.)	Rate (₹)	Amount (₹)	
2016												
Mar. 1									500	5	2,500	Op. Stk
4						200	5	1,000	300	5	1,500	
9						150	5	750	150	5	750	
12		400	6	2,400					150	5	750	
									400	6	2,400	
									550		3,150	
18						300	6	1,800	150	5	750	
									100	6	600	
									250		1,350	
21		500	7	3,500					150	5	750	
									100	6	600	
									500	7	3,500	
									750		4,850	
28		50	6	300					150	5	750	Returned from Job
									150	6	900	
									500	7	3,500	
									800		5,150	
									150	5	750	
30						300	7	2,100	150	6	900	
									200	7	1,400	
									500		3,050	

Tutorial Note :

(1) It is assumed that return from job on 28th March was from issue of materials on 18th March @ ₹ 6 per kg.

[For Honours Candidates Only]

Illustration 80

The following information is provided in respect of Material Exe by Sunrise Ltd. for the month of March 2010 :

1.3.2010	Stock	:	200 units @ ₹ 5 per unit
5.3.2010	Purchase	:	600 units @ ₹ 3 per unit
8.3.2010	Issued	:	500 units
25.3.2010	Purchased	:	800 units @ ₹ 4 per unit
31.3.2010	Issued	:	700 units

You are required to calculate :

- the value of stock on 31.3.2010.
- the value of materials consumed during the month of March 2010. The accountant of Sunrise Ltd. followed FIFO Method of pricing issues.

[C.U.B.Com. (Hons.) - 2010]

Solution

(i) Calculation of Value of Closing Stock Using FIFO Method

Opening Stock	200 units
Purchased (5.3.2010)	600 units
Purchased (25.3.2010)	<u>800 units</u>
	<u>1,600 units</u>
Issued (8.3.2010)	500 units
Issued (31.3.2010)	<u>700 units</u>
	<u>1,200 units</u>

Closing Stock = (1,600 units – 1,200 units) = **400 units.**

1st issue of 500 units on 8.3.2010 was made as follows (under FIFO Method) :

200 units @ ₹ 5	= ₹ 1,000
300 units @ ₹ 3	= ₹ <u>900</u>
	<u>₹ 1,900</u>

After 1st issue there were (600 – 300) = 300 units @ ₹ 3 each.

Before 2nd issue on 31.3.2010, there were 1,100 units. The break-up was as follows :

300 units @ ₹ 3 each per unit
800 units @ ₹ 4 per unit.

2nd issue of 700 units on 31.3.2010 was made as follows (under FIFO) :

300 units @ ₹ 3	900
400 units @ ₹ 4	<u>1,600</u>
	<u>2,500</u>

After 2nd issue, closing stock was 400 units @ ₹ 4 each.

Therefore, the value of Closing Stock = 400 units @ ₹ 4 = **₹ 1,600.**

(ii) Value of Materials Consumed

1st Issue on 8.3.2010 :

200 units @ ₹ 5 per unit	= ₹ 1,000
300 units @ ₹ 3 per unit	= ₹ <u>900</u>
	1,900

2nd Issue on 31.3.2010 :

300 units @ ₹ 3 per unit	= ₹ 900
400 units @ ₹ 4 per unit	= ₹ <u>1,600</u>
	<u>2,500</u>

Total Value of Materials Consumed 4,400

3.110 Accounting for Materials

Illustration 81

ABC Ltd. furnishes the following information regarding an item of raw material for the month of December, 2011:

Opening Stock : 50,000 units @ ₹ 3.00 per unit.

Purchases :

December 1 1,00,000 units @ ₹ 2.50

December 30 50,000 units @ ₹ 3.00

Issue :

December 20 1,40,000 units

ABC Ltd. uses LIFO method of stock valuation for the said period.

Compute :

(a) Value of Inventory on 31st December, 2011.

(b) Amount of cost of goods sold for December, 2011.

[C.U.B.Com. (Hons.) - 2012]

Solution

(a) Calculation of Value of Inventory Using LIFO Method

Opening Stock	50,000 units
Purchased (1.12.2011)	1,00,000 units
Purchased (30.12.2011)	<u>50,000 units</u>
	<u>2,00,000 units</u>
Issued (20.12.2011)	1,40,000 units
Closing Stock = (2,00,000 – 1,40,000)	60,000 units

Issue on 20.12.2011, 1,40,000 units was made as follows (under LIFO Method) :

1,00,000 units @ ₹ 2.50 per unit =	₹ 2,50,000
40,000 units @ ₹ 3.00 per unit =	<u>₹ 1,20,000</u>
	<u>₹ 3,70,000</u>

After issue of 1,40,000 units on 20.12.2011, the Closing Inventory was as follows :

10,000 units @ ₹ 3.00 per unit =	30,000
<u>50,000 units @ ₹ 3.00 per unit =</u>	<u>1,50,000</u>
<u>60,000 units</u>	<u>1,80,000</u>

Therefore, value of closing inventory = ₹ **1,80,000**.

(b) Cost of Goods Sold

1,00,000 units @ ₹ 2.50 per unit =	2,50,000
<u>40,000 units @ ₹ 3.00 per unit</u>	<u>1,20,000</u>
<u>1,40,000 units</u>	<u>3,70,000</u>

Illustration 82

The opening stock of a material in a store on 1.1.2013 is 200 units @ ₹ 16 each.

The store-keeper made a purchase on 15.1.2013 which was 300 units @ ₹ 20 each and he made an issue on 30.1.2013, 250 units.

Find out the value of closing stock under :

(i) LIFO; (ii) Simple Average; and (iii) Weighted Average.

[C.U.B.Com. (Hons.) - 2013]

Solution

Calculation of Value of Closing Stock

Opening Stock	200 units @ ₹ 16 per unit
Purchased (15.1.2013)	<u>300 units @ ₹ 20 per unit</u>
	<u>500 units</u>

Issued (30.1.2013) **250 units**

Closing Stock = (500 units – 250 units) = 250 units.

(i) Valuation of Closing Stock under LIFO Method

Under LIFO method of issuing materials, last purchased is issued first. In this case, the last purchase was 300 units @ ₹ 20 per unit.

After issuing 250 units, the closing stock will be :

200 units @ ₹ 16	₹ 3,200	(Opening Stock)
50 units @ ₹ 20	₹ 1,000	(Out of last Purchase)
Total value of Closing Stock	₹ 4,200	

(ii) Valuation of Closing Stock under Simple Average Method

Value of materials before issue :

Opening Stock 200 units @ ₹ 16	3,200
Purchased 300 units @ ₹ 20	6,000
500 units	9,200

$$\begin{aligned}\text{Value of materials issued} &= 250 \times \left(\frac{16 + 20}{2} \right) \\ &= 250 \times 18 \\ &= ₹ 4,500\end{aligned}$$

Therefore, value of Closing Stock = ₹ 9,200 – ₹ 4,500 = ₹ 4,700

(iii) Valuation of Closing Stock under Weighted Average Method

$$\text{Weighted Average Rate of Issue} = \frac{9,200}{500} = ₹ 18.40$$

Value of Materials Issued = 250 × ₹ 18.40 = ₹ 4,600

Therefore, Value of Closing Stock = ₹ 9,200 – ₹ 4,600 = ₹ 4,600.

Illustration 83

The following transactions in respect of material A occurred during the month of December, 2014 :

Date	Purchase (units)	Price per unit (₹)	Issue (units)
2014			
December 2	200	25	—
December 10	300	24	—
December 12	—	—	250
December 20	400	26	—
December 22	—	—	300
December 26	500	23	—
December 31	—	—	550

The chief accountant argues that the value of closing stock on 31.12.2014 remains the same in case of FIFO or LIFO method of pricing of material issues is used. Do you agree ? Give your opinion by showing value of closing stock of material on 31.12.2014 under FIFO and LIFO methods.

[C.U.B.Com. (Hons.) - 2015]

Solution

It is easier to find out the value of closing stock by preparing the Stores Ledger. Therefore, Stores Ledger has been prepared separately under FIFO method and LIFO method.

3.112 Accounting for Materials

Stores Ledger Account [FIFO]

Code No Maximum Level: Folio:
Minimum Level: Location:
Description of Material: Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Kg.)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2014												
Dec. 2		200	25	5,000					200	25	5,000	
10		300	24	7,200					200	25	5,000	
									300	24	7,200	
									500		12,200	
12						200	25	5,000				
						50	24	1,200	250	24	6,000	
						250		6,200				
20		400	26	10,400					250	24	6,000	
									400	26	10,400	
									650		16,400	
22						250	24	6,000				
						50	26	1,300	350	26	9,100	
						300		7,300				
26		500	23	11,500					350	26	9,100	
									500	23	11,500	
									850		20,600	
31						350	26	9,100				
						200	23	4,600	300	23	6,900	Cl. Stk
						550		13,700				

Stores Ledger Account [LIFO]

Code No Maximum Level: Folio:
Minimum Level: Location:
Description of Material: Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Kg.)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
2014												
Dec. 2		200	25	5,000					200	25	5,000	
10		300	24	7,200					200	25	5,000	
									300	24	7,200	
									500		12,200	
12						250	24	6,000	200	25	5,000	
									50	24	1,200	
									250		6,200	
20		400	26	10,400					200	25	5,000	
									50	24	1,200	
									400	26	10,400	
									650		16,600	

22					300	26	7,800	200 50 100	25 24 26	5,000 1,200 2,600	
								350		8,800	
26		500	23	11,500				200 50 100 500	25 24 26 23	5,000 1,200 2,600 11,500	
								850		20,300	
31					500 50	23 26	11,500 1,300	200 50 50	25 24 26	5,000 1,200 1,300	
					550		12,800	300		7,500	Cl. Stk

Value of Closing Stock :

FIFO method of Issue = ₹ 6,900

LIFO method of Issue = ₹ 7,500

It is clear that value of closing stock will not be same under FIFO and LIFO. In this case the **value of closing stock under LIFO is more than that of FIFO method.**

Illustration 84

Sunita Ltd. furnishes the following stock records for the month of December, 2015 :

December 1	Stock of material	400 units @ ₹ 5 per unit
December 5	Purchased	600 units @ ₹ 3 per unit
December 10	Issued	500 units
December 20	Purchased	700 units @ ₹ 4 per unit
December 31	Issued	400 units

You are required to calculate :

(i) the value of Closing Stock on 31.12.2015; (ii) the value of materials consumed during the month of December, 2015. The accountant of Sunita Ltd. follow LIFO method of pricing issues.

[C.U.B.Com. (Hons.) - 2016]

Solution

(i) Calculation of Value of Closing Stock using LIFO Method

Opening Stock	400 units
Purchased (5.12.2015)	600 units
Purchased (20.12.2015)	700 units
	<u>1,700 units</u>
Issued (10.12.2015)	500 units
Issued (31.12.2015)	400 units
	<u>900 units</u>

Closing Stock = (1,700 units – 900 units) = **800 units.**

1st issue on 10.12.2015 was made as follows (under LIFO Method) :

500 units @ ₹ 3 per unit = ₹ 1,500.

After 1st issue, there were (600 – 500) = 100 units @ ₹ 3 and 400 units (Opening Stock) @ ₹ 5 per unit.

Before 2nd issue on 31.12.2015, there were 1,200 units. The break-up was as follows :

400 units @ ₹ 5 per unit
100 units @ ₹ 3 per unit
<u>700 units @ ₹ 4 per unit</u>
<u>1,200 units</u>

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2nd issue of 400 units on 31.12.2015 was made out of 700 units @ ₹ 4 per unit.

After the 2nd issue (i.e., 400 units @ ₹ 4 = ₹ 1,600), the Closing Stock was as follows :

400 units @ ₹ 5 per unit =	₹ 2,000
100 units @ ₹ 3 per unit =	₹ 300
300 units @ ₹ 4 per unit =	₹ 1,200
800 units	<u>₹ 3,500</u>

(ii) Value of Materials Consumed

1st issue (10.12.2015) = 500 units @ ₹ 3	₹ 1,500
2nd issue (31.12.2015) = 400 units @ ₹ 4	<u>₹ 1,600</u>
	<u>₹ 3,100</u>

Illustration 85

The Stores Ledger of a manufacturing company recorded for material P-17 for March, 2017 provides the following information :

Date	Quantity Received (Units)	Receipts Value (₹)	Quantity Issued (Units)	Issue Value (₹)
4.3.2017	100	160	—	—
6.3.2017	40	120	—	—
12.3.2017	—	—	70	140
16.3.2017	50	100	—	—
20.3.2017	40	240	—	—
26.3.2017	—	—	90	270

(a) State the method of pricing that was employed in the Stores Ledger. (Give reasons)

(b) Re-draft the Stores Ledger and complete it under the method of pricing where closing stock represents latest purchase price.

[C.U.B.Com. (Hons.) - 2017]

Solution

Generally any of the following methods of pricing is adopted to issue of materials :

- FIFO Method;
- LIFO Method;
- Weighted Average Method; and
- Simple Average Method

Value of 70 Units issued on 12.03.2017 :

	₹
(i) Under FIFO Method = 70×1.60	112
(ii) Under LIFO Method = 40×3.00	120
30×1.60	<u>48</u>
(iii) Under Weighted Average Method = $\{70 \times (160 + 120) \div (100 + 40)\}$	140
(iv) Under Simple Average Method = $\{70 \times (1.60 + 3) \div (2)\}$	161

From the above it is clear that **Weighted Average Method** was employed in the Stores Ledger for pricing the issue of material.

Closing Stock represents latest purchase price under FIFO Method of pricing issues.

Stores Ledger Account
[FIFO]

Code No

Maximum Level:

Folio:

Minimum Level:

Location:

Description of Material:

Re-order Level

Date	Received				Issued				Balance			Remarks
	GRN	Quantity (Units)	Rate (₹)	Amount (₹)	MRN	Quantity (Kg.)	Rate (₹)	Amount (₹)	Quantity (Units)	Rate (₹)	Amount (₹)	
4.3.2017		100	1.60	160					100	1.60	160	
6.3.2017		40	3.00	120					100	1.60	160	
									40	3.00	120	
									140		280	
12.3.2017						70	1.60	112	30	1.60	48	
									40	3.00	120	
									70		168	
16.3.2017		50	2.00	100					30	1.60	48	
									40	3.00	120	
									50	2.00	100	
									120		268	
20.3.2017		40	6.00	240					30	1.60	48	
									40	3.00	120	
									50	2.00	100	
									40	6.00	240	
									150		508	
26.3.2017						30	1.60	48				
						40	3.00	120	30	2.00	60	
						20	2.00	40	40	6.00	240	
						90		208	70		300	

THEORETICAL QUESTIONS

- Define EOQ. / What is EOQ ? [C.U.B.Com. (General) - 2008, 2011, 2014, 2016]
- How will you calculate 'Maximum Stock Level' ? [C.U.B.Com. (General) - 2009]
- What is Re-order Stock Level ? [C.U.B.Com. (General) - 2010]
- How do you calculate 'Economic Order Quantity' ? [C.U.B.Com. (General) - 2012]
- What is 'Minimum Stock Level' ? [C.U.B.Com. (General) - 2012]
- What is ABC Analysis ? [C.U.B.Com. (General) - 2014, 2016]
- State two limitations of EOQ. [C.U.B.Com. (General) - 2015]
- What is 'Maximum Stock level' ? [C.U.B.Com. (General) - 2015]
- What is Just-in-Time (JIT) Inventory ? [C.U.B.Com. (General) - 2016]
- State the functions of the purchasing department. (Page 3.1)
- What are the qualities of a purchase manager ? (Page 3.3)
- Give specimen of 'Bin Card' and 'Purchase Requisition'. (Page 3.17 and 3.3) [C.U.B.Com. (Hons.) - Adapted]
- Draw specimen draft of a 'Purchase Order'. (Page 3.5)
- State the advantages of centralized purchasing system. (Page 3.5)
- State the advantages of decentralized purchasing system. (Page 3.6)
- What are Just-in-Time purchasing ? What are the advantages of Just-in-Time purchasing ? (Page 3.7)
- What are the functions of receiving department ? (Page 3.7)

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18. What is Goods Received Note ? Give a specimen of a Goods Received Note. (Page 3.8)
19. What are the duties of a store-keeper ? (Page 3.14)
20. State the advantages and disadvantages of centralized stores. (Page 3.15)
21. State the advantages and disadvantages of decentralized stores. (Page 3.16)
22. What is Bin Card ? (Page 3.16)
23. What is Stores Ledger ? (Page 3.17)
24. Distinguish clearly between 'Bin Card' and 'Stores ledger'. (Page 3.18)
25. Is there any necessity of maintaining both 'Bin Card' and 'Stores ledger' ? Answer with reasons. (Page 3.18) *[C.U.B.Com. (Hons.) - 2007]*
26. What are the main considerations for control of material ? (Page 3.19)
27. Explain the concept of 'ABC Analysis' as a technique of inventory control. (Page 3.20)
28. Explain the EOQ. What are the basic assumptions of EOQ model ? (Page 3.22 and 3.26) *[I.C.W.A. (Inter) - Adapted]*
29. Discuss the concept of Economic Batch Quantity (EBQ). (Page 3.39) *[C.A. (Inter) - May, 2000]*
30. What is re-order level ? Explain its relationship with minimum and maximum stock level. (Page 3.43) *[D.U.B.Com. (Hons.) - 2004]*
31. In material management, what do you understand by (i) maximum level; (ii) minimum level; and (iii) re-order level ? (Page 3.43, 3.44 and 3.44) *[I.C.W.A. (Inter) - Adapted]*
32. What are the considerations that are to be kept in view while fixing the maximum and minimum levels of inventory in a large organisation ? (Page 3.44) *[I.C.W.A. (Inter) - Adapted]*
33. Distinguish between :
 - (i) Perpetual inventory system and Continuous stock taking;
 - (ii) Bills of materials and Materials requisition note. (Page 3.53 and 3.71) *[D.U.B.Com. (Hons.) - 2004]*
34. What do you mean by Perpetual Inventory System ? State the advantages of Perpetual Inventory System. (Page 3.51 and 3.51)
35. Write short notes on :
 - (a) ABC Analysis (Page 3.20)
 - (b) Reorder Level (Page 3.43)
 - (c) EOQ (Page 3.22)
 - (d) Perpetual Inventory System (Page 3.51)
 - (e) Periodical Stock Taking (Page 3.52)
 - (f) Materials Requisition Note (Page 3.71)
 - (g) Just-in-Time Purchase (Page 3.6)

PRACTICAL QUESTIONS

- 3.1 Materials X is used in manufacturing a product 'Zed'. The demand for this product for the next year is forecast to be 20,000 units. Each finished unit of product 'Zed' contains 0.72 kg of material X. there is a preparation loss of 10% of materials used. It is not planned to change the stock-holding of product 'Zed' in the near future, but a reduction of 1,000 kg in the stock of material X is planned.
You are required to calculate the quantity of material X that needs to be purchased in the year ahead.
- 3.2 M/s. Precision Works having a capacity of 4,800 tonnes per annum manufactures a product which passes through two production departments A and B. The sales forecast for the next financial year envisages full utilization of production capacity in the following customer-mix :

Customer P : 3,000 tonnes @ ₹ 1.50 lakh/tonne

Customer Q : 1,800 tonnes @ ₹ .200 lakh/tonne

Over the years the company has established three possible sources of raw material suppliers as under:

Supplier X : is prepared to supply 3,600 tonnes of input materials @ ₹ 0.60 lakh/tonne.

Supplier Y : offers to supply 4,000 tonnes of input materials @ ₹ 0.55 lakh/tonne.

Supplier Z : agree to supply @ ₹ 0.65 lakh/tonne only if the entire input requirement is taken from him but offers a discount of 5%.

The cost of transport for bringing the input materials from suppliers' point is as under :

Supplier X : ₹ 0.02 lakh/tonne to be spent by M/s. Precision Works.

Supplier Y : ₹ 0.03 lakh/tonne to be spent by M/s. Precision Works.

Supplier Z : the transport cost is to be paid by the supplier.

The average level of scrap arising from the two production departments A and B are 5.0% and 10.0% respectively calculated on the first output. The realisable value of scrap sold out is ₹ 0.15 lakh/tonne for department A and ₹ 0.20 lakh/tonne for department B. this realization is credited to the cost of production.

Budgets for the department cost for the next year are as under :

	Dept. A	Dept. B
Direct labour	₹ 16.00 lakhs	₹ 48.00 lakhs
Overheads	₹ 64.00 lakhs	₹ 144.00 lakhs

Based on the above data, you are required to work out the following :

- Gross quantity of input material required to be procured.
- Selection of the source of procurement and the price at which this inputs are to be procured.
- Total profitability for next year assuming a distribution cost of 15% on cost of production.

[I.C.W.A. (Inter) - Adapted]

- 3.3 The average annual consumption of material is 20,000 kg at a price of ₹ 2 per kg. The storage cost is 16% on average inventory and the cost of placing one order is ₹ 50. How much is to be purchased at a time?

- 3.4 The annual demand for a product is 6,400 units. The unit cost is ₹ 6 and inventory carrying cost per unit per annum is 25% of the average inventory cost. If the cost of procurement is ₹ 75, determine :

- economic order quantity (EOQ);
- number of orders per annum; and
- Time between two consecutive orders.

[C.S. (Inter) - Adapted]

- 3.5 ACC Ltd. manufactures a product and the following particulars are collected for the year ended March 2017 :

Monthly demand (units)	1,000
Cost of placing an order (₹)	100
Annual carrying cost (₹ per unit)	15
Normal usage (units per week)	50
Minimum usage (units per week)	25
Maximum usage (units per week)	75
Reorder period (weeks)	4-6

You are required to calculate :

- Reorder quantity; (2) Reorder level; (3) Minimum level; (4) Maximum level; and (5) Average stock level.

[C.S. (Inter) - Adapted]

- 3.6 From the following information you are required to calculate maximum level, minimum level and ordering level for materials X and Y :

	X	Y
Normal usage per week	150	200
Re-ordering quantity	900	1,500

3.118 Accounting for Materials

Maximum usage per week	225	250
Minimum usage per week	75	100
Re-ordering period (week)	12 to 18	6 to 12

[I.C.W.A. (Inter) - Adapted]

- 3.7 PQR Ltd. manufactures a special product, which required ZED. The following particulars were collected for the year 2016-17 :

(i) Monthly demand of ZED	7,500 units
(ii) Cost of placing an order	₹ 500
(iii) Re-order period	5 to 8 weeks
(iv) Cost per unit	₹ 60
(v) Carrying cost % p.a.	10%
(vi) Normal usage	500 units per week
(vii) Minimum usage	250 units per week
(viii) Maximum usage	750 units per week

Required :

- (i) Re-order quantity; (ii) Re-order level; (iii) Minimum stock level; (iv) Maximum stock level; and (v) Average stock level.

[C.A. (Inter) - Adapted]

- 3.8 In a company weekly minimum and maximum consumption of material A are 25 and 75 units respectively. The re-order quantity as fixed by the company is 300 units. The material is received within 4 to 6 weeks from issue of supply order. Calculate the minimum level and maximum level of material A.

[C.A. (Inter) - Adapted]

- 3.9 About 40 items are required every day for a machine. A fixed cost of ₹ 50 per order is incurred for placing an order. The inventory carrying cost per item amounts to ₹ 0.02 per day. The lead period is 32 days. Computer : (i) economic order quantity; and (ii) re-order level.

[B.Com. (Hons.) - Adapted]

- 3.10 SK Enterprise manufactures a special product ZEE. The following particulars were collected for the year 2017 :

Annual consumption	12,000 units (360 days)
Cost per unit	₹ 1
Ordering cost	₹ 12 per order
Inventory carrying cost	24%
Normal lead time	15 days
Safety stock	30 days consumption

Required :

- (i) Re-order quantity
(ii) Re-order level
(iii) What should be the inventory level (ideally) immediately before the material order is received ?

[C.A. (Inter) - Adapted]

- 3.11 PQR Limited produces a product which has a monthly demand of 52,000 units. The product requires a component X which is purchased at ₹ 15 per unit. For every finished product, 2 units of component X are required. The ordering cost is ₹ 350 per order and the carrying cost is 12% p.a.

Required :

- (i) Calculate the economic order quantity for component X.
(ii) If the minimum lot size to be supplied is 52,000 units, what extra cost the company has to incur?
(iii) What is the minimum carrying cost, the company has to incur ?

- 3.12 A manufacturing company has an expected usage of 6,00,000 units of a certain product next year. The cost of processing an order is estimated to be ₹ 300 and the average carrying cost per unit per year is estimated to be ₹ 2.40 per unit. The order is to be placed in a multiple of 1,000 units. The lead time of an order is 7 days and the company wishes to keep a reserve supply of 6,000 units. Assuming 300 working days per year, calculate (a) economic order quantity; and (b) re-order level.

[K.U.B.Com. (Hons.) - 2008]

- 3.12 About 200 units are required per quarter. ₹ 100 per order is incurred for placing an order. The inventory carrying cost per unit is ₹ 4. The re-order level is 350 units. The minimum usage is 25 units per week and the re-order period is 4 to 6 weeks.

Compute :

- (a) Economic order quantity; and (b) Maximum level.

[C.U.B.Com. (Hons.) - 2000]

- 3.14 A company manufactures a product from a raw material, which is purchased at ₹ 30 per kg. the company incurs a handling cost of ₹ 2,700 plus freight of ₹ 3,300 per order. The incremental carrying cost of inventory of raw material is ₹ 0.75 per kg per month. In addition, the cost of working capital finance on the investment in inventory of raw material is ₹ 11 per kg. per annum. The annual production of the product is 2,70,000 units and 4.5 units are obtained from one kg of raw material.

- (a) Calculate the economic order quantity of raw materials.
(b) Advise, how frequently should orders for procurement be placed.
(c) If the company proposes to rationalize placement of orders on quarterly basis, what percentage of discount in the price of raw materials should be negotiated ?

- 3.15 The complete gardener is deciding on the economic order quantity for two brands of lawn fertilizers : Super Grow and Nature's Own. The following information is collected :

	Fertiliser	
	Super Grow	Nature's Own
Annual demand	2,000 bgs	1,280 bags
Relevant ordering cost per purchase order	₹ 1,200	₹ 1,400
Annual relevant carrying cost per bag	₹ 480	₹ 560

Required :

- (i) Compute EOQ for Super Grow and Nature's Own.
(ii) For the EOQ, what is the sum of the total annual relevant ordering costs and total annual relevant carrying costs for Super Grow and Nature's Own.
(iii) For the EOQ, compute the number of deliveries per year for both the fertilizers.

- 3.16 PQR Tubes Ltd. are the manufacturer of picture tubes for T.V. The following are the details of their operations during 2016-17 :

Ordering cost	₹ 100 per order
Inventory carrying cost	20% p.a.
Cost of tubes	₹ 500 per tune
Normal usage	100 tubes per week
Minimum usage	50 tubes per week
Maximum usage	200 tubes per week
Lead time to supply	6 - 8 weeks

Required :

- (i) Economic order quantity. If the supplier is willing to supply quarterly 1,500 units at a discount of 5%, is it worth accepting ?
(ii) Re-order level
(iii) Maximum level of stock
(iv) Minimum level of stock.

3.120 Accounting for Materials

3.17 From the details given below, calculate :

(i) Re-ordering level, (ii) Maximum level, (iii) Minimum level, (iv) Danger level.

Re-ordering quantity is to be calculated on the basis of following information :

Cost of placing a purchase order is ₹ 20.

Number of units to be purchased during the year is 5,000.

Purchase price per unit inclusive of transportation cost is ₹ 50.

Annual cost of storage per unit is ₹ 5.

Details of lead time : average 10 days, maximum 15 days, minimum 6 days. For emergency purchase 4 days.

Rate of consumption : average 15 units per day, maximum 20 units per day.

3.18 IPL Limited uses a small casting in one of its finished products. The castings are purchased from a foundry. IPL Limited purchases 54,000 castings per year at a cost of ₹ 800 per casting.

The castings are used evenly throughout the year in the production process on a 360-days per year basis. The company estimates that it costs ₹ 9,000 to place a single purchase order and about ₹ 300 to carry one casting in inventory for a year. The high carrying costs result from the need to keep the castings in carefully controlled temperature and humidity conditions, and from the high cost of insurance. Delivery from the foundry generally takes 6 days, but it can take as much as 10 days. The days of delivery time and percentage of their occurrence are shown in the following tabulation :

Delivery time (days)	6	7	8	9	10
Percentage of occurrence	75	10	5	5	5

Required :

(i) Compute the economic order quantity (EOQ).

(ii) Assume the company is willing to assume a 15% risk of being out of stock. What would be the safety stock ? The re-order point ?

(iii) Assume the company is willing to assume a 5% risk of being out of stock. What would be the safety stock / The re-order point ?

(iv) Assume 5% stock-out risk. What would be the total cost of ordering and carrying inventory for one year ?

(v) Refer to the original data. Assume that using process re-engineering the company reduces its cost of placing a purchase order to only ₹ 600. In addition company estimates that when the waste and inefficiency caused by inventories are considered, the true cost of carrying a unit in stock is ₹ 720 per unit.

(a) Compute the new EOQ.

(b) How frequency would the company be placing an order, as compared to the old purchasing policy?

3.19 A company has the option to procure a particular material from two sources :

Source I assures that defectives will not be more than 2% of supplied quantity.

Source II does not give any assurance, but on the basis of past experience to supplies received from it, it is observed the defective percentage is 2.8%.

The material supplied in lots of 1,000 units. Source II supplies that lot at a price, which is lower by ₹ 100 as compared to Source I. The defective units of material can be rectified for use at a cost of ₹ 5 per unit.

You are required to find out which of the two sources is more economical.

3.20 ABC Company buy in lots of 125 boxes which is a three months supply. The cost per box is ₹ 125 and the ordering cost is ₹ 250 per order. The inventory carrying cost is estimated at 20% of unit value per annum.

You are required to ascertain :

(i) What is the total annual cost of the existing inventory policy ?

(ii) How much money would be saved by employing the economic order quantity (EOQ) ?

[C.S. (Inter) - Adapted]

- 3.21 The following data are available in respect of the material used in Progressive Engineering Co. for the year 2016 :

Material purchase price per unit = ₹ 12.

Interest per unit per month = ₹ 0.10.

Clerical and Administration cost per order = ₹ 200.

Insurance charges per annum = 12%.

Wastage of material per unit per quarter = 2%.

Cost of buying office, inspection and accounting per order = ₹ 400.

Quarterly consumption of materials = 3000 units.

You are required to compute :

- Best Ordering Quantity of the material buying;
- Time gap between two consecutive orders; and
- Total inventory cost at optimal policy of buying.

[C.U.B.Com. (Hons.) - 2017]

- 3.22 From the following particulars, calculate the best quantity to be ordered :

Ordering Quantity (in kg.)	Price per kg. (₹)
Less than 500	10.00
500 and less than 1,600	9.60
1,600 and less than 4,000	9.40
4,000 and less than 8,000	9.20
8,000 and above	9.00

The annual requirements of the material is 8,000 kg. Stock holding (carrying) cost is 20% of material cost per annum. Ordering (re-ordering) cost per order is ₹ 10.

[C.U.B.Com. (Hons.) - Adapted]

- 3.23 Assume that the following quantity discount schedule for a particular bearing is available to a retail store :

Order size (units)	Discount
0 - 49	0%
50 - 99	5%
100 - 199	10%
200 and above	12%

The cost of a single bearing with no discount is ₹ 30. The annual demand is 250 units. Ordering cost is ₹ 20 per order and annual inventory carrying cost is ₹ 4 per unit. Determine the optimal order quantity and the associated minimum total cost of inventory and purchasing costs, if shortages are not allowed.

[C.U.B.Com. (Hons.) - Adapted]

- 3.24 A firm is able to obtain quantity discounts on its order of material as follows :

Price per tone (₹)	Tonnes
6.00	Less than 250
5.00	250 and less than 800
5.80	800 and less than 2,000
5.70	2,000 and less than 4,000
5.60	4,000 and over

The annual demand for the material is 4,000 tonnes. Stock holding costs are 20% of material cost per annum. The delivery cost per order is ₹ 6. You are required to calculate the best quantity for order.

[I.C.W.A. (Inter) - Adapted]

3.122 Accounting for Materials

- 3.25 From the following particulars relating to material 'ESS', prepare a Stores Ledger Account under FIFO system :

2017

July 1	Balance b/f - 900 units @ ₹ 3.30.
5	Purchased 400 units @ ₹ 4.20.
10	Issued 1,000 units.
16	Issued 200 units.
19	Returned from production centre issued on 10.7.2017 - 80 units.
25	Purchased 800 units @ ₹ 4.50.
30	Issued 500 units.

A surplus of 20 units was noticed on 21.7.2017

[C.U.B.Com. (Hons.) - Adapted]

- 3.26 From the following, prepare Stores Ledger for the month of February 2017 under (i) LIFO and (ii) Weighted Average Method.

Date		Receipts		Issues	
		Units	Rate per Unit	Date	Units
		(₹)			
Feb. 3	Purchased	450	16.20	Feb. 4	350
7	Purchased	780	17.50	6	220
13	Purchased	340	16.80	9	670
18	Returned from Workshop				
	(Issued on Feb 7)	65		16	325
24	Purchased	670	16.50	21	270
				26	430

Further information : Opening balance on 1.2.2017 - 620 units @ ₹ 15.40 per unit. A shortage of 24 units was noticed and recorded on 15th February.

[C.U.B.Com. (Hons.) - Adapted]

- 3.27 The following transactions took place in respect of a raw material during the month of January, 2017 :

Date	Particulars	Kg.	Rate per Kg. (₹)
January			
1	Balance	1,000	9
2	Purchased	1,500	10
5	Issued	390	-
8	Shortage	10	-
15	Surplus returned by a Production Department	200	12
20	Issued	1,000	-
25	Received from Vendor	300	14
28	Issued	1,200	-
31	Issued	100	-

You are required to write up the Stores Ledger Account applying Simple Average Method of pricing of issues.

[C.U.B.Com. (Hons.) - Adapted]

- 3.28 From the following information, select the most suitable method of pricing material issues and write up a Stores Ledger Card based on that method :

2017

January	1	Opening balance 24,000 kg @ ₹ 7,500 per tonne.
	1	Purchased 44,000 kg. @ ₹ 7,600 per tone.
	3	Issued 10,000 kg.
	5	Issued 16,000 kg.
	12	Purchased 10,000kg. @ ₹ 7,800 per tonne.
	13	Issued 24,000 kg.
	18	Issued 25,000 kg.
	22	Purchased 50,000kg. @ ₹ 8,000 per tonne.
	28	Issued 20,000kg.
	31	Issued 22,000 kg.

On 24th January, 2017 a shortage of 200 kg. was noticed in stock taking.

[C.U.B.Com. (Hons.) - Adapted]

- 3.29 From the data given, answer the following :

- What is the simple average price of the four weeks' receipt of material A ?
- What is the weighted average price of the four weeks' receipts of material B ?
- What is the value of the balance of material A, in stocks at the close of the fourth week if issues are priced on a LIFO basis ?
- What is the value of the fourth week's issues of material B if they are priced on a FIFO basis ?

Week	Raw Material Received				Issued	
	A		B		A	B
	Kg	₹	Kg	₹	Kg	Kg
1st	250	1,000	1,250	1,690	175	1,500
2nd	300	1,260	1,400	1,960	250	1,200
3rd	200	880	750	1,050	300	1,300
4th	250	900	1,600	2,400	300	1,000

Stores opening stock : A - 200 kg : ₹ 720; B - 2,000 kg : ₹ 2,900.

[I.C.W.A. (Inter) - Adapted]

- 3.30 Stocks are issued at standard price and the following transactions occurred in a specific material :

2017

1st Jan	Stock	10 tons at ₹ 240 per ton
4th Jan	Purchased	5 tons at ₹ 260 per ton
5th Jan	Issued	3 tons
12th Jan	Issued	4 tons
13th Jan	Purchased	3 tons at ₹ 250 per ton
19th Jan	Issued	4 tons
26th Jan	Issued	3 tons
30th Jan	Purchased	4 tons at ₹ 280 per ton
31st Jan	Issued	3 tons

The debit balance of price variation on 1st January was ₹ 20. Show the Stock Account for the material for the month of January, indicating how would you deal with the difference in material price variance when preparing the Profit and Loss Account for the month.

[I.C.W.A. (Inter) - Adapted]

3.124 Accounting for Materials

- 3.31 The stores ledger of a manufacturing company recorded for Material Q for the month of April, 2017 is as follows :

2017 April	Qty. Units	Rate per unit ₹	Value ₹	Qty. Units	Rate per unit ₹	Value ₹
1	-	-	-	100	2	200
10	200	2	400	100	2	-
				200	2	600
15	300	4	1,200	100	2	-
	-	-	-	200	2	-
	-	-	-	300	4	1,800
16	-	-	-	100	2	-
	-	-	-	300	4	1,400
20	-	-	-	100	4	400
25	400	5	2,000	100	4	-
	-	-	-	400	5	2,400
28	-	-	-	200	5	1,000
29	-	-	-	50	5	250

- (i) State the method of pricing that was employed in the ledger.
(ii) Complete the store ledger as per the method followed.

[D.U.B.Com. - Adapted]

- 3.32 The following transactions took place in respect of a certain item of material for the month of September, 2017 :

2017 September	Qty. Units	Rate per unit ₹	Value ₹	Qty. Units	Rate per unit ₹	Value ₹
1	3,000	1.50				
2	4,000	1.525				
7				2,200		3,300
10				1,600		2,420
14				2,000		3,050
15	4,800	1.60				
19				1,800		2,790
21	10,000	1.625				
25				1,800		2,880
29				4,800		7,740

At physical stock-taking on September 30, it was revealed that 7,500 units were in stock.

You are required to :

- (a) State the method of pricing you consider was employed.
(b) Calculate the value of transactions given and make any entries you consider necessary to complete the account for the month of September, 2012. Also give an explanation to the adjustments included.

[I.C.M.A. (Inter) - Adapted]

- 3.33 The following is a summary of the receipts and issues of materials in a factory during the month of December, 2017 :

- 1st Opening balance 500 units at ₹ 25 per unit.
3rd Issue balance 70 units.
4th Issue balance 100 units.
8th Issue balance 80 units.
13th Received from supplier 200 units at ₹ 24.50 per unit.

- 14th Received to Store 15 units at ₹ 24 per unit.
 16th Issue 180 units.
 20th Received from supplier 240 units at ₹ 24.75 per unit.
 24th Issue 304 units.
 25th Received from supplier 320 units at ₹ 24.50 per unit.
 26th Issue 112 units.
 27th Returned to store 12 units at ₹ 24.50 per unit.
 28th Received from supplier 100 units at ₹ 25 per unit.

Write up Stores Ledger Account on the basis of 'First in First out'. This revealed that on 15th there was a shortage of 5 units and another on 27th of 8 units.

How the shortage will be treated in Cost Account ?

[C.A. (Inter) - Adapted]

Guide to Answers

Practical Questions

- 3.1. Quantity of material X to be purchased :
 Quantity required = $26,000 (0.72 \div 0.9) = 20,800$ kg.
 Quantity to be purchased : $20,800 \text{ kg} - 1,000 \text{ kg} = 19,800$ kg.
- 3.2. (a) Gross input required: 5,520 tonnes. (b) 4,000 tonnes from source 'Y' & 1,520 tonnes from source 'X'.
- 3.3. 500 kgs.
- 3.4. (i) EOQ : 800 units; (ii) 8 orders; (iii) 1.5 monhts.
- 3.5. (1) Re-order quantity : 186 units; (2) Re-order level : 450 per week; (3) Minimum level : 200 units; (4) Maximum level : 536 units; (5) Average level : 368 units.
- 3.6.
- | | X | Y |
|----------------|-------|-------|
| Maximum level | 4,050 | 3,900 |
| Minimum level | 1,800 | 1,200 |
| Re-order level | 4,050 | 3,000 |
- 3.7. (i) Re-order quantity : 3,873 units; (ii) Re-order level : 6,000 units; (iii) Minimum stock level : 2,750 units; (iv) Maximum stock level : 8,623 units; (v) Average stock level : 5,687 units.
- 3.8. (i) Minimum level : 200 units; (ii) Maximum level : 650 units; (iii) Re-order level : 450 units.
- 3.9. (i) EOQ : 500 items; (ii) Re-order level : 1,600 items.
- 3.10. (i) Re-order quantity : 1095.4 units or say, 1096 units. (ii) Re-order level : 1,500 units
 (iii) Safety : 1,000 units
- 3.11. (i) EOQ : 15,578 units of components. (ii) Extra cost incurred : $51,000 - 28,040 = ₹ 22,960$.
 (iii) Minimum carrying cost : ₹ 14,020.
- 3.12. (a) EOQ : 12,247 units; (b) Re-order level : 20,000 units.
- 3.13. (a) EOQ : 200 units; (b) Maximum stock level : 450 units.
- 3.14. (a) EOQ : 6,000 kg; (b) 36 days (10 orders); (c) 3%
- 3.15.
- | | Super Grow | Nature's Own |
|-------------------------------------|------------|--------------|
| (i) EOQ (in bags) | 100 | 80 |
| (ii) Annual relevant cost (in ₹) | 48,000 | 44,800 |
| (iii) Number of deliveries per year | 20 orders | 16 orders |
- 3.16. (i) EOQ : 102 tubes (approx.). If supplier's offer a 5% discount, the manufacturer will save ₹ 68,601. Therefore, supplier's offer must be accepted. (ii) Re-order level : 1,600 tubes; (iii) Maximum level of stock: 1,402 tubes; (iv) Minimum level of stock : 900 tubes.
- 3.17. (i) Re-order level : 300 units; (ii) Maximum level : 440 units; (iii) Minimum level : 150 units; Danger level: 40 units.

3.126 Accounting for Materials

- 3.18 (i) EOQ : 1,800 casting. (ii) Safety stock : 1,050 castings
(iii) Safety stock : 450 castings; Re-order Point : 1,350 castings.
(iv) Cost of ordering : ₹ 2,70,000; Total cost of carrying ₹ 4,05,000
(v) (a) New EOQ : 300 castings
(b) After every 2 days (360 day a year) : 180 orders per annum.
- 3.19 Supply of materials from Source II is more economical.
- 3.20 (i) Annual cost of existing policy 65,062.50
(ii) Annual cost with EOQ 65,000.00
Savings in Cost (if EOQ is adopted) 62.50
- 3.21 Best order quantity — 2000 units; (b) Time gap — 2 months; and (c) Total inventory cost — ₹ 1,51,200.
- 3.22 Best quantity to be ordered : 1,600 kg. Minimum cost will be ₹ 76,754.
- 3.23 (i) Optimal order quantity = 100 units.
(ii) Total cost = ₹ 7,000.
- 3.24 The best quantity to order is 800 tonnes. Total cost ₹ 23,694.
- 3.25 Closing stock : 500 units; Value of closing stock : ₹ 2,250.
- 3.26 Value of Closing Stock
(i) LIFO: 396 @ ₹ 15.40 = 6,098
240 @ ₹ 16.50 = 3,960
646 10,068
(ii) Weighted Average L 636 units @ ₹ 16.614 = ₹ 10,567.
- 3.27 Closing stock : 300 kg. Value of closing stock : ₹ 770.
- 3.28 As the prices of materials purchased are steadily increasing, the most suitable method of pricing the issues of material is LIFO method.
Quantity of closing stock : 7,800 kg. Value of closing stock ₹ 84,900.
- 3.29 1. The simple average price of the four weeks' receipts of material A is ₹ 4.11 per kg.
2. The weighted average price of the four weeks' receipts of material B is ₹ 1.42 per kg.
3. Closing value of material A under LIFO method : ₹ 630 (175 kg.).
4. Closing value of material B under FIFO method : ₹ 2,820 (1,000 kg.).
- 3.30 **Calculation of Standard Price :**
Value of opening stock = $10 \times ₹ 240$ 2,400
Add: Price variance, not yet transferred
to Costing Profit and Loss Account 20
Total Value of 10 tons 2,420
Standard Price for Issue per ton = ₹ 242 (₹ 2,420 ÷ 10 tons)
Closing Stock :
Standard 5 tons @ ₹ 242 1,210
Actual 5 tons 1,456
Difference (adverse) 246
Value of total issues 4,114
- 3.31 (i) FIFO method of pricing materials has been employed in the Stores Ledger.
(ii) Value of closing stock : ₹ 250 (50 units @ ₹ 5 each).
- 3.32 (a) FIFO method of pricing issue of materials has been adopted.
(b) Value of closing stock : ₹ 12,187.50 (7,500 units @ ₹ 1.625). There is a shortage of 100 units on 30th September.
- 3.33 Value of closing stock : ₹ 12,850; the quantity of closing stock is 528 units.
If the shortage is normal, it can be treated as works overhead. However, if the shortage is abnormal, it is to be charged to Costing Profit and Loss Account.

Employee Cost and Incentive Systems

Section A : Personnel and Payroll

Introduction

In a manufacturing organisation man and machine together converts materials into finished goods. In a service organisation such as software company, hospital and hotel, human contribution is more than anything else. Therefore, the most challenging job for the management is to control, motivate and account for this human cost factor. A motivated labour force, loyal to company and happy with the labour policy of the organisation can make a great contribution towards achieving the organisation's goal.

Proper records related to employees, which are easily understood and easily available are very important in maintaining harmonious relationship between management, employees, labour unions and government agencies. Harmonious relationship with workers will help to increase the efficiency of the work force and will help to produce products at the lowest possible cost.

Fundamentally, a labour cost consists of hourly rate, the daily wages or weekly wages or monthly salary of the employees. In addition to basic pay, dearness allowance, house rent allowance, overtime earnings, night-shift allowances, production incentives are included in the labour costs. In many organisations, free lunch, free medical treatment, LTA (Leave Travel Assistance) or LTC (Leave Travel Concession) are provided. All these items must be included in the labour cost where they exist.

For cost accounting purpose, labour cost is divided into Direct labour cost and Indirect labour cost. Direct labour cost is directly charged to the job or process or operation. Indirect labour cost is treated as a component of production overhead.

The Personnel / Human Resource Department

Recruitment, transfer, training and discharge of labour are normally carried out by a separate department of the organisation called Personnel Department or Human Resource Department.

The employees in the personnel department are not directly involved in production but they are helping to provide efficient and motivated work force. Generally, the personnel department is headed by a manager called Personnel Manager / HRD Manager. On receiving request for new personnel from production department or other departments, the personnel manager will consult previous applications or will advertise in the newspaper or other media.

Before selecting any candidate, personnel department conducts written test, group discussion and personal interviews. Final interview is conducted by the departmental manager or foreman (under whom the candidate will work) along with the personnel manager.

After recruitment, the new employee is given an '*Employee Number*' and it is retained by him throughout his period of service in the organisation and it acts as a quick means of reference. After the allotment of Employee Number, a Service Record Card is prepared for every employee and this is designed to record all personal particulars of the employee, e.g., name, permanent address, date of birth, age, qualification, etc. On the reverse side of the card, space is given for sickness records, absenteeism, holiday periods, training details, etc.

4.2 Employee Cost and Incentive Systems

A format of Service Record Card is given below :

Front

Service Record Card

Name of the Employee :					
Employee Number :					
Personal Details		Employment Details			
Permanent Address :		Date	Department	Grade	Pay Scale
Present Address :					
Father's name :					
Date of Birth :					
Age :					
Date of Employment :					
Married / Single :					
Height : Weight :					
Blood Group :					
Previous Employment Details :		Date	Training, Progress and Conduct		
			Particulars		
Reference :					
Special Note :					

Back

Time Keeping and Merit

Year	Days Lost	Overtime Hours	Lost Time Hours	Earned Leave Carried Forward	Merit

Date of Leaving :

Reasons for Leaving :

General remarks :

After the appointment of the new employee, the following procedure is followed :

- Notice is given to the concerned department which has sent the requisition for new personnel, stating the date of joining of the employee. When the new employee reports for duty, the personnel manager or his subordinate takes him to the departmental head along with necessary papers.
- Similarly, notice is given to the payroll department stating the details of pay scale and other details (e.g., PAN card number, bank account number, etc.)

Recording Labour Costs

Labour costs recording involves the following :

- (i) Collection of total time worked in the factory and specific time worked on particular job, process or department. The **time keeping department** of the organisation is entrusted with this work.
- (ii) Calculating gross earnings and net earnings of workers based on method of payment of wages and salaries. The **payroll department** of the organisation is entrusted with this work.
- (iii) Analysis and distribution of labour costs to different jobs, processes or departments. The **cost department** is entrusted with this work.

The Time Keeping Department

In most organisations, time keeping is handled by a regular time keeping department, which operates as a separate unit.

The main function of this department is to provide reliable evidence of the employee's presence in the factory during the working hours. The time keeping department is also responsible for providing information in respect of work done by the employee during his stay in the factory.

Supply of reliable data by the time keeping department is necessary for the payroll department to compute and prepare the payroll. These data are also the basis on which the cost accounting department charges direct labour costs to jobs or processes and applies overheads.

Methods of Recording Hours Worked

Attendance Registers, Time Clock and other devices are used to capture data relating to hours worked by the employee. The size of the organisation, the nature of employee (permanent or temporary) will determine the method of recording hours worked by the employee.

Attendance Register

The most common form of attendance record is a manual register. This is extensively used in small and medium-size organisations. Each employee puts his signature against his name in the register with arrival time and departure time. Generally, departmental heads are given the power to maintain the attendance register properly.

This method of recording attendance is very simple but is subject to considerable abuse by the employees for nepotism.

Time Recording Clocks

Many large organisations use 'Time Recording Clocks' for capturing data relating to arrival and departure of the employees in the factory premises. A clock card, bearing the name of the employee, is issued to individual employee. At the time of entering into the factory premises, the employee inserts the clock card into the 'Time Recording Clock' which automatically prints the day, date and time of arrival on the card. Some machines print particulars of late arrival or overtime in red, the change-over from black to red is done automatically at pre-determined times.

Time Recording Clocks are placed either at the entrance of the factory premises or in various departments.

A responsible security office will be in charge of the clocks to ensure that workers do not stamp each other's cards.

It is the practice for supervisor or works manager to authorize these cards at the end of the shift / day / week or other designated periods by signing each one. The payroll department will calculate remuneration on the basis of data available from these clock cards.

A sample picture of time recording clock is given in the next page :

4.4 Employee Cost and Incentive Systems



[Fig. 4.1]

Biometric Time Clocks

Biometrics or biometric authentication refers to the process of identification of humans using their unique characteristics like fingerprints, voice, retinal patterns, iris, palm print, face recognition, etc. Most modern organisations use Biometrics as a form of identification and access control for employees. These unique characteristics, mentioned above, help the system to identify an individual uniquely and thus he or she can be granted or denied access to a building, a particular room, or a computer system.

A biometric time attendance system is a biometric time clock that tracks employee attendance, including when they clock in, when they clock out, and if they showed up when they were scheduled to work. A biometric time clock has a built in fingerprint scanner that helps in identifying the employee uniquely and in turn, in accurate time keeping.

A biometric attendance system not only acts as an accurate time keeper, but also controls unauthorized access to the office building. Organisations may restrict access to certain areas of the building for the security purpose, in such a way, that only the intended group of people can enter that area, when the access system approves their fingerprint. *A simple biometric time clock is given below :*



[Fig. 4.2]

Magnetic Card

Some organisations use an electronic system to record hours worked. Employees are issued magnetic cards (similar to a credit card) which they swipe through a magnetic card reader as they enter and leave the factory.

If a time card system is used, all time cards are collected from the card rack at the end of the work and sent to the time keeping department for calculation of total hours worked by each worker.

If magnetic cards or biometric time clocks are used, the time clock data of each worker is sent electronically to the time keeping department via computer network.

$$\text{Hours worked} = \text{Leaving time} - \text{Entry time}$$

Time Booking

The 'clock card' provide the hours in attendance but it does not provide details of time spent in different jobs/ processes or departments.

The 'time ticket' or 'job ticket' is used to capture data relating to the activities of the employee during the period at work. This document will be completed by the employee and will record each job or process the person is engaged upon during each working day. The accurate recording of time on time ticket or job ticket is very important because these reports show how the employees spend their time in the factory premises.

Only one ticket is issued by the foreman to a worker at a time. After finishing the job, the operator records the time (usually by clock) spent on that job and submits it to the foreman.

A new job ticket is issued immediately with the starting time recorded on it. If it is not possible to issue new job ticket for lack of job or waiting for materials, immediately an idle time card is issued to record idle time. This will help to account for non-productive time.

Logically, the hours spent at the factory premises as per 'clock card' or 'magnetic card' or 'biometric clock' should be equal to the time recorded in the 'Time Ticket' or 'Job Ticket'. But in majority of the cases both time may not tally. This is because there may be time gap between taking up a new job after finishing the previous job. The difference in time is generally recorded as idle time.

The time tickets / job tickets are the basic supporting documents for preparing labour cost distribution.

A specimen of a Job Ticket is given below :

Job Ticket

Name of the Employee : Ram Lal Sribastab

Employee Number : 7786

Department : Finishing

Date : 1st December, 2017

Job / Department Number	Time	Time	Total	Worked Performed	
	Started	Finished	Hours	Code	Description
056	6 a.m.	9 a.m.	3	132	Polishing
075	9 a.m.	1 p.m.	4	088	Sanding
085	1 p.m.	2 p.m.	1	099	Finishing touch
	Total		8		

Overtime : In simple language, overtime means the hours worked beyond the normal working hours in a day or week. In India, working hours of the factory workers are governed by The Factories Act, 1948. This Act has defined '**overtime**' as follows :

"Any work beyond 9 hours in a day or beyond 48 hours in a week represents overtime work". The Act provides that the overtime hours should be paid at the double rate (including allowances). Where Factories Act is not applicable, overtime work is paid as per the agreement between the employer and the employee. Generally, the overtime rate is higher than the normal hourly rate.

4.6 Employee Cost and Incentive Systems

Example : (i) Hourly rate = ₹ 50 per hour.

(ii) Hours worked in a week : 50 hours

The wages will be calculated as follows :

48 hours @ ₹ 50 per hour	2,400
<u>2 hours @ ₹ 100 per hour</u>	<u>200</u>
50	2,600

Extra amount paid (2×50) ₹ 100 is termed as '*overtime premium*'.

Treatment of 'overtime premium' and 'idle time' in Cost Accounting will be taken up after few pages.

The Payroll Department

In big organisations, payroll department is operated as a separate unit. The work and functions of this department depend upon the size and complexity of particular organisation. Generally, the following functions are performed by the payroll department :

1. Calculation of the total hours worked by each employee during the week / month as the cases may be.
2. Calculation of the regular hours and overtime hours.
3. Checking and entering wage rates of each employee.
4. Computation of normal wages and overtime wages.
5. Computation of gross wages after considering basic pay, dearness allowance, house rent allowance, production bonus, special allowance, overtime premium, etc.
6. Computation of payroll deductions, e.g., PF deduction (employee's contribution), tax deducted at source, loan instalment, etc.
7. Computation of net pay due to each employee.
8. Preparation of payroll registers, pay cheques or pay packets or payment statement for instructing the bank for payment of salary through bank account of the employee.
9. Preparation of returns for tax deducted at source (TDS).
10. Depositing TDS and PF contribution in appropriate accounts.
11. Preparing 'pay slip' for distribution amongst the employees.
12. Addressing the complaint of employees relating to computation of salary / deductions, etc.
13. Disbursing of pay cheques, pay packets, etc.
14. Supplying payroll data to accounts department and finance manager.

Payroll Documents and Records

Documents and records to be kept by the payroll department will depend upon the requirement of the particular organisation. However, the following documents, forms and records are common to all payroll system:

1. Attendance register / clock card / computer printout for attendance (when biometric clocks or magnetic card is used for attendance);
2. Payroll register;
3. Pay envelopes with attached pay stubs or pay cheques details (number, branch and amount);
4. Individual earning records.

Attendance Register / Clock Cards

Attendance register / clock cards are the main source of information for calculation of remuneration of each employee. Time worked by each employee is gathered from attendance register or clock cards.

Remuneration is calculated on the basis of methods of payment of remuneration. (It has been discussed in detail in Section B of this chapter) and rate of wages / pay scale.

Payroll Register

Payroll register is also called payroll summary. It can be prepared manually or electronically. This document contains the following information :

- i. Name, clock number of each employee;
- ii. Number of normal hours worked and overtime hours worked;
- iii. The gross pay (in details - basic pay + D.A. + H.R.A., etc.);
- iv. The net pay showing different deductions from gross pay;
- v. Cheque number, amount and date of the pay cheque.

Pay Cheques / Pay Envelopes

Many organisations issue account payee cheque in the name of the employee to pay his remuneration. Pre-printed stationery is used for issuing cheques. Cancelled / spoiled cheques are preserved for audit purposes. Pre-printed stationery must be kept in a secured place and cheque printing must be given to a responsible officer of the payroll department. Pay cheques are provided with a pay slip detailing gross pay, deductions and net pay.

Many organisations use pay envelop for payment of remuneration to casual or temporary workers. **For example**, almost all tea gardens in India use pay envelopes for payment of weekly / fortnightly wages to regular as well as casual workers. On the face of the envelope, the name of the employee, employee number and payment details are written before filling it with notes and coins (Net pay). The pay envelope is handed over to the employee on the date of payment of remuneration. The employee in turn signs the payment sheet as acknowledgement receipt. Now-a-days, many organisations are directly crediting the accounts of the employee for net payment of salary or wages.

Individual Earning Records

After preparation of payroll and payment of remuneration, individual earning records are prepared taking data from payroll register. This record is necessary to comply with requirement of labour laws of the State Government and other agencies (e.g., Provident Fund authority, Income Tax authority and Service Tax authority).

The employees' individual earnings records are the basis for issue of Form 16 of the Income Tax Act by the employer. Form 16 is a very important document for income tax assessment of the employee.

Employee Service Records

Every organisation should maintain properly the service record of each permanent employee. These records contain data relating to date of appointment, pay scale, experience, educational qualification, designation at present, past history, etc. These records are also important for calculating retirement benefits of the employee. When the employee leaves the organisation, this record must state the reasons for leaving / termination. In case of a labour dispute, these records provide vital evidence for defending the case in the court of law.

Computerised Payroll

Many organisations, now-a-days, have computerized payroll system. It may manage the payroll on its own or may outsource from outside agencies. The agency calculates the pay and delivers payroll register and payroll cheques for all the employees of the organisation. They also keep an individual earning record for each employee and prepare all necessary returns and documents for submitting to appropriate authorities.

The following are the advantages of payroll service outsourcing :

1. It is very cost effective for small and medium enterprises (SMEs).
2. The outsourcing agency keeps upto date information of labour laws. It is easier for them to prepare different documents and returns as per the requirement of the Government law.
3. It is easier to maintain confidentiality of payroll when the payroll function is outsourced.
4. Fraud relating to payroll can be prevented if payroll function is outsources.

4.8 Employee Cost and Incentive Systems

Illustration 1

In a factory, 20 workers are employed in the production of a goods. From the following particulars, compute the Wage Bill for the workers for the month of January, 2002 :

- Basic wage @ ₹ 1,000 p.m. per worker;
- Dearness allowance @ ₹ 900 p.m. per worker;
- Bonus for the month @ 20% of basic wages plus D.A.;
- Other allowances @ ₹ 200 p.m.
- Own and Employer's contribution to P.F. @ 10% of basic wages.
- Own and Employer's contribution to ESI @ 2% of basic wages.
- Professional Tax deducted from salary ₹ 20 p.m.

[C.U.B.Com. (Hons.) - 2002]

Solution

Wages Bill for the month of January, 2002

	₹	₹
Basic Wages (20 x ₹ 1,000)	20,000	
Dearness Allowance (20 x ₹ 900)	18,000	38,000
Bonus (20% of ₹ 38,000)		7,600
Other Allowances (₹ 200 x 20)		4,000
Gross Wages		49,600
Less: Deductions :		
Own contribution to P.F. (10% of basic wages)	2,000	
Own contribution to ESI (2% of basic wages)	400	
Professional Tax (₹ 20 x 20)	400	2,800
Amount of Wages to be paid to workers in cash		46,800
Gross Wages		49,600
Add: Employer's own contribution to P.F.	2,000	
Add: Employer's own contribution to ESI	400	2,400
Total Wages for the month		52,000

Illustration 2

A company operates a factory which employed 40 direct workers throughout the four-week period just ended. Direct employees are paid at a rate of ₹ 40 per hour for a 48-hour week. Total hours of the direct workers in the four-week period were 8,128. Overtime, which is paid at a premium of 50% is worked in order to meet general production requirements. Employees deductions total 30% of gross wages. 188 hours of direct workers time were registered as idle.

You are required to pass Journal entries to account for labour costs of direct workers for the period.

Solution

In the books of ... Journal

			Dr.	Cr.
Date	Particulars	L.F.	₹	₹
	Wages Control A/c (Note 1) Dr.		3,34,080	
	To Employee Deduction A/c (Note 2)			1,00,224
	To Bank A/c (Note 2)			2,33,856
	(Being payment of wages after deduction of 30%)			
	Work-inProgress A/c (Note 3) Dr.		3,17,600	
	Production Overhead A/c (Note 4) Dr.		16,480	
	To Wages Control A/c			3,34,080
	(Being charging of direct wages to work-in-progress and overtime premium plus idle time wages charged to production overheads)			

Working Notes :

(1) (a) Basic time = 40 workers × 48 hours per week × 4 weeks = 7,680 hours.

(b) Overtime hours = 8,128 hours – 7,680 hours = 448 hours.

Total Wages :	₹
(i) Basic pay = 8,128 × ₹ 40	3,25,120
(ii) Overtime premium 448 × ₹ 20	8,960
	<u>3,34,080</u>

(2) **Deductions** = ₹ 3,34,080 × 30% 1,00,224

Net Pay = ₹ 3,34,080 × 70% 2,33,856

(3) **Productive Time** = Total Time - Idle Time = 8,128 - 188 = 7,940 hours.

(i) Productive wages = 7,940 × ₹ 40	3,17,600
(ii) Idle time wages = 188 × ₹ 40	7,520
	<u>3,25,120</u>

(4) **Overheads :**

(i) Overtime premium	8,960
(ii) Idle time wages	7,520
	<u>16,480</u>

Illustration 3

From the following information available, you are required to :

(a) Calculate the Net Wage Bill as well as Total Wages Cost; and

(b) Show necessary journal entries in Financial and Cost accounts.

(i) As per the time cards the gross earnings of the workmen is ₹ 30,000.

(ii) The various deductions from the gross earnings of the workmen are as under (all figures in ₹) :

Employee's contribution to Provident Fund	2,500	ESI - Employee's Contribution	400
Advance against wages	800	Cooperative dues	600
Income Tax	500	Canteen charges	100

(iii) Company's contribution to Provide Fund and ESI are ₹ 2,500 and ₹ 800 respectively.

(iv) Analysis of time cards reveals that 85% of time utilized is on manufacturing operations and the balance is to be treated as indirect.

[I.C.W.A. (Inter) - Adapted]

Solution

(a) Calculation of Net Wages Bill

	₹	₹
Gross Earnings of Workers		30,000
Less: Deductions :		
Employees Contribution to P.F.	2,500	
Employees Contribution to E.S.I.	400	
Advance against Wages	800	
Cooperative Dues	600	
Canteen Charges	100	
Income Tax	500	4,900
Net Wages for the month		25,100

Calculation of Total Wages Cost

	₹	₹
Gross Earnings of Workers		30,000
Add : Employer's Contribution to P.F.	2,500	
Employer's Contribution to E.S.I.	800	3,300
Total Wages for the month		33,300

4.10 Employee Cost and Incentive Systems

In the Financial Books of ...				
(b) Journal				
			Dr.	Cr.
Date	Particulars	L.F.	₹	₹
(i)	Wages A/c Dr. (Cost Ledger Control A/c - Memorandum) To Provident Fund A/c (2,500 + 2,500) To Employees State Insurance A/c (400 + 800) To Advance Against Wages A/c To Cooperative Dues A/c To Canteen Charges A/c To Income Tax A/c To Bank A/c (Being the wages paid after deduction for employer and employees)		33,300	
(ii)	Provident Fund A/c Dr. Employees State Insurance A/c Dr. Cooperative Dues A/c Dr. Income Tax A/c Dr. To Bank A/c (Being the amount deposited with different authorities to discharge the legal obligations)		5,000 1,200 600 500	5,000 1,200 800 600 100 500 25,100 7,300

In the Cost Books of ...				
(b) Journal				
			Dr.	Cr.
Date	Particulars	L.F.	₹	₹
	Wages Control A/c Dr. To Cost Ledger Control A/c (Being the incorporation of total wages cost in the cost ledger)		33,300	33,300
	Work-in-Progress Control A/c Dr. Factory Overhead Control A/c Dr. To Wages Control A/c (Being the transfer of direct wages to Work-in-Progress Account and Indirect Wages to Factory Overheads Control Account)		28,305 4,995	33,300

Illustration 4

The following details relate to the labour in a production cost centre for a period :

	Direct worker	Indirect worker
Hourly rate of pay :	(₹)	(₹)
Basic	10.00	7.00
Overtime	13.00	9.10
Payroll hours :	Hours	Hours
Productive	310	118
Idle	18	4
	<u>328</u>	<u>122</u>

Additional information :

1. Basic rates of pay apply to a normal working week of 38 hours.
2. There are 8 direct workers and 3 indirect workers in the cost centre.
3. Overtime is worked from time to time to meet the general requirement of production.
4. Idle time is regarded as normal.

You are required to calculate :

- (i) The total amount to be paid to the direct workers and indirect workers respectively.
- (ii) The total amount to be charged as direct wages to work-in-progress and indirect wages to overheads respectively. (Show clearly the make-up of the indirect charges.)

Solution (i) Statement Showing the Total Amount of Wages Paid

Direct Workers	₹	Indirect Workers	₹
Normal hours (8 x 38 = 304 @ ₹ 10)	3,040	Normal hours (3 x 38 = 114 @ ₹ 7)	798.00
Overtime hours (328 - 304 = 24 @ ₹ 13)	312	Overtime hours (122 - 114 = 8 @ ₹ 9.10)	72.80
	3,352		870.80

(ii) (a)	Wages charged to work-in-progress = 310 hours @ ₹ 10 = ₹ 3,100.	
(b)	Amounts to be charged to Production Overheads :	₹
	Idle time (being normal) 18 hours @ ₹ 10	180.00
	Overtime premium 24 hours @ ₹ 3	72.00
		252.00
	Add: Amounts paid to indirect workers	870.80
		<u>1,122.80</u>

Illustration 5

The finishing department in a factory has the following payroll data for the month just ended :

	Direct Workers	Indirect Workers
Total attendance time (including overtime)	2,640 hours	940 hours
Productive time	2,515 hours	
Non-productive time :		
Machine break-down	85 hours	
Waiting for work	40 hours	
Overtime	180 hours	75 hours
Basic hourly rate	₹ 5.00	₹ 4.00
Group bonuses	₹ 2,840	₹ 710
Employer's ESI contribution	₹ 1,460	₹ 405

Overtime, which is paid at 140% of basic rate, is usually worked in order to meet the factory's general requirements. However, 40% of the overtime hours of both direct and indirect workers in the month were worked to meet the urgent request of a particular customer.

Required :

- Calculate the gross wages paid to direct workers and to indirect workers in the month.
- Using the above information, record the relevant entries for the month in the finishing department's Wages Control Account and Production Overhead Control Account. (You should clearly indicate the account in which the corresponding entry would be made in the company's separate cost accounting system. Workings must be shown.)

Solution (a) Calculation of Gross Wages

	Direct Workers (₹)	Indirect Workers (₹)
Allowance Time	(2,640 x 5.00) 13,200	(940 x 4.00) 3,760
Overtime Premium	(180 x 2.00) 360	(75 x 1.60) 120
Group Bonuses	2,840	710
Gross Wages	16,400	4,590

Total Wages paid to workers = ₹ 16,400 + ₹ 4,590 = ₹ 20,990.

4.12 Employee Cost and Incentive Systems

(b) Analysis of Gross Wages

	Direct Charge to WIP (₹)	Indirect Charge to Production Overhead (₹)
Attendance Time :		
Direct workers	(2,515 x 5) 12,575	*(125 x 5) 625
Indirect workers		(940 x 4) 3,760
Overtime Premium :		
Direct workers (Note 1)	144	(Note 2) 216
Indirect workers (Note 1)	48	(Note 2) 72
Group Bonuses :		
Direct workers (Note 3)	-	2,840
Indirect workers (Note 3)	-	710
	12,767	8,223

*Non-productive : 85 hours (machine break-down) + 40 hours (waiting for work) = 125 hours.

Dr.		Wages Control Account		Cr.	
Particulars		₹		Particulars	₹
To Cost Ledger Control A/c		20,990		By Work-in-Progress A/c	12,767
				By Production Overhead Control A/c	8,223

Dr.	Production Overhead Control Account		Cr.
Particulars	₹	Particulars	₹
To Wages Control A/c	8,223		
To Cost Ledger Control A/c (Note 4)	1,865		

Working Notes :

- 40% of the overtime hours of both direct and indirect workers will be charged to Work-in-Progress as it was done on the request of a customer.
 - Direct workers' overtime premium = (40% of 180) × 2.00 = 72 × 2.00 = ₹ 144.
 - Indirect workers' overtime premium = (40% of 75) × 1.60 = ₹ 48.
- 60% of the overtime hours of both direct and indirect workers will be charged to Production Overhead.
 - Direct workers' overtime premium = (60% of 180) × 2.00 = 108 × 2.00 = ₹ 216.
 - Indirect workers' overtime premium = (60% of 75) × 1.60 = 45 × 1.60 = ₹ 72.
- Group bonuses will be treated as indirect charge both for direct workers and indirect workers.
- Employer's ESI contribution of ₹ 1,865 (₹ 1,460 + ₹ 405) will be debited to Production Overhead Control Account and to be credited to Cost Ledger Control Account.

The Cost Department

After getting data, based on labour distribution summary or job ticket or time ticket, it is the responsibility of the cost department to record direct labour cost on the appropriate cost sheet and indirect cost on the overhead analysis sheet.

In many organisations, cost department is operated as a separate unit. It is neither directing or controlling time keeping department or payroll department.

Generally, the cost department prepares the following reports on regular basis :

- Normal and special labour report;
- Labour efficient report;
- Idle time reports.

In small organisation, cost department may be stationed in production department to assist in accumulating and classifying labour costs.

Section B : Remuneration and Incentives

The term 'remuneration' means all monetary earnings of the employees and it includes hourly wages, piece work wages and other financial incentives. Every system of remuneration should be designed in such a manner so as to encourage the individual worker to do his best. A good remuneration system will attract best employee from the market. It will also reduce labour turnover to a great extent.

Essential Features of a Successful Wages / Remuneration Payment Plan

The following are the essential features of a successful system of wages / remuneration :

1. The remuneration system should be satisfactory from the view point of employees and employer.
2. The scheme should be accepted by the employees and its union.
3. The scheme should stabilize the labour turnover.
4. The scheme shall aim at improving the moral of the employees.
5. There should be some provision for flexibility to permit necessary changes in future.
6. The cost of administration and operation should be minimum.
7. It should be at par with the industry to attract and retain talented people.
8. There should be a provision for incentive plans.
9. The wages should be related to the efforts put in by the employees.
10. It should encourage the efficient workers to earn more and reduce the overall cost per unit.

Methods of Remuneration

There are **three** major remuneration methods for calculating gross pay of the workers. These are as follows :

- (i) Time-based remuneration / time rates;
- (ii) Piecework remuneration / piece rates; and
- (iii) Premium bonus systems / Incentive schemes.

Time-based Remuneration / Time Rates System

Under this method of remuneration, worker is paid for the **time worked**. The actual output produced by the worker during that period is immaterial. The remuneration may be based upon the hour, or the day, or the week or the month.

This method of remuneration is generally adopted in the following situations :

- (a) This method of remuneration is suitable where service of workers cannot be accurately measured and payment by results is not possible. **For example**, office staff, indirect workers, security staff are generally paid on time basis.
- (b) This is suitable where quality of output is more important than the quantity of output. **For example**, fancy furniture making, tea testing, fine work with precious metals, etc.
- (c) It is suitable for payment of remuneration to new workers / trainee workers.
- (d) It is suitable where the output of the worker depends mainly on the speed of the machine over which he has no control. **For example**, in case of mobile phone assembly lines the speed of the conveyor belt will determine the output of the workers.
- (e) It is suitable where products are not standardised. The manufacturing process of different products are different and piece rate cannot be implemented.

The remuneration / earnings of the worker is calculated as follows :

$\text{Earnings} = \text{*Hours worked} \times \text{Rate per Hour*}$

* 'Hours' is replaced by days, weeks or months, according to situation.

Hours Worked : The entire time expended by the workers in the factory should be recorded. In a manual system it can be done automatically by means of time recording 'clock'. The clock is kept at the entry gate. Each worker is provided with a numbered time-card. It is kept in an appropriate card rack.

4.14 Employee Cost and Incentive Systems

On arrival, the worker picks up his card from the rack, inserts it in the slot of the 'clock' and presses a level which simultaneously prints the time on his card and rings a bell. The worker takes out the card from the clock's slot and places it in other rack provided for this purpose. A similar operation is performed at the time of leaving the factory.

Time Spent at Work : The time-card provides the hours worked at the factory but it does not provide details of the activities undertaken during the period at work. For direct worker, the analysis of activities is done with the help of **time sheet / job card** or its equivalent. The document will be completed by the employee and will record each job or task the employee is engaged upon during each working day.

Logically, the 'hours worked' as per time-card should agree with the time recorded in the job card / time sheet. But in majority cases, time recorded in the job card / time sheet is less than the 'hours worked'. This is because, there will be times when the employee has no work to do. For example, the employee cannot start a job because maintenance work is going on or waiting for materials, etc. This non-productive time can not be avoided and it is termed as '**Idle Time**'.

Illustration 6

The normal working hours per week are fixed at 44 hours in a factory. An analysis of the time card of a worker shows that during a week he actually worked 43 hours (including 4 hours overtime) on production and remained idle for the remaining 5 hours due to machine break down.

Normal rate per hour is ₹ 5. Overtime rate is 150% of the normal and the rate of wages for the idle time is 80% of the normal. Calculate total wages payable to the worker.

[C.U.B.Com. (Hons.) – Adapted]

Solution

Statement Showing the Total Earnings of the Worker

Particulars	₹
1. Normal wages (43 hours – 4 hours) = 39 hours @ ₹ 5 per hour	195
2. Overtime wages 4 hours @ ₹ 7.50 per hour	30
3. Idle time 5 hours @ ₹ 5 × 80% (5 × ₹4)	20
Total	245

Illustration 7

Calculate the normal and overtime wages payable to a workman from the following data :

- Normal working hours : 8 hours per day
- Normal rate : ₹ 50 per hour
- Overtime rate : (i) Hours upto 9 hours in a day at single rate.
(ii) Hours beyond 9 hours in a day at double rate or upto 48 hours in a week at single rate and hours beyond 48 hours at double rate whichever is more beneficial to the workman.

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Hours worked	8	10	9	11	9	4

[I.C.W.A. (Inter) – Adapted]

Solution

Statement Showing the Normal Hours and Overtime Hours Worked

Day	Normal Working Hours	Total Hours Worked	Hours Worked		
			At Normal Rate	Overtime At Single Rate	Overtime At Double Rate
Monday	8	8	8	–	–
Tuesday	8	10	8	1	1
Wednesday	8	9	8	1	–
Thursday	8	11	8	1	2
Friday	8	9	8	1	–
Saturday	8	4	4	–	–
Total	48	51	44	4	3

Calculation of Normal Wages and Overtime Wages

	₹
(i) Normal wages = 44 hours @ ₹ 50 per hour	2,200
(ii) Overtime wages :	
(a) At single rate : 4 hours @ ₹ 50 per hour	200
(b) At double rate : 3 hours @ ₹ 100 per hour	<u>300</u> <u>500</u>
Total Wages	<u>2,700</u>

Note : On weekly basis also, the overtime at double rate will be paid for 3 hours (51 hours – 48 hours). Total wages will remain the same.

	₹
48 hours @ ₹ 50	2,400
3 hours @ ₹ 100	<u>300</u>
Total Wages	<u>2,700</u>

Advantages of Time-based Remuneration

The following are the advantages of time-based remuneration system :

1. It is easily understood by the workers.
2. It requires minimum clerical work and therefore wages office can be managed at minimum cost.
3. Workers can work without pressure and can concentrate on the quality of the work.
4. Workers are assured of a guaranteed income for each wages period.
5. Supervision and inspection cost will be minimum.

Disadvantages of Time-based Remuneration

The following are the disadvantages of time-based remuneration system :

1. The efficient worker and inefficient worker will get same wages. The efficient worker will not try to increase the production.
2. Generally, cost of production will be more under this system because of overall inefficiencies.
3. The workers will go slow so that they can do some 'overtime' work.
4. Lack of financial incentives may lead to decrease in production which in turn may lead to reduction in profit.
5. Efficient workers will leave the organisation for better income opportunity and inefficient work may become a liability for the organisation.

Treatment of Idle Time in Cost Accounting

The treatment of idle time in cost accounting depends upon the *nature of idle time*. Idle time can be divided into:

- (i) Normal Idle Time; and
- (ii) Abnormal Idle Time.

Normal Idle Time : Normal idle time is unavoidable and inherent to every condition. *Examples* of normal idle time are : (a) time lost to reach workshop from the factory gate; (b) setting up time for the machine; (c) time interval between a finished job and a new job; and (d) waiting for instruction from foreman, etc.

Abnormal Idle Time : Abnormal idle time can be avoided and it arise due to abnormal factors such as machine break down, fire, flood, power failure, etc.

Cost Accounting Treatment

- (i) Normal idle time is charged to **Production Overhead**. It is recovered from different products by applying a suitable overhead recovery rate.
- (ii) Abnormal idle time is charged to **Costing Profit and Loss Account**. No part of the abnormal idle time is charged to product.

4.16 Employee Cost and Incentive Systems

Treatment of Overtime Premium

Overtime hours at normal rate will be treated as direct labour cost and it is to be charged to the job. However, the overtime premium (extra payment) will be treated according to situation. The cost accounting treatment depends primarily upon the following reason for the overtime work :

- (1) When overtime is resorted at the request of the customer, the entire amount of wages including overtime premium should be charged to the job itself.
- (2) When overtime is required to make up lost production due to fire, flood, strike, etc., the overtime premium should be charged to Costing Profit and Loss Account.
- (3) A particular job may be taken on urgent basis with prior knowledge that overtime will be required and the quotation of the job may include the overtime premium factor. In such cases, overtime premium is charged to that specific job only.
- (4) Where a plant is working overtime because it has more orders than it can complete within normal working hours, the overtime premium should be treated as factory overhead. It is to be recovered, by using a suitable overhead recovery rate from all products produced during that period.
- (5) If there is any bottleneck in the production process and overtime is necessary, the overtime premium should be treated as factory overhead and is to be recovered in the usual manner.
- (6) When overtime work is undertaken to avail a special opportunity of the market like diwali sale, cricket world cup, order from MNCs etc., the overtime premium should be charged to the products produced for that purpose. In this case generally, the price of the product is higher than normal price.
- (7) Where overtime is necessary due to negligence of workers of other department, the overtime premium should be charged to the concerned department.

Control of Overtime : The following steps should be taken to control the overtime :

- (1) All overtime should be properly authorised and the document authorising overtime should be transferred to payroll department for verification of overtime booking.
- (2) If there is any bottleneck in the production process for which overtime is arising, proper steps should be taken to remove that bottleneck.
- (3) A daily report of overtime work should be submitted to the works manager.
- (4) There should be a system of preventive maintenance to avoid or reduce machine breakdown.
- (5) Skill development programme should be undertaken for the workers to improve labour efficiency and to reduce overtime.

Piecework Remuneration / Piece Rates System

Piece rate system can be sub-divided into *three* categories :

- (a) Straight Piece Rates
- (b) Piece Rates with Guaranteed Day Rate
- (c) Differential Piece Rates

Straight Piece Rates : Under this method, wages are paid at fixed rate per unit produced. Normally, only 'good' pieces are paid for to maintain quality of the work done. It is to be noted that there are ***no overtime or idle time computations***. Straight piece rates can be applied only where the work is of a sufficient repetitive nature to facilitate the setting of a definite piece rate. Straight piece rate system is based on the theory of "Produce more, earn more."

$\text{Earnings} = \text{Number of units produced} \times \text{Rate per unit}$

It is to be noted that 'unit' used in the above formula may represent 'piece'; or 'kg' or 'square feet' or 'dozen' etc. as the case may be.

This method of remuneration is generally adopted in the following situations :

- (1) It is possible to identify the output with the individual worker.
- (2) The products are homogeneous in nature and production process is also the same.
- (3) The piece rate can be determined accurately.
- (4) Same type of job is done for a long time and workers are comfortable with the production process.
- (5) No special skill is necessary to earn more wages.
- (6) It is acceptable to workers' union.
- (7) The overhead burden per unit is more than the direct wages per unit.
- (8) The aim of the organisation is to produce more units in less time and there is huge demand in the market for the product.
- (9) There is acute shortage of suitable labour.

Advantages of Straight Piece Rate System

The following are the advantages of Straight Piece Rate System :

- (1) The employee has a definite monetary incentive to do his best.
- (2) The employee is paid according to his merit and skill.
- (3) It will motivate the inefficient workers to improve their performance.
- (4) High production rate is obtained and overhead cost per unit is reduced to the minimum.
- (5) It is easily understood by the workers.
- (6) Costing is simplified as wages are paid only on the number of units produced.

Disadvantages of Straight Piece Rate System

The following are the disadvantages of Straight Piece Rate System :

- (1) The setting of 'exact' piece rate is very difficult and delicate. Setting of lower piece rate may not be acceptable to workers' union. Again, higher piece rate once set cannot be reduced in future.
- (2) A rigid system of inspection is necessary to prevent quality deterioration. It will lead to extra cost.
- (3) The wastage by the worker may increase due to bad handling of materials and machines.
- (4) There is a possibility of over-production.
- (5) Break-down of machinery or malfunctioning of the machinery may lead to labour unrest.
- (6) Abnormal idle time has to be paid for at day-work rate.
- (7) Many workers oppose piece rate on the ground that surplus workers will be retrenched in future.
- (8) An employee has the right to adequate rest as well as to a reasonable remuneration. The straight piece work does not guarantee that.
- (9) Absenteeism and lateness may increase on the assumption that these are permissible. The working environment of the organisation may be disturbed by such act of the employees.

Piece Rates with Guaranteed Day Rate / Weekly Rate

Under this method wages are paid to workers on the basis of straight piece rate but where the piece rate wages is less than agreed minimum wages per day / week / month, the worker is entitled to get the **minimum wages**. This minimum wages is payable as per the provisions of Minimum Wages Act or as per the agreement between the employer and the employees.

The main advantage of this method of remuneration is that the workers will not be penalised when their piece-work wages are low due to machine break-down, malfunctioning of machines, waiting for job etc.

The other advantages and disadvantages are similar to that of Straight Piece Rates.

Bengal Govt announces revised minimum wages

Press Trust of India

Kolkata, Oct. 25, 2011

The West Bengal Government today announced the revised minimum monthly and daily wages in 31 industrial segments with the highest monthly and daily rates for those highly skilled at ₹ 5,614 and ₹ 215 respectively.

The 31 industrial segments include, among others, bell metal and brass industry, ceramic industry, chakki mills, construction or maintenance of roads, flour mills, oil mills, paints and chemical factories, plastic industry, ply wood industry, power looms, silk building industry, shoe making industry, rice mills, security services and agriculture. In some segments, employees have been categorised in three groups unskilled, semi-skilled and skilled, while in some segments, the employees have been categorised in four groups with the addition of highly skilled.

For those skilled, the revised highest minimum monthly and daily wages are ₹ 5,104 and ₹ 196 respectively.

For semi-skilled, the revised highest minimum monthly and daily wages are ₹ 4,640 and ₹ 178 respectively.

For unskilled, the revised highest minimum monthly and daily wages are ₹ 4,218 and ₹ 162 respectively.

Finally, in agriculture sector, the revised minimum monthly wages are ₹ 4,007 for skilled, ₹ 3,643 for semi-skilled, ₹ 3,112 for unskilled without food and ₹ 154, ₹ 140 and ₹ 127 daily wages without food respectively.

The revised minimum daily wages with food for skilled, semi-skilled and unskilled in agriculture sector are now ₹ 145, ₹ 131 and ₹ 118 respectively.

[Source : Hindu Business Line]

Illustration 8

In a factory, wages are paid on a weekly basis (40 hours per week) at a guaranteed hourly rate of ₹ 10. A study has revealed that standard output per hour is 40 units. During a particular, week, A produced 1400 units and B produced 1800 units.

Calculate the earning and labour cost per 100 units in case of each of the two worked under :

- Straight Piece Rate; and
- Piece Work with a Guaranteed Weekly Wage.

[C.U.B.Com. (Hons.) – Adapted]

Solution

Hourly rate = ₹ 10

Production per hour = 40 units

Rate per piece = ₹ 10 / 40 = ₹ 0.25 per unit.

(i) Calculation of Earnings – Straight Piece Rate

A's earnings = Number of units produced × Rate per unit
 = 1,400 units × ₹ 0.25 per unit
 = ₹ 350

B's earnings = Number of units produced × Rate per unit
 = 1,800 units × ₹ 0.25 per unit
 = ₹ 450

(ii) Calculation of Earnings – Piece Work with a Guaranteed Weekly Wages

A's Earnings = Number of units produced × Rate per unit
 = 1,400 units × ₹ 0.25 per unit = ₹ 350

Guaranteed weekly wages = 40 hours × ₹ 10 per hour = ₹ 400

Piecework wages is less than minimum guaranteed wages. Therefore, A's earnings will be ₹ 400.

B's Earnings = Number of units produced × Rate per unit
 = 1,800 units × ₹ 0.25 per unit = ₹ 450

B's Earnings is more than guaranteed weekly wages of ₹ 400. Therefore, B will get ₹ 450.

Statement showing the Earnings and Labour Cost per 100 Units

Workers	A (₹)	B (₹)
(i) Straight Piece Rate	$350 / 1,400 \times 100 = ₹ 25.00$	$450 / 1,800 \times 100 = ₹ 25$
(ii) Piecework with Guaranteed Weekly Wages	$400 / 1,400 \times 100 = ₹ 28.57$	$450 / 1,800 \times 100 = ₹ 25$

Differential Piece Rate System

A differential piece rate method is a refinement to the 'Straight Piece Rate' method. In the straight piece rate method, time factor is *not* taken into consideration. However, '*time is money*' and saving in time will save overhead to a great extent. The differential piece rate system set time target. The worker who will finish the job before *normal* time will be given higher piece rate than a worker who will finish the job at normal time.

An organisation may formulate and operate its own differential piece rate system after consultation with the workers. However, there are many well established differential piece rate systems. These are :

- Taylor Differential Piece Rate System;
- Merrick Differential Piece Rate System; and
- Gantt Task and Bonus System

Illustration 9

From the following particulars, you are required to work out the earnings of a worker for a week under :

- Straight Piece Rate; and
- Differential Piece Rate.

Weekly working hours	48
Hours wage rate (₹)	7.50
Piece rate unit (₹)	3.00
Normal time taken per piece	24 minutes
Normal output per week	120 pieces
Actual output for the week	150 pieces
Differential piece rate	80% of piece rate when output is below normal and 120% of piece rate when output is above normal

Solution

- Straight Piece Work Wages System**

$$\begin{aligned} \text{Earnings} &= \text{Actual output} \times \text{Piece rate per unit} \\ &= 150 \text{ pieces} \times ₹ 3 = ₹ 450 \end{aligned}$$

- Differential Piece Rate Wages System**

$$\text{Efficiency} = \frac{\text{Actual Output}}{\text{Normal Output}} \times 100 = \frac{150 \text{ pieces}}{120 \text{ pieces}} \times 100 = 125\%$$

Efficiency is above normal, therefore, the piece rate will be 120% of normal rate = 120% of ₹ 3 = ₹ 3.60 per piece.

$$\begin{aligned} \text{Earnings} &= \text{Actual output} \times \text{Differential piece rate} \\ &= 150 \text{ pieces} \times ₹ 3.60 \\ &= ₹ 540 \end{aligned}$$

4.20 Employee Cost and Incentive Systems

Taylor Differential Piece Rate System

This method of remuneration was developed by Dr. F.W. Taylor in the year 1880 in USA. The main aim of this system was to encourage efficient workers to produce more and avail **higher** piece rate. Under this system, there are **two** piece rates; a low piece for workers who will not be able to produce standard output or whose efficiency is below 100%.

A higher piece rate for workers who will be able to produce standard output and above or whose efficiency is 100% or more. The difference between two rates are very high. **For example**, low rate is ₹ 8 per unit whereas, high rate is ₹ 12 per unit.

The efficiency of the worker is calculated as follows :

Method 1

$$\text{Efficiency} = \frac{\text{Actual Output}}{\text{Standard Output}} \times 100$$

Method 2

$$\text{Efficiency} = \frac{\text{Standard Hours}}{\text{Actual Hours}} \times 100$$

Any of the above two methods can be used for calculating efficiency depending upon the information available in the examination.

Main Features of this Method of Remuneration

- (1) Day wages were not guaranteed.
- (2) Two rates were fixed – one for efficient workers and another for inefficient workers.
- (3) Unusually strong incentives to efficient workers.
- (4) The objective was to weed out inefficient workers, who soon become discouraged and leave the organisation.
- (5) Same rate will be applicable to all outputs.

Example :

Standard output per week	400 units
Standard piece rate	₹ 5 per unit

Differential piece rate to be applied :

- (i) 80% of piece rate when below standard.
- (ii) 120% of piece rate when above standard.

In a 48 hours week :

Worker X completes 300 units

Worker Y completes 440 units

First the efficiency of the workers is to be calculated as follows :

$$\text{Efficiency} = \frac{\text{Actual Output}}{\text{Standard Output}} \times 100$$

$$\text{X's Efficiency} = \frac{300 \text{ units}}{400 \text{ units}} \times 100 = 75\% ; \text{Y's Efficiency} = \frac{440 \text{ units}}{400 \text{ units}} \times 100 = 110\%$$

Piece rate for X will be 80% of ₹ 5 = ₹ 4; Piece rate for Y will be 120% of ₹ 5 = ₹ 6.

Earnings of X = 300 units × ₹ 4 = ₹ 1,200; Earnings of Y = 440 units × ₹ 6 = ₹ 2,640.

It is to be noted in the above example, that the piece rate of Y is 50% more than that of X, which is not fair. This is the reason, perhaps, why the Taylor System has never been popular.

Merrick Differential Piece Rate System

This is a modification of Taylor Differential Piece Rate System. In this system there are **three** rates. None of the rate is fixed below the normal piece rate. The rates are calculated as follows :

Efficiency	Piece Rate Applicable
(i) Upto 83 $\frac{1}{3}$ %	Normal piece rate
(ii) Upto 100%	110% of normal piece rate
(iii) Above 100%	130% of normal piece rate

[Note : Many authors take 120% in place of 130% when efficiency is above 100%]

The main features of this system are :

- (1) The day wages are not guaranteed.
- (2) There are **three** piece rates.
- (3) Inefficient workers are not penalised.
- (4) Same rate will be applicable for all units produced.

It is to be noted that the efficiency of the worker will be calculated in the similar manner as we do in case of Taylor Differential Piece Rate System.

Illustration 10

Calculate the earnings of workers A, B and C under Straight Piece Rate System and Merrick's Multiple Piece Rate System from the following particulars :

Normal rate per hour ₹ 54

Standard time per unit 1 minute

Output per day is as follows :

Worker A – 390 units; B – 450 units; C – 600 units.

Working hours per day are 8.

Solution

- (a) Standard output per hours = 60 units.
- (b) Normal wages per hour = ₹ 54.
- (c) Normal wages rate per unit = (₹ 54) / (60 units) = ₹ 0.9 per unit.
- (d) Standard output per day of 8 hours = 60 units × 8 = 480 units.

Earnings of workers under Straight Piece Rate System :

Worker A = 390 units × ₹ 0.9 = ₹ 351.

Worker B = 450 units × ₹ 0.9 = ₹ 405.

Worker C = 600 units × ₹ 0.9 = ₹ 540.

Calculation of Efficiency

$$\text{Efficiency} = \frac{\text{Actual Output}}{\text{Standard Output}} \times 100$$

$$\text{Worker A} = \frac{390 \text{ units}}{480 \text{ units}} \times 100 = 81.25\%$$

$$\text{Worker B} = \frac{450 \text{ units}}{480 \text{ units}} \times 100 = 93.75\%$$

$$\text{Worker C} = \frac{600 \text{ units}}{480 \text{ units}} \times 100 = 125\%$$

4.22 Employee Cost and Incentive Systems

Under Merrick's Multiple Piece Rate System, three rates are calculated according to efficiency :

- (i) Upto $83\frac{1}{3}\%$ efficiency Normal piece rates are paid
- (ii) Above $83\frac{1}{3}\%$ and 100% efficiency 110% of normal piece rates are paid
- (iii) Above 100% efficiency 130% of the normal piece rates are paid
- (a) A's efficiency is 81.25%. Therefore, applicable piece rate = Normal piece rate = ₹ 0.9 per unit.
- (b) B's efficiency is 93.75%. Therefore, applicable piece rate = 110% of normal piece rate = 110% of ₹ 0.9 = 0.99 per unit.
- (c) C's efficiency is 125%. Therefore, applicable piece rate = *130% of normal piece rate = 130% of ₹ 0.9 = ₹ 1.17.

Earnings of Workers under Merrick's Multiple Piece Rate System :

Worker A – 390 units × 0.9 per piece [see (a) above] ₹ 351

Worker B – 450 units × 0.99 per piece [see (b) above] ₹ 446

Worker C – 600 units × 1.17 per piece [see (c) above] ₹ 702

*Many authors takes 120% of normal rate when efficiency is above 100%. In that case applicable piece rate will be : 120% of 0.9 = ₹ 1.08.

Earnings of C will be 600 units × ₹ 1.08 = ₹ 648.

Gantt Task and Bonus System

This system combines a guaranteed time rate with a step bonus and piece rate system. This system is suitable for highly efficient workers. It provides security for the less efficient workers. The remuneration is calculated as follows :

Stage 1 :

Output below Standard : Time rate (guaranteed)

Stage 2 :

Output at Standard : Time rate + 20% bonus

Stage 3 :

Output above Standard : High piece rate on workers' whole production

From the above, following points are to be noted :

- (1) Until standard is reached, earnings are fixed at a guaranteed minimum.
- (2) A bonus of 20% (usually) is given if standard is reached.
- (3) A high piece rate takes the place of bonus when the job is done in *less* than standard time.

Premium Bonus Systems / Incentive Schemes

The main aim of premium bonus systems is to provide an incentive to the direct workers (on the time based payment system) to *save time* in doing the job or task. The time saved is the difference between time allowed and time taken. *For example*, time allowed for doing a job is 30 hours. Actual time taken by the worker is 25 hours. Therefore, time saved = 5 hours (30 hours – 25 hours). The premium bonus to be paid is calculated on the basis of *time saved*. The time saved is shared by worker and the organisation on the basis of **scheme** adopted by the organisation. The worker is paid basic remuneration on the basis of hours worked (Hours worked × Rate per hour). There are many premium bonus systems, some of them are more than 100 years old.

Many organisations develop and operate their own system to recognise and reward the time saved by the direct workers. However, some of the best known schemes are :

- (1) The Halsey Premium Scheme (50 : 50);
- (2) The Halsey–Weir Premium Scheme (30 : 70);
- (3) The Rowan Premium Scheme; and
- (4) Emerson Efficiency System.

Main Principles / Desirable Characteristics of a Good Incentive System

The following are the desirable characteristics of a good incentive system :

- (1) The incentive scheme should be simple so that the workers can understand it and can calculate their earnings themselves.
- (2) The incentive scheme should be so designed that they result in a reduction in fixed overhead cost per unit by increasing the quantity of production in a given time.
- (3) The incentive scheme should be based upon standard of performance.
- (4) When the standard is once set, it should not be changed, unless there is a change in the method of production.
- (5) The incentive scheme should be reasonable and permanent. It should not be allowed to change without consulting the workers.
- (6) The incentive scheme should be administered fairly and intelligently.
- (7) The incentive scheme should be implemented only after the approval of the labour union and workers.
- (8) The incentive scheme should be designed in such a way that workers are not penalised for reasons beyond their control.
- (9) The scheme should provide for strict inspection of output. Only standard or acceptable quality production should be considered in determining the bonus.
- (10) The cost of operating the incentive scheme should be minimum.
- (11) The scheme should be designed in such a manner that the worker gets minimum guaranteed time wages.
- (12) The scheme should be capable of inspiring the morale of the workers.
- (13) It is highly desirable that the indirect workers participate in the incentive scheme.
- (14) Group incentive scheme should be used where it is possible to do so.
- (15) There should not be any limit to earnings by the workers.

1. The Halsey Premium Scheme (50 : 50)

Under this system, a standard time is allowed for the execution of the job. If the job is done in *less* time than standard time, a bonus is given for the time saved. The worker is given 50% share of time saved. The time wages is given on the basis of hours worked / taken at a given rate.

The time 'saved' is the difference between standard time allowed and time taken for doing the job. The earnings of the worker is calculated as follows :

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + (50\%) \text{ of Time Saved} \times \text{Rate per Hour}$$

Main Features :

- (1) Time wages is guaranteed.
- (2) Average earning per hour will increase due to bonus on saved time.
- (3) Worker and employer share time saved in the ratio of 50 : 50 and this ratio is fixed.
- (4) If the worker can finish the job before standard time allowed, he can start another job immediately.
- (5) The efficient worker is awarded for his skill.
- (6) Fixed cost per unit will be reduced for increase in output during a certain period.

Advantages of Halsey Premium Scheme

1. The worker is certain that he will get full rate of pay for hours worked.
2. The bonus, where time is saved, is an incentive to worker to give his best.
3. The calculation of bonus is very simple and any worker can calculate his remuneration easily.
4. Cost of supervision is less and fixed overhead cost per unit will be less.
5. Greater care is taken for materials and machines. Therefore, there will be less wastage and less depreciation.

4.24 Employee Cost and Incentive Systems

Disadvantages of Halsey Premium Scheme

1. The main objection of the employee is that he will have to share 50% of the time saved.
2. The quality of work may suffer as the workers will try to finish the job before standard time allowed.
3. There is a possibility of a tendency to over-production.

2. The Halsey–Weir Premium Scheme (30 : 70)

This is a variation of Halsey premium scheme. In this case, worker is given 30% of the time saved (not 50% of the time saved as is given in Halsey Premium Scheme). Total earnings is calculated as follows :

$$\text{Earnings} = (\text{Hours Worked} \times \text{Rate per Hour}) + 30 \% \text{ of Time Saved} \times \text{Rate per Hour}$$

*In many cases it is taken as $\frac{1}{3}$ of time saved.

3. The Rowan Premium Scheme

This scheme was introduced in 1901 by David Rowan of Glasgow, U.K. It is almost similar to Halsey Premium Scheme with the exception that time saved is shared in the ratio of Time Saved / Time Allowed.

Here also, standard time allowed is fixed for a job. If the worker can save time, he shares this with the employer.

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + \frac{\text{Time Saved}}{\text{Time Allowed}} \times \text{Time Taken} \times \text{Rate per Hour}$$

Main features of Rowan Premium Scheme are :

1. Time wages are guaranteed
2. The sharing of time saved is not at fixed ratio.
3. Average earning per hour will increase due to bonus on saved time.
4. The efficient worker is awarded for his skill.
5. If the worker can finish the given job before standard time allowed, he can start a new job immediately.

Advantages of Rowan Premium Scheme

1. The worker is certain that he will get full rate of pay for hours worked.
2. The bonus, where time is saved, is an incentive to worker to give his best.
3. The cost of supervision is less.
4. Greater care is taken for materials and machines. Therefore, there will be less wastage and less depreciation.

Disadvantages of Rowan Premium Scheme

1. The calculation of bonus is not very simple.
2. There is a tendency to over-production.
3. The sharing of 'time saved' is not liked by the workers.
4. The acceleration of machine speed will naturally increase the repairs and maintenance cost of the machines.

Distinction Between Halsey Plan and Rowan Plan

	Halsey Plan		Rowan Plan
1.	Under this method it is easy to calculate the bonus	1.	Under this method the calculation of bonus is not very easy like Halsey Plan.
2.	Under this method bonus is paid at a flat rate of 50% of time saved.	2.	Under this method bonus is paid at a different rate depending upon the ratio of time taken and time allowed.

3.	Under this method bonus is calculated as follows : Bonus = $50\% \times \text{Time Saved} \times \text{Rate per Hour}$	3.	Under this method bonus is calculated as follows : Bonus = $(\text{Time Taken} \div \text{Time Allowed}) \times \text{Time Saved} \times \text{Rate per Hour}$
4.	This method offers low incentive to the workers.	4.	This method offers higher incentive to the workers.
5.	Under this method the workers will try to save more time to get more bonus. It may lead to bad workmanship and more wastage of resources.	5.	Under this method a worker cannot get more bonus by saving more hours because of the in-built mechanism of this method.

4. Emerson Efficiency System

This system has been designed to encourage less efficient workers. The worker is entitled to get guaranteed day rate if he can achieve $66\frac{2}{3}\%$ of efficiency. When the efficiency exceeds $66\frac{2}{3}\%$, the worker is paid bonus.

Emerson used about 32 slabs for payment of bonus. Some of the slabs are given below :

Efficiency	Bonus
Upto $66\frac{2}{3}\%$	Nil
Above $66\frac{2}{3}\%$ to 79%	10%
Between 80% – 99%	20%
Between 100% – 125%	45%

Main features of Emerson Efficiency System

- (1) Day wages are guaranteed.
- (2) Bonus is payable according to the efficiency of the worker. Specially compiled table is used for bonus percentage calculation.
- (3) A worker is entitled to 10% bonus once he is crossing $66\frac{2}{3}\%$ of efficiency.
- (4) Generally, efficiency is calculated on the basis of total weekly output.
- (5) Increase in percentage of bonus is not very sharp.

Advantages of Emerson Efficiency System

- (1) The time wages is guaranteed.
- (2) It encourages the less-efficient worker to improve his performance.
- (3) It is simple to understand and operate.
- (4) There is no reduction in the wage rate if the efficiency level is poor.

Disadvantages of Emerson Efficiency System

- (1) This method of payment of wage is not suitable for industries producing high quality product.
- (2) The workers will try to increase the efficiency and the quality of the product may suffer.
- (3) The break-down rate of the machine may increase because of bad handling of the machines.

Example

There are two workers A and B. A minimum wages is paid for production upto $66\frac{2}{3}\%$ of standard output or efficiency. When the worker's production exceeds $66\frac{2}{3}\%$ of the standard output, he is paid bonus as follows:

Efficiency	Bonus
Upto $66\frac{2}{3}\%$	Nil
Above $66\frac{2}{3}\%$ to 79%	10%
Between 80% – 99%	20%
Between 100% – 125%	45%

4.26 Employee Cost and Incentive Systems

	A	B
Standard output	300 units	500 units
Actual output	240 units	600 units
Base rate per hour	₹2.10	₹2.00

Wages of A will be calculated as follows :

$$\begin{aligned}\text{Efficiency} &= \frac{\text{Actual Output}}{\text{Standard Output}} \times 100 \\ &= \frac{240 \text{ units}}{300 \text{ units}} \times 100 = 80\%\end{aligned}$$

$$\begin{aligned}\text{Minimum Wages} &= \text{Hours worked} \times \text{Rate per hour} \\ &= 40 \text{ hours} \times ₹2.10 = ₹84\end{aligned}$$

$$\begin{aligned}\text{Actual Wages} &= \text{Minimum wages} + 20\% \text{ bonus (as efficiency level is 80\%)} \\ &= ₹84 + 20\% \text{ of } ₹84 = ₹84 + ₹16.80 = ₹100.80\end{aligned}$$

Wages of B will be calculated as follows :

$$\text{Efficiency} = \frac{\text{Actual Output}}{\text{Standard Output}} \times 100 = \frac{600 \text{ units}}{500 \text{ units}} \times 100 = 120\%$$

$$\begin{aligned}\text{Minimum Wages} &= \text{Hours worked} \times \text{Rate per hour} \\ &= 40 \times ₹2 = ₹80\end{aligned}$$

$$\begin{aligned}\text{Actual Wages} &= \text{Minimum wages} + 45\% \text{ bonus (as efficiency level is 120\%)} \\ &= ₹80 + 45\% \text{ of } ₹80 = ₹80 + ₹36 = ₹116\end{aligned}$$

Illustration 11

Using the following data, calculate the wages payable to workman under :

- (i) Halsey Premium Bonus Plan; and
- (ii) Rowan Premium Bonus Plan

Time allowed : 48 hours

Time taken : 40 hours

Rate per hour = ₹1

[C.U.B.Com. (General) – 2002]

Solution

Calculation of Wages Payable – Halsey Premium Bonus Plan

$$\text{Wages Payable} = \text{Hours Worked} \times \text{Rate per Hour} + (50\% \text{ of Time Saved} \times \text{Rate per Hour})$$

$$\begin{array}{ll}\text{Time allowed} & 48 \text{ hours}\end{array}$$

$$\begin{array}{ll}\text{Time taken} & 40 \text{ hours}\end{array}$$

$$\begin{array}{ll}\text{Time saved} & \underline{8 \text{ hours}}\end{array}$$

$$\begin{aligned}\text{Wages Payable} &= 40 \text{ Hours} \times ₹1 + (50\% \text{ of } 8 \times ₹1) \\ &= 40 + ₹4 = ₹44\end{aligned}$$

Calculation of Wages Payable – Rowan Premium Bonus Plan

$$\text{Wages Payable} = \text{Hours Worked} \times \text{Rate per Hour} + (\text{Time Saved} / \text{Time Allowed})$$

$$\times \text{Time Taken} \times \text{Rate per Hour}$$

$$= 40 \text{ Hours} \times ₹1 + (8 \div 48 \times 40 \times ₹1)$$

$$= 40 + ₹6.67$$

$$= ₹46.67$$

Wages Payable to Workman :

$$\begin{array}{ll}\text{(i) Halsey Premium Bonus Plan} & ₹44.00\end{array}$$

$$\begin{array}{ll}\text{(ii) Rowan Premium Bonus Plan} & ₹46.67\end{array}$$

Illustration 12

From the following particulars, calculate the earnings of workers Asim and Biman for a day under :

- (i) Halsey Premium Bonus Plan Method; and
- (ii) Rowan Premium Bonus Plan Method
 - (a) Standard production : 8 units per hour
 - (b) Normal time rate : Asim — ₹ 10 per hour
Biman — ₹ 12 per hour
 - (c) Working hours of the day : 8 hours
 - (d) Output : Asim — 60 units
Biman — 80 units

[C.U.B.Com. (General) – 2004]

Solution Statement Showing Time Taken, Time Allowed and Time Saved

	Asim	Biman
(a) Production in units	<u>60</u>	<u>80</u>
(b) Time allowed in hours (@ 8 units per hour)	Hours 7.5	Hours 10
(c) Time taken in hours	8	8
(d) Time saved in hours [B – C]	0	2

(1) Calculation of Earnings per Day

(a) Halsey Premium Bonus Plan Method

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + 50\% \text{ of Time Saved} \times \text{Rate per Hour}$$

$$\text{Asim's Earnings per day} = 8 \times 10 + 50\% \text{ of Nil} \times ₹ 10 = ₹ 80$$

$$\text{Biman's Earnings per day} = 8 \times 12 + 50\% \times 2 \times ₹ 12 = ₹ 96 + ₹ 12 = ₹ 108$$

(b) Rowan premium Bonus Plan Method

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + \frac{\text{Time Saved}}{\text{Time Allowed}} \times \text{Time Taken} \times \text{Rate per Hour}$$

$$\text{Asim's Earnings per day} = 8 \times ₹ 10 + (0/8) \times 7.5 \times ₹ 10 = ₹ 80$$

$$\text{Biman's Earnings per day} = 8 \times ₹ 12 + (2/10) \times 8 \times ₹ 12 = ₹ 96 + ₹ 19.20 = ₹ 115.20$$

Summary of Earnings :

	Asim	Biman
(i) Halsey Premium Bonus Plan Method	₹ 80	₹ 108
(ii) Rowan Premium Bonus Plan Method	₹ 80	₹ 115.20

Illustration 13

From the data as given below, determine the total remuneration and effective hourly rate of wages of a worker under (i) Halsey Plan (50%) and (ii) Rowan Plan :

Basic rate of wages per hour	₹ 10.80
Time allowed for the job	16 hours
Time actually taken	12 hours

[C.U.B.Com. (General) – 2005]

Solution

Calculation of Remuneration – Halsey Plan (50%)

Time allowed	16 hours
Time taken	<u>12 hours</u>
Time saved	<u>4 hours</u>

4.28 Employee Cost and Incentive Systems

$$\begin{aligned}\text{Remuneration} &= \text{Hours Worked} \times \text{Rate per Hour} + (50\% \text{ of Time Saved} \times \text{Rate per Hour}) \\ &= 12 \times ₹ 10.80 + (50\% \text{ of } 4 \times ₹ 10.80) \\ &= 129.60 + ₹ 21.60 = ₹ 151.20\end{aligned}$$

Calculation of Remuneration– Rowan Plan

$$\begin{aligned}\text{Wages Payable} &= \text{Hours Worked} \times \text{Rate per Hour} + (\text{Time Saved} / \text{Time Allowed}) \\ &\quad \times \text{Time Taken} \times \text{Rate per Hour} \\ &= 12 \times ₹ 10.80 + (4 / 16 \times 12 \times ₹ 10.80) \\ &= 129.60 + ₹ 32.40 \\ &= ₹ 162.00\end{aligned}$$

Calculation of Effective Earnings per Hour

$$\text{Effective Hourly Rate} = \text{Total Wages} \div \text{Hours Worked}$$

- (i) Halsey Plan = ₹ 151.20 ÷ 12 ₹ 12.60
(ii) Rowan Plan = 162.00 ÷ 12 ₹ 13.50

Illustration 14

Time allowed for the production of 100 'Bolt' is 2 hours and hourly rate of wages payment is ₹ 12. M & N produced 600 and 500 pieces of 'Bolt' respectively in a particular day of 8 hours. Calculate their earnings under Halsey Premium Bonus and Rowan Premium Bonus Method.

[C.U.B.Com. (Hons.) – 2002]

Solution

Calculation of Earnings – Halsey Premium Bonus

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + (50\% \text{ of Time Saved} \times \text{Rate per Hour})$$

M's Earnings :

$$\begin{array}{ll}\text{Time allowed} - (2 \text{ hours} / 100 \text{ units}) \times 600 \text{ units} & 12 \text{ hours} \\ \text{Time taken} & \underline{8 \text{ hours}} \\ \text{Time saved} & \underline{4 \text{ hours}}\end{array}$$

$$\text{Earnings} = (8 \text{ hours} \times ₹ 12 \text{ per hour}) + 50\% \text{ of } 4 \text{ hours} \times ₹ 12 \text{ per hour} = ₹ 96 + ₹ 24 = ₹ 120$$

N's Earnings :

$$\begin{array}{ll}\text{Time allowed} - (2 \text{ hours} / 100 \text{ units}) \times 500 \text{ units} & 10 \text{ hours} \\ \text{Time taken} & \underline{8 \text{ hours}} \\ \text{Time saved} & \underline{2 \text{ hours}}\end{array}$$

$$\text{Earnings} = (8 \text{ hours} \times ₹ 12 \text{ per hour}) + 50\% \text{ of } 2 \text{ hours} \times ₹ 12 \text{ per hour} = ₹ 96 + ₹ 12 = ₹ 108$$

Calculation of Earnings – Rowan Premium Bonus

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + (\text{Time Saved} / \text{Time Allowed}) \times \text{Time Taken} \times \text{Rate per Hour}$$

$$\text{M's Earnings} = 8 \text{ hours} \times ₹ 12 \text{ per hour} + (4 / 12 \times 8) \times ₹ 12 = ₹ 96 + ₹ 32 = ₹ 128$$

$$\text{N's Earnings} = 8 \text{ hours} \times ₹ 12 \text{ per hour} + (2 / 10 \times 8) \times ₹ 12 = ₹ 96 + ₹ 19.20 = ₹ 115.20 \text{ (say, ₹ 115)}$$

Summary of Earnings :

	M	N
Halsey Premium Bonus	120	108
Rowan Premium Bonus	128	115

Illustration 15

A, B and C in a particular day had produced 200, 250 and 300 pieces respectively of a product 'P'. The time allowed for production of 25 units of 'P' is 1 hour and the hourly rate of wage payment is ₹ 8. Calculate for each of these three workers the following under Halsey Premium Bonus (50% sharing) and Rowan Premium Bonus Methods of Labour Remuneration.

- (i) Earnings for the day (8 hours per day); and
(ii) Effective Rate of Earnings per Hour

[I.C.W.A. (Inter) – Adapted]

Solution Statement Showing Time Taken, Time Allowed and Time Saved

	A	B	C
(a) Production in units	<u>200</u>	<u>250</u>	<u>300</u>
(b) Time allowed in hours (@ 25 pieces per hour)	Hours 8	Hours 10	Hours 12
(c) Time taken in hours	8	8	8
(d) Time saved in hours [B – C]	0	2	4

(1) Calculation of Earnings per Day

(a) Halsey Premium Bonus Method

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + 50\% \text{ of Time Saved} \times \text{Rate per Hour}$$

A's Earnings per day = $8 \times 8 + 50\% \text{ of Nil} \times ₹ 8 = ₹ 64$

B's Earnings per day = $8 \times 8 + 50\% \times 2 \times ₹ 8 = ₹ 64 + ₹ 8 = ₹ 72$

C's Earnings per day = $8 \times 8 + 50\% \times 4 \times ₹ 8 = ₹ 64 + ₹ 16 = ₹ 80$

(b) Rowan Premium Bonus Method

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + \frac{\text{Time Saved}}{\text{Time Allowed}} \times \text{Time Taken} \times \text{Rate per Hour}$$

A's Earnings per day = $8 \times ₹ 8 + (0/8) \times 8 \times ₹ 8 = ₹ 64$

B's Earnings per day = $8 \times ₹ 8 + (2/10) \times 8 \times ₹ 8 = ₹ 64 + ₹ 12.80 = ₹ 76.80$

C's Earnings per day = $8 \times ₹ 8 + (4/12) \times 8 \times ₹ 8 = ₹ 64 + ₹ 21.33 = ₹ 85.33$

Calculation of Effective Earnings per Hour

	A	B	C
(a) Halsey Premium Bonus Method :	₹ 64 / 8 = ₹ 8	₹ 72 / 8 = ₹ 9	₹ 80 / 8 = ₹ 10
(b) Rowan Premium Bonus Method :	₹ 64 / 8 = ₹ 8	₹ 76.80 / 8 = ₹ 9.60	₹ 85.33 / 8 = ₹ 10.67

Illustration 16

During first week of April, 2017 the workman Mr. Kalyan manufactured 300 articles. He received wages for guaranteed 48 hours week at the rate of ₹ 40 per hour. The estimated time to produce one article is 10 minutes and under incentive scheme the time allowed is increased by 20%. Calculate his gross wages according to :

- (a) Piece work with a guaranteed weekly wages; piece rate is ₹ 8; (b) Rowan premium bonus plan; and (c) Halsey premium bonus plan 50% to workman. [C.U.B.Com. (Hons.) – Adapted]

Solution

(a) Piece Work with Guaranteed Weekly Wages

Actual Piece Work Wages = Number of Articles Produced × Rate per Piece = 300 units × ₹ 8 = ₹ 2,400

Guaranteed Wages = 48 hours × ₹ 40 per hour = ₹ 1,920.

Actual wages is more than guaranteed wages. Therefore, Mr. Kalyan will get ₹ 2,400.

(b) Rowan Premium Bonus Plan

Earnings = Hours Worked × Rate per Hour + (Time Saved / Time Allowed) × Time Taken × Rate per Hour
 = 48 hours × ₹ 40 + [12 hours (Note 1) / 60 hours] × 48 hours × ₹ 40 = ₹ 1,920 + ₹ 384 = ₹ 2,304

(c) Halsey Premium Bonus Plan

Earnings = Hours Worked × Rate per Hour + (50% of Time Saved × Rate per Hour)
 = 48 hours × ₹ 40 + (50% of 12 hours × ₹ 40) = ₹ 1,920 + ₹ 240 = ₹ 2,160

4.30 Employee Cost and Incentive Systems

Working Notes :

(1) Calculation of Time Allowed and Time Saved

Estimated time for one article 10 minutes

Add: 20% increase under incentive 2 minutes

12 minutes

(a) Time allowed for 300 articles = $(300 \times 12 \text{ minutes}) / 60 = 60 \text{ hours}$

(b) Time Saved = Time allowed – Time taken = 60 hours – 48 hours = **12 hours**

Illustration 17

In a factory, wages are paid on a weekly basis (40 hours per week) at a guaranteed hourly rate of ₹ 10. A study has revealed that standard output per hour is 40 units. During a particular week, A produced 1400 units and B produced 1800 units.

Calculate the earning and labour cost per 100 units in case of each of the two worked under :

(i) Piece-work with a guaranteed weekly wage;

(ii) Halsey Premium Plan; and,

(iii) Rowan Premium Plan.

[C.U.B.Com. (Hons.) - 2006]

Solution

(i) Piece-work with a Guaranteed Weekly Wage

Actual piece work wages = Number of articles produced $\times$ Rate per piece.

(i) A produced 1,400 units

(ii) B produced 1,800 units

(iii) Rate per piece = $10 \div 40 = 0.25$.

(iv) Minimum Wages = $40 \times ₹ 10 = ₹ 400$

A's actual piece-work wages = $1,400 \times 0.25 = ₹ 350$.

B's actual piece work wages = $1,800 \times 0.25 = ₹ 450$.

A's actual wages (₹ 350) is less than the minimum wages (₹ 400). Therefore, A will get ₹ 400.

B's actual wages (₹ 450) is more than the minimum wages. Therefore, B will get ₹ 450.

(ii) Halsey Premium Plan

Earnings = Hours worked $\times$ Rate per hour + (50% of Time saved $\times$ Rate per hour)

A's Earnings = $40 \times ₹ 10 + (50\% \text{ of Nil} \times \text{Rate per hour})$

= ₹ 400 + 0

= ₹ 400

B's Earnings = $40 \times ₹ 10 + (50\% \text{ of } 5 \times 10)$

= ₹ 400 + ₹ 25

= ₹ 425

(iii) Rowan Premium Plan

Earnings = Hours worked $\times$ Rate per hour + $\left(\frac{\text{Time Taken}}{\text{Time Allowed}} \times \text{Time Saved} \right) \times \text{Rate per Hour}$

A's Earnings = $(40 \times ₹ 10) + \left(\frac{40}{45} \times 5 \right) \times 10$

= 400 + 44.44

= ₹ 444.44

Working Notes :

(1) Calculation of Time Allowed :

	A	B
Time Allowed =	$(\frac{60}{40} \times 1,400) \div 60$	$(\frac{60}{40} \times 1,800) \div 60$
	= 35 hours	= 45 hours

(2) Calculation of Time Saved

Time Allowed	35 hours	45 hours
Time Taken	40 hours	40 hours
	<u>Nil</u>	<u>5</u> hours

Calculation of Labour Cost Per 100 Units

Method of Payment	Piece Wages	Halsey Premium Plan	Rowan Premium Plan
A's Earnings	₹ 400	₹ 400	₹ 400
A's Output	1,400	1,400	1,400
Labour Cost per 100 Units	$(400 \div 1,400) \times 100$ = ₹ 28.57	$(400 \div 1,400) \times 100$ = ₹ 28.57	$(400 \div 1,400) \times 100$ = ₹ 28.57
B's Earnings	₹ 450	₹ 425	₹ 444.44
A's Output	1,800	1,800	1,800
Labour Cost per 100 Units	$(450 \div 1,800) \times 100$ = ₹ 25.00	$(425 \div 1,800) \times 100$ = ₹ 23.61	$(444.44 \div 1,800) \times 100$ = ₹ 24.69

Illustration 18

P and Q are machine operators in a company which manufactures components for electric motor cars. The company operates a Halsey Bonus Scheme (50%). The basic wages rate is ₹ 40 per hour.

The following details relate to two jobs completed during the week 50 :

P		Q	
Job M20 : Component D225	110 units	Job M21 : Component D226	160 units
Hours worked on Job M20	38 hours	Hours worked on Job M21	43 hours
Hours booked to idle time	2 hours	Hour attended to be paid	43 hours
Hours attended to be paid	40 hours	time allowed per unit of D226	18 minutes
Time allowed per unit of D225	24 minutes		

All units produced as paid for, although, on inspection, P had 8 units rejected and Q had 6 units rejected.

Required :

Calculate separately for both P and Q :

- the amount of bonus payable;
- the total gross wages; and
- the direct wages cost per good unit produced.

Solution

Calculation of Bonus Payable

Particulars	P	Q
Units produced	110	160
Time allowed per unit	24 minutes	18 minutes
Time allowed in hours	44 hours	48 hours
Time taken in hours	38 hours	43 hours
Time saved in hours	6 hours	5 hours
Bonus [50% of time saved × rate per hour]	₹ 120	₹ 100

4.32 Employee Cost and Incentive Systems

Calculation of Gross Wages

Particulars	P	Q
(A) Hours worked	40 hours	43 hours
(B) Hourly rate	₹ 40	₹ 40
(C) Basis pay (A × B)	₹ 1,600	₹ 1,720
(D) Bonus (as above)	120	100
Total Gross Wages (C + D)	₹ 1,720	1,820

Calculation of Wages Cost per Good Unit Produced

Particulars	P	Q
Total Gross Wages	1,720	1,820
Less: Wages for Idle Time	80	Nil
	1,640	1,820
Number of Good Units	102 units	154 units
Cost per Good Unit	₹ 16.08	₹ 11.82

Illustration 19

In a factory bonus system, bonus hours are credited to the employees in the proportion of time taken, which time saved bears to time allowed. Jobs are carried forward from one week to another. No overtime is worked and payment is made in full for all units worked on, including those subsequently rejected.

From the following information you are required to calculate for each employee : (i) the bonus hours and amount of bonus earned; (ii) the total wages costs; and, (iii) the wages cost of each good unit produced.

Particulars	Worker A	Worker B	Worker C
Basic rate per hour	₹ 10	₹ 16	₹ 12
Units produced	2600	2200	3600
Time allowed for 100 units	2 hrs 30 mts	3 hrs	1 hr 30 mts
Time taken	52 hrs	75 hrs	48 hrs
Rejects	100 units	40 units	400 units

[I.C.W.A. (Inter) – December, 2009]

Solution Statement Showing the Bonus Hours and the Amount of Bonus Earned

Worker	A	B	C
Units produced	2,600	2,200	3,600
Less: Units rejected	100	40	400
Good Units	2,500	2,160	3,200
Time allowed for 100 units	2 hrs 30 mts	3 hrs	1 hr 30 mts
Total time allowed	65 hrs	66 hrs	54 hrs
Time taken	52 hrs	75 hrs	48 hrs
Time saved	13 hrs	–	6 hrs
Amount of Bonus Earned (Note 1)	₹ 104	–	₹ 64

Statement Showing the total Wages Cost and Wages Cost per Unit

Particulars	A (₹)	B (₹)	C (₹)
Basic wages (Hours worked × Rate per hour)	520	1,200	576
Bonus Earned (See above table)	104	–	64
Total Wages (X)	624	1,200	640
Number of Good Units (Y)	2,500	2,160	3,200
Wages Cost per Unit (X ÷ Y)	0.25	0.56	0.20

Working Note :

Amount of Bonus Earned = (Hours Saved / Hours Allowed) × Time Taken × Rate per Hour

$$A = 13/65 \times 52 \text{ hours} \times ₹ 10 = ₹ 104. \quad C = 6/54 \times 48 \text{ hours} \times ₹ 12 = ₹ 64.$$

Illustration 20

A worker, whose day-work wages is ₹ 25 an hour, received production bonus under the Rowan Scheme. He carried out the following work in a 48-hour week :

Job 1 1500 items at 4 hours per 1000

Job 2 1800 items at 3 hours per 1000

Job 3 9000 items at 6 hours per 1000

Job 4 1500 items for which no standard time was fixed and it was arranged that the worker would be paid a bonus of 25%. Actual time on the job was 4 hours.

Job 5 2000 items at 8 hours per 1000, each item was estimated to be half-finished.

Job 2 was carried out on a machine running at 90 per cent efficiency and extra allowance of 1/9th of actual time was given to compensate the worker.

4 hours were lost due to power cut.

Calculate the earnings of the worker, clearly stating your assumptions for the treatment given by you for the hours lost due to power cut.

[I.C.W.A. (Stage - I) - December, 2001]

Solution

Calculation of Time Allowed for all Jobs

Job 1 : (4 hours / 1,000) × 1,500 = 6 hours

Job 2 : (3 hours / 1,000) × 1,800 = 5.4 hours + allowance 1/9 = 6 hours

Job 3 : (6 hours / 1,000) × 9,000 = 54 hours

Job 4 : Time allowed for 1,500 items 4 hours

Bonus 25% thereof $\frac{1 \text{ hour}}{5 \text{ hours}}$

Job 5 : (8 hours / 1,000) × 2,000 × ½ = 8 hours

Total time allowed : 6 + 6 + 54 + 5 + 8 79 hours

Total time taken = (48 hours less 4 hours lost due to power cut) 44 hours

Time saved 35 hours

Earnings of the Worker under Rowan Scheme

Earnings = (Hours worked × Rate per hour) + (Time saved ÷ Time allowed) × Time taken × Rate per hour
 = (48 × 25) + (35 ÷ 79 × 44 × 25) = ₹ 1,200 + ₹ 487.34 = ₹ **1,687.34**

The following to be noted:

- (i) 4 hours lost due to power cut will be treated as **abnormal loss** and will not be taken into consideration at the time of calculation of time saved. For calculation of time saved, time taken will be equal to 48 hours less 4 hours power cut = **44 hours**.
- (ii) Worker will get wages for 4 hours @ ₹ 25 per hour.
- (iii) Wages paid for 4 hours @ ₹ 25, i.e., ₹ 100 will be debited to Factory Overhead.

Illustration 21

In a factory, S took 30 hours to complete a job. The factory cost of the job is ₹ 5,200, Raw material cost of the job is ₹ 4,000. Hourly rate of wages ₹ 20. Works overhead is recovered on the job at ₹ 15 per labour hour worked. S is entitled to receive bonus according to Rowan Plan. Calculate standard time for completion of the job.

[C.U.B.Com. (Hons.) - 2007]

4.34 Employee Cost and Incentive Systems

Solution

Calculation of Standard Time

Particulars	₹
Factory cost of the job	5,200
Less: Factory overhead (30 hours × ₹ 15)	450
Prime Cost	4,750
Materials cost	4,000
Wages cost (Total)	750
Less: Time wages (30 hours × ₹ 20)	600
Bonus under Rowan Plan	150

Let, Standard Time = x

Bonus under Rowan Plan = $\frac{(\text{Standard Time} - \text{Time Taken})}{\text{Standard Time}} \times \text{Time Taken} \times \text{Rate per Hour}$

$$\text{or, } 150 = \frac{(x - 30)}{x} \times 30 \times 20$$

$$\text{or, } 150 = \frac{(x - 30)}{x} \times 600$$

$$\text{or, } 150 = \frac{600x - 18,000}{x}$$

$$\text{or, } 150x = 600x - 18,000$$

$$\text{or, } 450x = 18,000$$

$$\text{or, } x = 40$$

Therefore, standard time = **40 hours**.

Proof:

Standard time 40 hours (as calculated)

Time taken 30 hours (as given)

Time saved 10 hours

Bonus under Rowan Scheme = $\frac{\text{Time Saved}}{\text{Standard Time}} \times \text{Time Taken} \times \text{Rate per Hour}$

$$\text{Bonus} = \frac{10 \text{ hours}}{40 \text{ hours}} \times 30 \text{ hours} \times 20 = ₹ 150$$

Illustration 22

Two workmen, Vishnu and Shiva, produce the same product using the same material. Their normal wage rate is also the same. Vishnu is paid bonus according to the Rowan system, while Shiva is paid bonus according to the Halsey system. The time allowed to make the product is 100 hours. Vishnu takes 60 hours while Shiva takes 80 hours to complete the product. The factory overhead rate is ₹ 10 per man-hour actually worked. The factory cost for the product for Vishnu is ₹ 7,280 and for Shiva it is ₹ 7,600.

You are required to :

- find the normal rate of wages;
- find the cost of materials; and,
- prepare a statement comparing the factory cost of the product as made by the two workmen.

[C.A. (Inter) – Adapted]

Solution

Let x be the cost of material and y be the normal rate of wages per hour. The factory cost can be calculated as follows :

	Factory Cost of Workman Vishnu		Factory Cost of Workman Shiva
Materials Cost	x	Materials Cost	x
Wages	60y	Wages	80y
Bonus (40/100 × 60)y	24y	Bonus (50/100 × 20)y	10y
Overheads	600	Overheads	800
Total Factory Cost	x + 84y + 600	Total Factory Cost	x + 90y + 800

It has been given that the factory cost for the product for Vishnu is ₹ 7,280 and for Shiva it is ₹ 7,600.

From the above information the following equation can be formulated :

$$x + 84y + 600 = 7,280 \quad \dots (1)$$

$$x + 90y + 800 = 7,600 \quad \dots (2)$$

Subtracting equation (1) from (2) we get

$$6y + 200 = 320$$

$$\text{or, } 6y = 320 - 200$$

$$\text{or, } 6y = 120$$

$$\text{or, } y = 20$$

∴ Normal rate of wages = ₹ 20.

Substituting the value of y in equation 2, we get :

$$x = 7,600 - (90 \times 20) - 800$$

$$\text{or, } x = 5,000$$

∴ Material cost = ₹ 5,000.

(a) Normal rate of wages = ₹ 20

(b) Cost of materials = ₹ 5,000

(c) Comparative Statement of Factory Cost of the Product made by the two workmen :

Particulars	Vishnu	Shiva
Material Cost (b)	5,000	5,000
Direct Wages (60 × ₹ 20) and (80 × ₹ 20)	1,200	1,600
Bonus (Note 1)	480	200
Factory overhead	600	800
Total Factory Cost	7,280	7,600

Working Note :

(1) **Bonus of Vishnu** = $24 \times ₹ 20 = ₹ 480$. **Bonus of Shiva** = $10 \times ₹ 20 = ₹ 200$

Illustration 23

Following particulars have been extracted from the books of Supreme Engineers Ltd.:

Situation	1	2	3
Time allowed for the job	15 hrs	15 hrs	15 hrs
Time taken	15 hrs	12 hrs	9 hrs
Bonus ratio for Halsey	50%		
Rate per hour	₹ 20		

(a) You are required to compute the quantum of wages under Halsey Scheme and Rowan Scheme. Which of these schemes would you like to introduce in this company if the time taken to complete the job is likely to reduce to 6 hours after three months ?

4.36 Employee Cost and Incentive Systems

- (b) An alternative method of payment by results by a straight piece work rate for completion of the job in 7 hours is feasible. Would you like to switch over to this method of payment given further that hourly rate would be reckoned at ₹ 15 for fixation of the piece rate ? Please give reasons for your advice.

[I.C.W.A. (Inter) – Adapted]

Solution

Supreme Engineers Ltd. Statement Showing the Total Wages under Different Situations

Situations	Time Allowed (Hours)	Time Taken (Hours)	Time Saved (Hours)	Rate per Hour (₹)	Basic Wages (₹)	Bonus		Total Wases	
						Halsey (₹)	Rowan (₹)	Halsey (₹)	Rowan (₹)
1	15	15	–	20	300	–	–	300	300
2	15	12	3	20	240	30	48	270	288
3	15	9	6	20	180	60	72	240	252
4	15	6	9	20	120	90	72	210	192

Working Notes :

(1) Calculation of Bonus under Halsey Scheme

Bonus = 50% of Time Saved × Rate per Hour

Situation 1 : Bonus – Nil

Situation 2 : Bonus = 50% × 3 hours × ₹ 20 = ₹ 30

Situation 3 : Bonus = 50% × 6 hours × ₹ 20 = ₹ 60

Situation 4 : Bonus = 50% × 9 hours × ₹ 20 = ₹ 90

(2) Calculation of Bonus under Rowan Scheme

Bonus = (Time Saved ÷ Time Allowed) × Time Taken × Rate per Hour

Situation 1 : Bonus = Nil

Situation 2 : Bonus = $3/15 \times 12 \times ₹ 20 = ₹ 48$

Situation 3 : Bonus = $6/15 \times 9 \times ₹ 20 = ₹ 72$

Situation 4 : Bonus = $9/15 \times 6 \times ₹ 20 = ₹ 72$

- (a) Total wages is minimum under '**Rowan Scheme**' when the job is likely to be completed in 6 hours. Therefore, Rowan Scheme is to be introduced after 3 months. However, it is to be taken into consideration that the quality of the job will not suffer if it is completed in 6 hours where time allowed is 15 hours.
- (b) If the wages paid under Straight Piece Rate, the total wages will be ₹ 105 (7 hours × ₹ 15). It is more economical than Rowan Scheme. The wages cost will be reduced by ₹ 87. It is expected that overhead for one hour (7 hours – 6 hours) will be much less than ₹ 87. Therefore, it is advisable to introduce **Straight Piece Rate**.

Illustration 24

Mr A is working by employing 10 skilled workers. He is considering the introduction of some incentive scheme – either Halsey Scheme (with 50% bonus) or Rowan Scheme – of wage payment for increasing the labour productivity to cope with the increased demand for the product by 25%. He feels that if the proposed incentive scheme could bring about an average 20% increase over the present earnings of the workers, it could act as sufficient incentive for them to produce more and he has accordingly given this assurance to the workers.

As a result of the assurance, the increase in productivity has been observed as revealed by the following figures for the current month :

Hourly rate of wages (guaranteed)	₹ 20.00	Average time for producing 1 piece by	
Number of working days in the month	25	one worker at the previous performance	2 hours
Number of working hours per day for each worker	8	(This may be taken as time allowed)	
		Actual production during the month	1,250 units

Required :

1. Calculate effective rate of earnings per hour under Halsey Scheme and Rowan Scheme.
2. Calculate the savings to Mr A in terms of direct labour cost per piece under the schemes.
3. Advise Mr A about the selection of the scheme to fulfill his assurance. [C.A. (Inter) – Adapted]

Solution

1. Total Wages under Halsey Scheme

$$\text{Wages} = \text{Hours worked} \times \text{Rate per Hour} + 50\% \text{ of Time Saved} \times \text{Rate per Hour} \\ = 2000 \text{ hours (Note 1)} \times ₹ 20 + 50\% (500 \text{ hours} \times ₹ 20) = ₹ 40,000 + ₹ 5,000 = ₹ 45,000$$

$$\text{Effective earning per hour} = (₹ 45,000 \div 2000 \text{ hours}) = ₹ 22.50$$

Total Wages under Rowan Scheme

$$\text{Wages} = \text{Hours Worked} \times \text{Rate per Hour} + (\text{Time Saved} \div \text{Time Allowed}) \times \text{Time Taken} \times \text{Rate per Hour} \\ = 2000 \times ₹ 20 + (500 / 2,500) \times 2000 \times ₹ 20 = ₹ 40,000 + ₹ 8,000 = ₹ 48,000$$

$$\text{Effective earnings per hour} = (₹ 48,000 / 2,000) = ₹ 24.00$$

2. (i) Savings in terms of direct labour cost per piece under Halsey Scheme :

(a) Direct labour cost per piece under time wages = 2 hours $\times$ ₹ 20 = ₹ 40

(b) Direct labour cost per piece under Halsey Scheme = ₹ 45,000 / 1,250 = ₹ 36

Savings per piece = ₹ 40 – ₹ 36 = ₹ 4.

(ii) Savings in terms of direct labour cost per piece under Rowan Scheme

(a) Direct labour cost per piece under time wages = ₹ 40

(b) Direct labour cost per piece under Rowan Scheme = (₹ 48,000 / 1,250) = ₹ 38.40

Savings per piece = ₹ 40 – ₹ 38.40 = ₹ 1.60.

3. From the above calculation, it is clear that savings under Halsey Scheme is ₹ 4 per unit whereas savings under Rowan Scheme is ₹ 1.60 only, therefore, under normal circumstances Halsey Scheme does not fulfill the assurance given to workers by Mr A about 20% increase in their earnings.

$$\% \text{ of increase in wages under Halsey Scheme} = (₹ 5,000 / 40,000) \times 100 = 12.5\%$$

$$\% \text{ of increase in wages under Rowan Scheme} = (₹ 8,000 / ₹ 40,000) \times 100 = 20\%$$

It is clear that Rowan Scheme fulfills the assurance given by Mr A. Therefore, Rowan Scheme may be adopted.

Working Notes :

(1) Total Hours Worked During the Month

$$\text{Number of workers} \times \text{Hours per day} \times \text{No. of days worked in a month} \\ = 10 \times 8 \times 25 = 2,000 \text{ hours}$$

(2) Time allowed = 1,250 units $\times$ 2 hours

Less: Time taken (Note 1)

Time saved

2,500 hours

2,000 hours

500 hours

(3) Total time Wages of 10 Workers per Month

Wages = Total hours worked (Note 1) $\times$ Rate per hour = 2,000 $\times$ ₹ 20 = ₹ 40,000

General Illustrations

Illustration 25

P Ltd. is reviewing its labour remuneration methods and you are given the following data :

(i) Normal working week	37.5 hours
(ii) Guaranteed rate of pay on a time basis	₹ 60 per hour
(iii) Standard time for one unit of production	10 minutes
(iv) Piecework rate	₹ 10 per unit
(v) Bonus scheme	₹ 60 per hour
(for 2/3 of hours saved in addition to guaranteed rate)	

4.38 Employee Cost and Incentive Systems

You are required to :

- Calculate the remuneration levels under time rate, piece work and bonus scheme for 80%, 100% and 120% of budgeted activity achieving within the working week.
- Determine which method would be most suitable if the company wished to minimize wages costs yet at the same time give its employees a guaranteed wages and an incentive to earn more. Give reasons for your decision.

Solution

Calculation of Remuneration under Time Rate

Particulars	Activity		
	80%	100%	120%
Hours worked	37.50	37.50	37.50
Rate per hour	₹ 60	₹ 60	₹ 60
Earnings	₹ 2,250	₹ 2,250	₹ 2,250

Calculation of Remuneration under Piecework

Particulars	Activity		
	80%	100%	120%
Hours worked	37.50	37.50	37.50
Number of pieces made (Note 1)	180	225	270
Rate per piece	₹ 10	₹ 10	₹ 10
Earnings	₹ 1,800	₹ 2,250	₹ 2,700

Calculation of Remuneration under Bonus Scheme

Particulars	Activity		
	80%	100%	120%
Time Allowed (Note 2)	30 hours	37.5 hours	45 hours
Time Taken	37.5 hours	37.5 hours	37.5 hours
Time Saved	0	—	7.5 hours
Earnings :	₹	₹	₹
Basic Pay	2,250	2,250	2,250
Bonus (Note 3)	—	—	300
	2,250	2,250	2,550

Cost per Unit Produced

Particulars	Activity		
	80%	100%	120%
Number of units produced	180	225	270
Method of Remuneration :	₹	₹	₹
Time	12.50	10.00	8.33
Piece	10.00	10.00	10.00
Bonus	12.50	10.00	9.44

As the company wishes to give its employees a minimum wages and an incentive to earn more, the premium bonus scheme appears to be most suitable. If this method of remuneration is adapted, ***the efficient worker will earn more and inefficient worker will get guaranteed wages.*** From the above table, it is clear that the cost per unit is reduced to ₹ 9.44 at 120% against ₹ 10 for the piece rate system. The time rate system is not recommendable as it will not encourage efficient employee to produce more within a given time.

Working Notes :

- Total hours available in minutes** = $37.5 \times 60 = 2,250$ minutes.
 Output at 100% efficiency = $2,250 / 10$ minutes = **225 units.**
 Output at 80% efficiency = $225 \times 80\% = 180$ units.
 Output at 120% efficiency = $225 \times 120\% = 270$ units.

(2) Calculation of Time Allowed

At 80% production = 180 units. Time allowed = $180 / 6 = 30$ hours

At 100% production = 225 units. Time allowed = $225 / 6 = 37.5$ hours

At 120% production = 270 units. Time allowed = $270 / 6 = 45$ hours

Illustration 26

In a manufacturing unit, a multiple piece rate plan is operated as under :

- (i) Basic piece rate up to 85% efficiency;
- (ii) 115% basic piece rate between 90% and 100% efficiency;
- (iii) 125% basic piece rate above 100% efficiency.

The workers are eligible for a "Guaranteed Day Rate" which is equal to 75% efficiency and the piece rate if ₹ 2.00 per piece.

Compute the labour cost per piece at 5% intervals between 65% and 125% efficiency assuming that at 100% efficiency 60 pieces are produced per day.

[I.C.W.A. (Stage – 1) – December, 1997]

Solution Calculation of Labour Cost per Piece at Different Levels of Efficiency

Efficiency (%)	Output per Day (Units)	Piece Wages @ ₹ 2 / pc.	Guaranteed Time Wages per Day	15% Additional Piece Wages	25% Additional Piece Wages	Total Labour Cost	Labour Cost per piece
		(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
65	39	78	90	–	–	90.00	2.31
70	42	84	90	–	–	90.00	2.14
75	45	90	90	–	–	90.00	2.00
80	48	96	–	–	–	96.00	2.00
85	51	102	–	–	–	102.00	2.00
90	54	108	–	16.20	–	124.20	2.30
95	57	114	–	17.10	–	131.10	2.30
100	60	120	–	18.00	–	138.00	2.30
105	63	126	–	–	31.50	157.50	2.50
110	66	132	–	–	33.00	165.00	2.50
115	69	138	–	–	34.50	172.50	2.50
120	72	144	–	–	36.00	180.00	2.50
125	75	150	–	–	37.50	187.50	2.50

Working Notes :

- (1) 65% efficiency piece wages are ₹ 276 but minimum wages are ₹ 90. Therefore, ₹ 90 is to be paid. Similarly, at 70% efficiency wages are ₹ 84 but minimum wages is ₹ 90. Therefore, ₹ 90 is to be paid.
- (2) Normal piece wages are payable at 75%, 80% and 85% levels of efficiency.
- (3) 15% of piece wages have been added for 90% and 100% levels of efficiency.
- (4) 25% of piece wages have been added for 10% to 125% levels of efficiency.

Illustration 27

Calculate the total monthly remuneration of three workers P, Q and R who are working in a factory, based on the following data :

- (i) Standard production per month per worker : 2000 units.
- (ii) Piece work rate : ₹ 0.50 per unit.
- (iii) Production bonus to be given as follows :
Upto 85% efficiency : Nil

4.40 Employee Cost and Incentive Systems

Between 85% and 100% efficiency : Incentive bonus at ₹ 40 for every 5% increase above 85%.
 Above 100% efficiency : Incentive bonus at ₹ 40 for every 5% increase above 85% plus 20% additional bonus on the incentive earned.

(iv) P, Q and R had a production of 1600 units, 2000 units and 2200 units respectively during January, 2001.

Solution

Statement of Total Earnings of P, Q and R for the Month of January, 2018

Name of the Worker	Output (Units)	Piecework Wages @ ₹ 0.50 per unit	Efficiency	Incentive (₹)	Notes	Total Earnings (₹)
P	1,600	800	80%	—	1(a)	800
Q	2,000	1,000	100%	120	1(b)	1,120
R	2,200	1,100	110%	240	1(c)	1,340

Working Notes :

- (1) (a) P's efficiency is 80%. Therefore, P will not get any production bonus.
- (b) Q's efficiency is 100%. Therefore, Q will get production bonus as follows:
 $100\% - 85\% = 15\%$. For every 5% increase in efficiency, bonus is ₹ 40. Therefore, total bonus = 3 units of incentive @ ₹ 40 each = ₹ 120.
- (c) R's efficiency is 110%. Therefore, R will get production bonus as follows:
 $110\% - 85\% = 25\%$. For every 5% increase in efficiency, bonus is ₹ 40.
 Total bonus = 5 units of incentive @ ₹ 40 each + 20% of incentive = ₹ 200 + 20% of ₹ 200 = ₹ 240.

Illustration 28

A firm manufactures a standard electronic component used in television sets. The details of current operations of the firm are as follows :

Number of workers employed	100
Weekly working hours (including lunch break)	48
Average number of hours lost due to idle time per employee per week	8
Standard time required per unit	2 hours
Hourly wage rate	₹ 15
Current level of efficiency	80%

For every unit sold, the company is getting a cash profit of ₹ 120 before charging labour cost [i.e., surplus of sales value over cost of production (only cash expenses), excluding labour cost].

In view of the increasing demand for the product, the firm came to an agreement with the labour union to rise the wages rate by ₹ 3 per hour in return for the workers reducing the idle time by 4 hours and raising the operational efficiency to 90%.

Evaluate the impact of the decision on the firm's profits.

[I.C.W.A. (Stage – 1) – December, 2000]

Solution

Statement Showing Cash Profit under Current Operation

Particulars	Hours
1. Total labour hours available per week (48 × 100)	4,800
Less: Idle time (8 × 100)	800
2. Hours actually worked	4,000
	Units
3. Production possible at 100% efficiency (4,000 / 2)	2,000
4. Production at current level (80% of 2,000)	1,600
	₹
5. Cash Profit (before charging labour cost) (1,600 × 120)	1,92,000
Less: Labour Cost (4,800 hours @ ₹ 15 per hour)	72,000
Net Cash Profit	1,20,000

Statement Showing Cash Profit after Agreement with Labour Union

Particulars	Hours
1. Total labour hours available per week (48 × 100)	4,800
Less: Idle time (4 × 100)	400
2. Hours actually worked	4,400
3. Production possible at 100% efficiency (4,400 / 2)	Units 2,200
4. Production at current level (90% of 2,200)	1,980
5. Cash Profit (before charging labour cost) (1,980 × 120)	₹ 2,37,600
Less: Labour Cost (4,800 hours @ ₹ 18 per hour)	86,400
Net Cash Profit	1,57,200

Effect of Agreement with Labour Union : The profit of the organisation will be increased by ₹ 31,200 (1,51,200 – 1,20,000) in spite of increase in labour cost.

Illustration 29

The standard hours of job X is 100 hours. The job has been completed by Amar in 60 hours, Akbar in 70 hours and Anthony in 95 hours.

The bonus system applicable to the job is as follows :

Percentage of time saved to time allowed	Bonus
Saving up to 10%	10% of time saved
From 11% to 20%	15% of time saved
From 21% to 40%	20% of time saved
From 41% to 100%	25% of time saved

The rate of pay is ₹ 100 per hour. Calculate the total earnings of each worker and also the rate of earnings per hour.

[C.A. (Inter) – Adapted]

Solution

Statement Showing the Total Earnings of Each Worker and Rate of Earnings per Hour

Workers	Amar (Hours)	Akbar (Hours)	Anthony (Hours)
Standard Hours of Job X	100	100	100
Time Taken (A)	60	70	95
Time Saved	40	30	5
Percentage of Time Saved to Time Allowed	40%	30%	5%
Bonus Hours (Note 1) (B)	6.5	4.5	0.5
Total Hours to be Paid [A + B]	66.5	74.5	95.5
	₹	₹	₹
Total Earnings @ ₹ 100 per Hour	6,650	7,450	9,550
Rate of Earnings per Hour (Note 2)	110.83	106.43	100.53

Working Notes :

(1) Calculation of Bonus Hours as Percentage of Time Saved

(a) Amar : (10 hours × 10%) + (10 hours × 15%) + (20 hours × 20%)

= 1 hour + 1.5 hours + 4 hours = **6.5 hours**

(b) Akbar : (10 hours × 10%) + (10 hours × 15%) + (10 hours × 20%)

= 1 hour + 1.5 hours + 2 hours = **4.5 hours**

(c) Anthony : (5 hours × 10%) = **0.5 hours**

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(2) Calculation of Rate of Earnings per Hour

$$(a) \text{ Amar} = \frac{\text{Total Earning}}{\text{Time Taken}} = \frac{6,650}{60 \text{ hours}} = ₹ 110.83 \text{ per hour}$$

$$(b) \text{ Akbar} = \frac{\text{Total Earning}}{\text{Time Taken}} = \frac{7,450}{70 \text{ hours}} = ₹ 106.43 \text{ per hour}$$

$$(c) \text{ Anthony} = \frac{\text{Total Earning}}{\text{Time Taken}} = \frac{9,550}{95 \text{ hours}} = ₹ 100.53 \text{ per hour}$$

Illustration 30

From the following information calculate for each employee his earnings, using :

- Guaranteed hourly rate only (basic pay);
- Piecework, but with earnings guaranteed at 75% of basic pay where the employee fails to earn this amount;
- Premium bonus, in which the employee receives two-thirds of time saved in addition to hourly pay.

	Employees			
	A	B	C	D
Actual hours worked	38	36	40	34
Hourly rate of pay (₹)	30	20	25	36
Output (units)	X	120	—	120
	Y	76	—	270
	Z	—	50	—

Standard time allowed (per unit)

X : 6 minutes; Y : 9 minutes; Z : 15 minutes.

Each minute earned is valued at ₹ 0.5 for piecework calculation.

Solution

(i) Calculation of Earnings – Hourly Rate Method

Earnings = Hours worked × Rate per Hour

$$A : 38 \times ₹ 30 = ₹ 1,140$$

$$B : 36 \times ₹ 20 = ₹ 720$$

$$C : 40 \times ₹ 25 = ₹ 1,000$$

$$D : 34 \times ₹ 36 = ₹ 1,224$$

(ii) Calculation of Earnings – Piece Work Method

Earnings = Number of Units Produced × Rate per Piece

$$\text{Piece Rate : } X = (6 \text{ minutes} \times ₹ 0.50) = ₹ 3.00$$

$$Y = (9 \text{ minutes} \times ₹ 0.50) = ₹ 4.50$$

$$Z = (15 \text{ minutes} \times ₹ 0.50) = ₹ 7.50$$

$$A : (42 \times 3) + (72 \times 4.50) + (92 \times 7.50) = ₹ 1,140$$

$$B : (120 \times 3) + (76 \times 4.50) = ₹ 702$$

$$C : (50 \times 7.50) = ₹ 375$$

$$D : (120 \times 3) + (270 \times 4.50) = ₹ 1,575$$

It is to be noted that only employee 'C' earns less than 75% of basic pay, i.e., 75% of ₹ 1,000 = ₹ 750. Therefore, 'C' will receive ₹ 750 Guaranteed basic pay. The piece rate wages should be charged directly to the products. The difference between guaranteed basic pay and piece work wages (750 – 375) = ₹ 375 for employee 'C' will be treated as **production overheads**.

(iii) Calculation of Earnings– Premium Bonus Scheme

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per Hour} + 75\% \text{ of Time Saved} \times \text{Rate per Hour}$$

Employee	Time Allowed (Hours)	Time Taken (Hours)	Time Saved (Hours)	Bonus (₹)	Basic Pay (₹)	Total Wages (₹)
A	38	38	0	0	1,140	1,140
B	23.4	36	0	0	720	720
C	12.5	40	0	0	1,000	1,000
D	52.5	34	18.50	444	1,224	1,668

Working Notes :

(1) Time Allowed :

$$A : (42 \times 6) / 60 + (72 \times 9) / 60 + (92 \times 15) / 60 = 38 \text{ hours} \quad B : (120 \times 6) / 60 + (76 \times 9) / 60 = 23.4 \text{ hours}$$

$$C : (50 \times 15) / 60 = 12.5 \text{ hours}$$

$$D : (120 \times 6) / 60 + (270 \times 9) / 60 = 52.5 \text{ hours}$$

(2) D's bonus = 18.5 hours $\times$ 2 $\div$ 3 $\times$ ₹ 36 = ₹ 444.

(3) A, B and C will not get any bonus because the time taken is more than time allowed.

Illustration 31

The time taken for a particular operation for operator X in the process division of a manufacturing concern on three different counts was 24, 22 and 27 minutes while that of operator Y was 20, 23 and 26 minutes. It has been ascertained that the rating of 'X' is 70 / 60 and that of 'Y' is 55 / 60. Allowance of fatigue, personal needs are assumed at 15%.

Calculate, using the above information as a base, for that particular operation – (i) the standard time, and (ii) the time allowed under an incentive allowance of 30% of standard time. *[I.C.W.A. (Inter) – Adapted]*

Solution

Statement Showing the Normalised Time

Particulars	Time Taken (Minutes)	Rating	Normalised Time (Minutes)	Total (Minutes)
Operator 'X'	24	70 / 60	28.00	85.17
	22	70 / 60	25.67	
	27	70 / 60	31.50	
	73			
Operator 'Y'	20	55 / 60	18.33	63.25
	23	55 / 60	21.08	
	26	55 / 60	23.84	
	69			
Total				148.42

Average Normalised Time (148.42 / 6)

24.737 minutes

Time Allowed :

Add: 15% Allowance for fatigue etc.

3.710 minutes

Standard Time 28.447 minutes

Standard time

28.447 minutes

Add: 30% Incentive 8.534 minutes

Total

36.981 minutes

Illustration 32

A time study was conducted for a worker in a factory. The observations are as under :

Observed time	40 hours week
Output	120 units
Time for which worker could not work	20%
Performance rating	125%

4.44 Employee Cost and Incentive Systems

It was also thought appropriate to make the following allowances :

Fatigue	10%
Personal needs	7%
Unavoidable work delay	3%

You are required to determine :

- (a) Productive Time;
- (b) Normal Time; and
- (c) Standard Time if above allowances are applied to standard time.

[C.U.B.Com. (Hons.) – Adapted]

Solution

(a) Calculation of Productive Time

Observed time	40 hours per week
Less: Time lost 20%	<u>8 hours per week</u>
Productive Hours	<u>32 hours per week</u>

(b) Calculation of Normal Time

Normal Time = Productive Time $\times$ Performance Rating = 32 hours $\times$ 125% = 40 hours

(c) Calculation of Standard Time

Normal Time	40 hours
Add: Allowance *20% on Standard or 25% of Normal Time	<u>10 hours</u>
Standard Time	<u>50 hours</u>

* Fatigue 10% + Personal needs 7% + Unavoidable work delay 3% = 20%.

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 33

Standard Time for the job is 60 hours. A worker takes 48 hours to do the job. Time wages is ₹ 10 per hour. Calculate the effective hourly wages of the worker under the following methods of payment of wages :

- (i) Halsey Plan; and (ii) Rowan Plan.

[C.U.B.Com. (General) - 2008]

Solution

Standard time for the job	60 Hours
Time taken	<u>48 Hours</u>
Time saved	<u>12 Hours</u>

(i) Halsey Plan

$$\begin{aligned}\text{Earnings} &= \text{Hours Worked} \times \text{Rate per Hour} + 50\% \text{ of Time Saved} \times \text{Rate per Hour} \\ &= 48 \times ₹ 10 + 50\% \text{ of } 12 \text{ hours} \times ₹ 10 \\ &= ₹ 480 + 60 \\ &= ₹ 540\end{aligned}$$

$$\begin{aligned}\text{Effective Hourly Wages} &= \frac{\text{Total Earnings}}{\text{Hours Worked}} \\ &= \frac{540}{48} = ₹ 11.25 \text{ per Hour}\end{aligned}$$

(ii) **Rowan Plan**

$$\begin{aligned}\text{Earnings} &= [(\text{Hours Worked} \times \text{Rate per Hour}) + (\text{Time Taken} \div \text{Times Allowed}) \\ &\quad \times \text{Time Saved} \times \text{Rate per Hour}] \\ &= [(48 \times ₹ 10) + (48 \div 60) \times 12 \times ₹ 10] \\ &= ₹ 480 + 96 \\ &= ₹ 576\end{aligned}$$

$$\begin{aligned}\text{Effective Hourly Wages} &= \frac{\text{Total Earnings}}{\text{Hours Worked}} \\ &= \frac{576}{48} = ₹ 12 \text{ per Hour}\end{aligned}$$

Illustration 34

Ascertain the normal and overtime wages payable to a workman on the basis of the following information :

Days	Hours Worked
Monday	10
Tuesday	8
Wednesday	9
Thursday	11
Friday	9
Saturday	5

Normal working hours are 8 hours per day and the normal rate of wages is ₹ 1.25 per hour. Overtime is paid at the following rates :

Upto 9 hours in a day at single rate and over 9 hours in a day at double rate. [C.U.B.Com. (General) - 2009]

Solution Statement Showing the Normal Hours and Overtime Hours Worked

Day	Normal Working Hours	Total Hours Worked	Hours Worked		
			At Normal Rate	Overtime At Single Rate	Overtime At Double Rate
Monday	8	10	8	1	1
Tuesday	8	8	8	—	—
Wednesday	8	9	8	1	—
Thursday	8	11	8	1	2
Friday	8	9	8	1	—
Saturday	8	5	5	—	—
Total	48	52	45	4	3

Calculation of Normal Wages and Overtime Wages	₹
(i) Normal wages = 45 hours @ ₹ 1.25 per hour	56.25
(ii) Overtime wages :	
(a) At single rate : 4 hours @ ₹ 1.25 per hour	5.00
(b) At double rate : 3 hours @ ₹ 2.50 per hour	<u>7.50</u> <u>12.50</u>
Total Wages	<u>68.75</u>

Illustration 35

A worker takes 90 hours to do a job for which the time allowed is 120 hours. His daily wage rate is ₹ 10 per hour. Calculate the earnings of a worker under the following methods of payment of wages :

(a) Time rate; (b) Piece rate; (c) Halse Plan; and (d) Rowan Plan.

[C.U.B.Com. (General) - 2010]

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Solution

Time allowed for the job	120 Hours
Time taken	<u>90 Hours</u>
Time saved	<u>30 Hours</u>

(a) Time Rate :

$$\begin{aligned}\text{Earnings} &= \text{Hours Worked} \times \text{Rate per Hour} \\ &= 90 \text{ hours} \times ₹ 10 \\ &= ₹ 900\end{aligned}$$

(b) Piece Rate :

$$\begin{aligned}\text{Earnings} &= \text{No. of Units Produced} \times \text{Rate per Piece} \\ &= 1 \times (120 \times ₹ 10) \\ &= ₹ 1,200\end{aligned}$$

(c) Halsey Plan

$$\begin{aligned}\text{Earnings} &= \text{Hours Worked} \times \text{Rate per Hour} + 50\% \text{ of Time Saved} \times \text{Rate per Hour} \\ &= 90 \times ₹ 10 + 50\% \text{ of } 30 \text{ hours} \times ₹ 10 \\ &= ₹ 900 + 150 \\ &= ₹ 1,050\end{aligned}$$

(d) Rowan Plan

$$\begin{aligned}\text{Earnings} &= [(\text{Hours Worked} \times \text{Rate per Hour}) + (\text{Time Taken} \div \text{Times Allowed}) \\ &\quad \times \text{Time Saved} \times \text{Rate per Hour}] \\ &= [(90 \times ₹ 10) + (90 \div 120) \times 30 \times ₹ 10] \\ &= ₹ 900 + 225 \\ &= ₹ 1,125\end{aligned}$$

Illustration 36

Standard time for a project is 120 hours. A worker takes 96 hours to finish the job. Time rate of wages is ₹ 10 per hour. Calculate the effective hourly wage of the worker under the following methods of payment of wages :

(i) Halse Plan; and (ii) Rowan Plan.

[C.U.B.Com. (General) - 2012]

Solution

Standard time	120 Hours
Time taken	<u>96 Hours</u>
Time saved	<u>24 Hours</u>

(i) Halsey Plan

$$\begin{aligned}\text{Earnings} &= \text{Hours Worked} \times \text{Rate per Hour} + 50\% \text{ of Time Saved} \times \text{Rate per Hour} \\ &= 96 \times ₹ 10 + 50\% \text{ of } 24 \text{ hours} \times ₹ 10 \\ &= ₹ 960 + ₹ 120 \\ &= ₹ 1,080\end{aligned}$$

$$\begin{aligned}\text{Effective Hourly Wages} &= \frac{\text{Total Earnings}}{\text{Hours Worked}} \\ &= \frac{1,080}{96} = ₹ 11.25 \text{ per Hour}\end{aligned}$$

(ii) Rowan Plan

$$\begin{aligned}\text{Earnings} &= [(\text{Hours Worked} \times \text{Rate per Hour}) + (\text{Time Taken} \div \text{Times Allowed}) \\ &\quad \times \text{Time Saved} \times \text{Rate per Hour}] \\ &= [(96 \times ₹ 10) + (96 \div 120) \times 24 \times ₹ 10] \\ &= ₹ 960 + 192 \\ &= ₹ 1,152\end{aligned}$$

$$\begin{aligned}\text{Effective Hourly Wages} &= \frac{\text{Total Earnings}}{\text{Hours Worked}} \\ &= \frac{1,152}{96} = \text{₹ 12 per Hour}\end{aligned}$$

Illustration 37

From the following particulars, determine the wages of a worker on the basis of Halsey Premium Bonus System and Rowan Premium Bonus System :

Standard time to complete a job	12 hours
Actual time taken	8 hours
Rate per hour	₹ 8

[C.U.B.Com. (General) - 2013]

Solution

Standard Time	12 Hours
Time taken	<u>8 Hours</u>
Time saved	<u>4 Hours</u>

(i) Halsey Premium Bonus System

$$\begin{aligned}\text{Earnings} &= \text{Hours Worked} \times \text{Rate per Hour} + 50\% \text{ of Time Saved} \times \text{Rate per Hour} \\ &= 8 \times ₹ 8 + 50\% \text{ of } 4 \text{ hours} \times ₹ 8 \\ &= ₹ 64 + 16 \\ &= \text{₹ 80}\end{aligned}$$

(ii) Rowan Premium Bonus System

$$\begin{aligned}\text{Earnings} &= [(\text{Hours Worked} \times \text{Rate per Hour}) + (\text{Time Taken} \div \text{Times Allowed}) \\ &\quad \times \text{Time Saved} \times \text{Rate per Hour}] \\ &= [(8 \times ₹ 8) + (8 \div 12) \times 4 \times ₹ 8] \\ &= ₹ 64 + 21.33 \\ &= \text{₹ 85.33}\end{aligned}$$

Illustration 38

From the following details, calculate the total earnings of a worker and the effective hourly rate of labour wages where bonus is paid under :

(i) The Halsey (50%) scheme;

(ii) The Rowan scheme.

Basic rate of wages per hour	₹ 10
Time allowed for the job	16 hours
Time actually taken	12 hours

[C.U.B.Com. (General) - 2014]

Solution

Time allowed	16 Hours
Time taken	<u>12 Hours</u>
Time saved	<u>4 Hours</u>

(i) Halsey 50% Scheme

$$\begin{aligned}\text{Earnings} &= \text{Hours Worked} \times \text{Rate per Hour} + 50\% \text{ of Time Saved} \times \text{Rate per Hour} \\ &= 12 \times ₹ 10 + 50\% \text{ of } 4 \text{ hours} \times ₹ 10 \\ &= ₹ 120 + 20 \\ &= \text{₹ 140}\end{aligned}$$

4.48 Employee Cost and Incentive Systems

$$\begin{aligned}\text{Effective Hourly Wages} &= \frac{\text{Total Earnings}}{\text{Hours Worked}} \\ &= \frac{140}{12} = \text{₹ 11.67 per Hour}\end{aligned}$$

(ii) Rowan Scheme

$$\begin{aligned}\text{Earnings} &= [(\text{Hours Worked} \times \text{Rate per Hour}) + (\text{Time Taken} \div \text{Times Allowed}) \\ &\quad \times \text{Time Saved} \times \text{Rate per Hour}] \\ &= [(12 \times \text{₹ 10}) + (12 \div 16) \times 4 \times \text{₹ 10}] \\ &= \text{₹ 120} + 30 \\ &= \text{₹ 150}\end{aligned}$$

$$\begin{aligned}\text{Effective Hourly Wages} &= \frac{\text{Total Earnings}}{\text{Hours Worked}} \\ &= \frac{150}{12} = \text{₹ 12.50 per Hour}\end{aligned}$$

Illustration 39

A worker takes 100 hours to do a job for which the time allowed is 125 hours. His hourly wage rate is ₹ 20.

Calculate the direct wages of the job under the following methods of payment of wages :

(a) Piece rate; (c) Halse Plan; and (d) Rowan Plan.

[C.U.B.Com. (General) - 2015]

Solution

Time allowed	125 Hours
Time taken	<u>100 Hours</u>
Time saved	<u>25 Hours</u>

Hourly wage rate = ₹ 20

Piece rate = 125 hours × ₹ 20 = ₹ 2,500.

(i) Piece Rate :

$$\begin{aligned}\text{Earnings} &= \text{No. of Units Produced} \times \text{Rate per Piece} \\ &= 1 \times 2,500 \\ &= \text{₹ 2,500}\end{aligned}$$

(ii) Halsey Plan

$$\begin{aligned}\text{Earnings} &= \text{Hours Worked} \times \text{Rate per Hour} + 50\% \text{ of Time Saved} \times \text{Rate per Hour} \\ &= 100 \times \text{₹ 20} + 50\% \text{ of } 25 \text{ hours} \times \text{₹ 20} \\ &= \text{₹ 2,000} + 250 \\ &= \text{₹ 2,250}\end{aligned}$$

(iii) Rowan Plan

$$\begin{aligned}\text{Earnings} &= [(\text{Hours Worked} \times \text{Rate per Hour}) + (\text{Time Taken} \div \text{Times Allowed}) \\ &\quad \times \text{Time Saved} \times \text{Rate per Hour}] \\ &= [(100 \times \text{₹ 20}) + (100 \div 125) \times 25 \times \text{₹ 20}] \\ &= \text{₹ 2,000} + 400 \\ &= \text{₹ 2,400}\end{aligned}$$

Illustration 40

From the following data, ascertain the total earnings of each worker separately. Also calculate effective hourly rate of wage of the workers :

	Milon	Mrinmoy
Time allowed (hours)	60	60
Actual time taken (hours)	42	45
Basic rate of wages per hour	₹ 20	₹ 20
Incentive scheme	Halsey	Rowan

[C.U.B.Com. (General) - 2016]

Solution

Calculation of Earnings — Halsey Incentive Scheme

Earnings = Hours Worked × Rate per Hour + 50% of Time Saved × Rate per Hour

Milon's Earnings :

Time allowed	60 Hours
Time taken	42 Hours
Time saved	18 Hours

$$\begin{aligned}\text{Earnings} &= 42 \times ₹ 20 + 50\% \text{ of } 18 \text{ hours} \times ₹ 20 \\ &= ₹ 840 + 180 \\ &= ₹ 1,020\end{aligned}$$

$$\begin{aligned}\text{Effective Hourly Wages} &= \frac{\text{Total Earnings}}{\text{Hours Worked}} \\ &= \frac{1,020}{42} = ₹ 24.29 \text{ per Hour}\end{aligned}$$

Calculation of Earnings — Rowan Incentive Scheme

Earnings = [(Hours Worked × Rate per Hour) + (Time Taken ÷ Times Allowed) × Time Saved × Rate per Hour]

Mrinmoy's Earnings :

Time allowed	60 Hours
Time taken	45 Hours
Time saved	15 Hours

$$\begin{aligned}\text{Earnings} &= [(45 \times ₹ 20) + (45 \div 60) \times 15 \times ₹ 20] \\ &= ₹ 900 + 225 \\ &= ₹ 1,125\end{aligned}$$

$$\begin{aligned}\text{Effective Hourly Wages} &= \frac{\text{Total Earnings}}{\text{Hours Worked}} \\ &= \frac{1,125}{45} = ₹ 25 \text{ per Hour}\end{aligned}$$

Illustration 41

From the following information calculate monthly remuneration of three workers : Papa, Munia and Tintu.

Standard production per month 100 units.

Actual production during the month :

Papa — 85 units, Munia — 72 units, Tintu — 96 units.

Piece rate wages ₹ 2 per unit.

4.50 Employee Cost and Incentive Systems

Fixed Dearness Allowance ₹ 100 per month, fixed house rent allowance ₹ 80 per month, additional bonus ₹ 10 for each percentage of actual production exceeding 80% of standard production.

[C.U.B.Com. (General) - 2017]

Solution **Calculation of Monthly Remuneration of Papa, Munia and Tintu**

Workers	Papa	Munia	Tintu
No. of units produced	85	72	96
Piece wages @ ₹ 2 per unit	170	144	192
Bonus (Note 1)	50	—	160
Dearness Allowance	100	100	100
Fixed House Rent Allowance	80	80	80
Total	400	324	532

Working Note : **(1) Calculation of Bonus**

Workers		Papa	Munia	Tintu
Standard Production Per Month	Units	100	100	100
Actual Production	Units	85	72	96
Percentage of actual production	%	85	72	96
Percentage of actual production in excess of 80%	%	5	—	16
Bonus @ ₹ 10 for each percentage above 80%	₹	50	—	160

[For Honours Candidates Only]

Illustration 42

A factory pays its workers under Rowan Premium Bonus Scheme. Workers also get dearness allowance of ₹ 250 per week of 48 hours.

A worker's basic wages is ₹ 100 per day of 8 hours and his time schedule for a week is summarised below :

Job No.	Time Allowed	Time Taken
103	25 hours	20 hours
107	30 hours	20 hours
Idle time (waiting)	—	<u>8 hours</u>
		<u>48 hours</u>

Calculate the gross wages he has earned for the week and indicate the accounts to which the wage amounts will be debited.

[C.U.B.Com. (Hons.) - 2008]

Solution **Calculation of Gross Wages**

Particulars	Job 108	Job 107	Idle Time
Time allowed (hours)	25	30	
Time taken (hours)	20	20	8
Time saved (hours)	5	10	8
	₹	₹	₹
Rate of wages per hour (₹ 100 ÷ 8)	12.50	12.50	12.50
(A) Time Wages (Hours worked × Rate per hour)	250	250	100
(B) Bonus (Note 1)	50	83	—
(C) Dearness Allowance (Note 2)	104	104	42
Total Wages (A + B + C)	404	437	142

Journal :

Job 103 Account	Dr.	404	
Job 107 Account	Dr.	437	
Factory Overhead Account*	Dr.	142	
To Wages Control Account			983

(*See page 4.15 for treatment of idle time in details.)

Note : Bonus has been calculated for each job separately. It was possible because time taken and time allowed for each job were given separately. If the time taken and time allowed were not given for each job separately, then all the time allowed for each job are to be added for calculation of bonus.

Working Notes :

(1) Calculation of Bonus under Rowan Premium Scheme

Bonus = (Time Saved ÷ Time Allowed) × Time Taken × Rate per Hour

Job 103 : $(5 \div 25) \times 20 \times ₹ 12.50 = ₹ 50$

Job 107 : $(10 \div 30) \times 20 \times ₹ 12.50 = ₹ 83.33$

(2) Dearness allowance has been distributed on the basis of time taken by each job:

Job 103 : $₹ 250 / 48 \times 20 \text{ hours} = ₹ 104 \text{ (approx.)}$

Job 107 : $₹ 250 / 48 \times 20 \text{ hours} = ₹ 104 \text{ (approx.)}$

Idle time = $₹ 250 / 48 \times 8 \text{ hours} = ₹ 42 \text{ (approx.)}$

Illustration 43

Sunshine Ltd. employs its workers for a single shift of 8 hours for 25 days in a month. Details of wages payable to the workers are as follows :

- (i) Basic wages per unit ₹ 2 (subject to a guaranteed minimum wage of ₹ 60 per day).
- (ii) Dearness allowance ₹ 40 per day.
- (iii) Standard output per day per worker — 40 units.
- (iv) Incentive bonus :
 - upto 80% efficiency : Nil
 - above 80% efficiency : ₹ 50 for every 1% increase above 80%.

The details of performance of three workers for the month of January '09 are as follows :

Workers	No. of days worked	Output (units)
A	25	820
B	18	500
C	25	910

Calculate the total earnings of each of three workers.

[C.U.B.Com. (Hons.) - 2009]

Solution

Statement Showing the Total Earnings of the Workers

Particulars	A (₹)	B (₹)	C (₹)
Piece wages (Note 1)	1,640	1,000	1,820
Guaranteed Minimum Wages (Note 2)	1,500	1,080	1,500
Wages Payable (Higher of the above two)	1,640	1,080	1,820
Dearness Allowance (₹ 40 per day)	1,000	720	1,000
Incentive Bonus (Note 3)	100	—	550
	2,740	1,800	3,370

4.52 Employee Cost and Incentive Systems

Working Notes :

(1) Calculation of Piece Wages :

Earnings = No. of Units Produced $\times$ Rate per Unit

A : $820 \times ₹ 2 = ₹ 1,640$

B : $500 \times ₹ 2 = ₹ 1,000$

C : $900 \times ₹ 2 = ₹ 1,800$

(2) Calculation of Bonus :

A : $25 \times ₹ 60 = ₹ 1,500$

B : $18 \times ₹ 60 = ₹ 1,080$

C : $25 \times ₹ 60 = ₹ 1,500$

(3) Calculation of Bonus

Particulars	A	B	C
No. of days worked in the month	25	18	25
Standard output per day	40	40	40
Standard output for the month	1,000	720	1,000
Actual output for the month	820	500	910
Efficient level (Actual Output $\div$ Standard Output) $\times$ 100	82%	69.44%	91%
Efficiency above 80% of standard	2%	–	11%
Bonus @ ₹ 50 per 1%	₹ 100	–	₹ 550

Illustration 44

In an organisation, where Halsey plan is in operation, Shrameek Babu can earn ₹ 27 on a job for which he takes time 8 hours. Rate of wages is ₹ 3 per hour. Calculate what will be his earnings if Rowan Plan is adopted.

[C.U.B.Com. (Hons.) - 2010]

Solution

Earnings Under Halsey Method

Earnings = Hours Worked $\times$ Rate per Hour + 50% of Time Saved $\times$ Rate per Hour

or, $27 = 8 \times ₹ 3 + 50\% \text{ of Time Saved} \times ₹ 3$

or, $27 - 24 = 50\% \text{ of Time Saved} \times ₹ 3$

or, $\frac{3}{3} = 50\% \text{ of Time Saved}$

or, Time Saved = **2 hours.**

Time Allowed = Time Taken + Time Saved

Time Allowed = $8 + 2 = 10$ hours.

Earnings Under Rowan Method

Earnings = [(Hours Worked $\times$ Rate per Hour) + (Time Taken $\div$ Times Allowed) $\times$ Time Saved $\times$ Rate per Hour]

Earnings = $[(8 \times ₹ 3) + (8 \div 10) \times 2 \times ₹ 3]$

= ₹ 24 + 4.80

= **₹ 28.80**

Illustration 45

In a factory A took 30 hours to complete a job. The factory cost of the job is ₹ 5,200. Raw materials cost of the job is ₹ 4,000. Hourly rate of wages is ₹ 20. Works overhead is recovered on the job at ₹ 15 per hours worked. A is entitled to receive bonus according to Rowan Plan. Calculate standard time for completion of the job.

[C.U.B.Com. (Hons.) - 2011]

Solution

		₹
Factory cost of the job		5,200
Less: Materials cost	4,000	
Less: Works overhead (300 × ₹ 15)	<u>450</u>	<u>4,450</u>
Total Wages for the Job		750
Time Wages (30 × ₹ 20)		<u>600</u>
Bonus (under Rowan Plan)		<u>150</u>
Let time allowed be x		

$$\text{Bonus under Rowan} = \frac{\text{Time Taken}}{\text{Time Allowed}} \times \text{Time Saved} \times \text{Rate per Hour}$$

$$\text{or, ₹ 150} = \frac{30}{x} \times (x - 30) \times ₹ 20$$

$$\text{or } 150x = (30x - 900) \times ₹ 20$$

$$\text{or } 150x = 600x - 18,000$$

$$\text{or } 450x = 18,000$$

$$\text{or } x = 40$$

Therefore, standard time for completion of the job = **40 hours**.

Illustration 46

From the particulars given below, calculate earnings of the workers, Satyen and Goutam, under differential piece-rate system :

Standard time allowed 40 units per hour

Time rate wage ₹ 4.00 per hour

Differential piece rates to be applied :

75% of piece rate when below standard.

125% of piece rate when at and above standard.

The workers have produced in a day of 8 hours as follows :

Satyen 400 units

Goutam 240 units

[C.U.B.Com. (Hons.) - 2012]

Solution

Time Allowed :

$$\text{Satyen} = \frac{400}{40} = 10 \text{ hours} \quad \text{Goutam} = \frac{240}{40} = 6 \text{ hours}$$

$$\text{Efficiency} = \frac{\text{Time Allowed}}{\text{Time Taken}} \times 100$$

$$\text{Satyen's Efficiency} = \frac{10}{8} \times 100 = 125\% \quad \text{Goutam's Efficiency} = \frac{6}{8} \times 100 = 75\%$$

Alternatively,

$$\text{Efficiency} = \frac{\text{Actual Output}}{\text{Standard Output}} \times 100$$

$$\text{Satyen's Efficiency} = \frac{400}{(8 \times 40)} \times 100 = 125\% \quad \text{Goutam's Efficiency} = \frac{240}{(8 \times 40)} \times 100 = 75\%$$

4.54 Employee Cost and Incentive Systems

(a) **Standard Piece Rate** = $4 \div 40 = ₹ 0.10$

(b) **Differential Piece Rate**

(i) For Satyen = $0.10 \times 125\% = 0.125$

(ii) For Goutam = $0.10 \times 75\% = 0.075$

Earnings = No. of Units Produced $\times$ Differential Piece Rate

Satyen's Earnings = $400 \times 0.125 = ₹ 50$

Goutam's Earnings = $240 \times 0.075 = ₹ 18$

Illustration 47

Pradeep Kar working under a bonus scheme saves 12 hours in a job for which the standard time is 60 hours. Calculate the rate per hour worked and wages payable to Pradeep Kar if incentive bonus of 10% on the hourly rate is payable when standard time (namely 100% efficiency) is achieved, and a further incentive bonus of 1% for each additional percentage in excess of that 100% efficiency is payable. Normal rate of wage is ₹ 5.00 per hour.

[C.U.B.Com. (Hons.) – 2013]

Solution

Time allowed 60 hours

Time saves 12 hours

Time taken 48 hours

Percentage of Efficiency = $(\text{Time allowed} / \text{Time taken}) \times 100 = (60 \text{ hours} \div 48 \text{ hours}) \times 100 = 125\%$

Bonus Payable to Pradeep Kar

(i) On achieving 100% efficiency – Bonus is 10% on hourly rate

(ii) On achieving more than 100% efficiency, for every 1% in excess of 100% bonus is 1%

$[125\% - 100\%] = 25\% \times 1\% - \text{Bonus is } 25\% \text{ on hourly rate}$

Total Bonus on hourly rate = 35% (10% + 25%)

Hourly rate after bonus = ₹ 5 + 35% of ₹ 5 = ₹ 6.75.

Earnings = Hours worked $\times$ Rate per hour = 48 hours $\times$ ₹ 6.75 per hour = ₹ 324

Illustration 48

In a factory, Sudhir took 26 hours to complete a job. The standard time for this work was 40 hours. He was paid at ₹ 10 per hour. He worked under Halsey Scheme.

Find out :

(a) Effective hourly rate of wages of Sudhir.

(b) Employer's savings from the work.

[C.U.B.Com. (Hons.) – 2014]

Solution

Time allowed 40 hours

Time saves 26 hours

Time taken 14 hours

Earnings under Halsey Scheme

Earnings = Hours Worked $\times$ Rate per Hour + 50% of Time Saved $\times$ Rate per Hour

Earnings = $26 \times ₹ 10 + 50\% \text{ of } 14 \text{ hours} \times ₹ 10$

= ₹ 260 + 70

= ₹ 330

(a) Effective Hourly Rate of Wages of Sudhir = ₹ 330 $\div$ 26 = ₹ 12.69

(b) Employer Savings = 50% of Time Saved $\times$ Rate per Hour

= 50% of 14 $\times$ ₹ 10

= ₹ 70

Tutorial Note : Under Halsey Scheme, the time saved is shared by the employee and employer equally.

Total savings = $14 \times ₹ 10 = ₹ 140$.

Employer's share $1 \div 2$ of ₹ 140 = ₹ 70.

Employee's share = $1 \div 2$ of ₹ 140 = ₹ 70.

Illustration 49

From the following particulars, calculate the Gross Earnings and Net Earnings for the month of March 2013 of Sri Netai Ghosh :

- (a) Basic wages — ₹ 10,000.
- (b) Dearness Allowance — 50%
- (c) Own contribution to Provident Fund (on basic wage) — 8%
- (d) Own contribution to ESI (on basic wage) — 2%
- (e) Overtime — 10 hours

The normal working hours for the month of March 2013 is 200 hours. Overtime is paid at double rate of normal wages and dearness allowance.

[C.U.B.Com. (Hons.) – 2014]

Solution

Statement Showing Gross Earnings and Net Earnings

Particulars		₹	₹
(a)	Basic wages	10,000	
(b)	Dearness allowance — 50% of basic wages	5,000	15,000
(c)	Overtime wages (Note 1)		1,500
	Gross Earnings		16,500
	Less: Contribution to P.F. (8% of ₹ 10,000)	800	
	Contribution to E.S.I. (2% of ₹ 10,000)	200	1,000
	Net Earnings		15,500

Working Note :

(1) Calculation of Overtime Wages :

Normal Rate of Wages = $15,000 \div 200$ hours = ₹ 75

Overtime Wages = $10 \times 75 \times 2 = ₹ 1,500$

Illustration 50

In an assembly shop of a motorcycle factory, 4 workmen P, Q, R and S work together as a team. They are paid on group piece rate and they also work individually on day rate jobs. In a 46 hours week, the following hours have been spent by P, Q, R and S on group piece work, viz., P—40 hours, Q—40 hours, R—30 hours and S—20 hours. The balance of time has been booked by each worker on day rate jobs. Their hourly rates are : P ₹ 5.00; Q ₹ 7.50; R ₹ 10.00; S ₹ 10.00

The group piece rate is ₹ 10.00 per unit and the team has produced 180 units.

Calculate gross weekly earnings of each workman taking into consideration that each worker is entitled to dearness allowance of 25% of time wages.

[C.U.B.Com. (Hons.) – 2015]

Solution

Total group piece wages = 180 units $\times$ ₹ 10 = ₹ 1,800.

This total wages of ₹ 1,800 will be divided among the workers in the ratio of time wages in a group :

P — 40 hours @ ₹ 5.00 = ₹ 200

Q — 40 hours @ ₹ 7.50 = ₹ 300

R — 30 hours @ ₹ 10.00 = ₹ 300

S — 20 hours @ ₹ 10.00 = ₹ 200

The ratio will be : 200 : 300 : 300 : 200 or **2 : 3 : 3 : 2**.

4.56 Employee Cost and Incentive Systems

(a) Sharing of Group Wages :	₹
P's share of group wages — 2/10 of ₹ 1,800	360
Q's share of group wages — 3/10 of ₹ 1,800	540
R's share of group wages — 3/10 of ₹ 1,800	540
S's share of group wages — 2/10 of ₹ 1,800	360
	<u>1,800</u>

(b) Time Wages of P, Q, R and S :
P's time wages — (46 – 40) ₹ 5 = ₹ 30
Q's time wages — (46 – 40) ₹ 7.5 = ₹ 45
R's time wages — (46 – 30) ₹ 10 = ₹ 160
S's time wages — (46 – 20) ₹ 10 = ₹ 260

Calculation of Gross Weekly Earnings of Each Workman

Particulars	P (₹)	Q (₹)	R (₹)	S (₹)
(a) Share of group wages	360.00	540.00	540.00	360.00
(b) Time wages	30.00	45.00	160.00	260.00
(c) Dearness Allowance (25% of Time Wages)	7.50	11.25	40.00	65.00
Total	397.50	596.25	740.00	685.00

Illustration 51

In a factory, standard time for a job is 84 hours. The hourly rate of wage is ₹ 50. Halsey-premium plan is in operation at the factory. Jayanta, a worker, completed the job at less than standard time and his effective hourly rate of wage was ₹ 60.

What will be his total earnings if he worked under Rowan-premium plan ?

[C.U.B.Com. (Hons.) – 2016]

Solution

Let time taken = x	
So, Time wages = x hours ₹ 50	50 x
Halsey Bonus = $50\% \times (84 - x) \times ₹ 50$	2,100 – 25 x
Total Wages = $50x + 2100 - 25x$	2,100 + 25 x

$$\text{Effective Hourly Rate} = \frac{\text{Total Wages}}{\text{Time Taken}} = \frac{2,100 + 25x}{x}$$

$$\text{or } 60 = \frac{2,100 + 25x}{x}$$

$$\text{or } 60x - 25x = 2,100$$

$$\text{or } 35x = 2,100$$

$$\text{or } x = 60$$

Therefore, time taken = **60 hours**.

Standard Time	84 Hours
Time taken	<u>60 Hours</u>
Time saved	<u>24 Hours</u>

Total Earnings Under Rowan Plan

$$\begin{aligned}
 \text{Earnings} &= [(\text{Hours Worked} \times \text{Rate per Hour}) + (\text{Time Taken} \div \text{Times Allowed}) \\
 &\quad \times \text{Time Saved} \times \text{Rate per Hour}] \\
 &= (60 \times ₹ 50) + (60 \div 84) \times 24 \times ₹ 50 \\
 &= ₹ 3,000 + ₹ 857.14 \\
 &= ₹ \mathbf{3,857.14}
 \end{aligned}$$

Illustration 52

In a factory, a job can be executed either by workman X or Y. X takes 32 hours to complete the job while Y finishes it in 30 hours. The standard time to finish the job is 40 hours. The raw material input cost and normal rate of wages are same for both the workers. X is entitled to receive bonus according to Halsey Plan. Y is paid bonus under Rowan Plan. Works overhead is recovered in the job @ ₹ 15 per labour hour worked. The factory cost of the job comes to ₹ 10,400 irrespective of the workman engaged.

Find the normal rate of wages per hour.

[C.U.B.Com. (Hons.) – 2017]

Solution

Let a be the cost of material and b be the normal rate of wages per hour. The factory cost can be calculated as follows :

	Factory Cost of Workman X	Factory Cost of Workman Y
Materials Cost	a	a
Wages	$32b$	$30b$
Bonus (Note 1)	$4b$	$7.5b$
Overhead	480	450
Total Factory Cost	$a + 36b + 480$	$a + 37.5b + 450$

It has been given that the factory cost of both the workers comes to ₹ 10,400.

From the above information, the following equation can be formulated :

$$a + 36b + 480 = 10,400 \quad \dots \dots \dots (1)$$

$$a + 37.5b + 450 = 10,400 \quad \dots \dots \dots (2)$$

$$\text{or, } a + 36b = 10,400 - 480$$

$$a + 37.5b = 10,400 - 450$$

$$\text{or, } a + 36b = 9,920 \quad \dots \dots \dots (3)$$

$$a + 37.5b = 9,950 \quad \dots \dots \dots (4)$$

Subtracting equation (3) from (4), we get

$$1.5b = 30$$

$$\text{or } b = 20$$

Therefore, rate of wage = ₹ 20.

Substituting the value of (b) in equation (3), we get :

$$a + (36 \times 20) = 9,920$$

$$\text{or } a = 9,920 - 720$$

$$\text{or } a = ₹ 9,200$$

Therefore, materials cost = ₹ 9,200.

Working Notes : Calculation of Bonus of X and Y

	X		Y
Time Allowed	40	Time Allowed	40
Time Taken	32	Time Taken	30
Time Saved	8	Time Saved	10
Bonus ($1/2 \times 8 \times b$)	4b	Bonus ($30/40 \times 10 \times b$)	7.5b

Illustration 53

Calculate total monthly remuneration of workers, A, B and C on the basis of the following information for the month of March, 2017 :

(a) Standard production for each worker = 2000 units.

(b) Rate of wages = ₹ 5 per unit.

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(c) Bonus = ₹ 100 for each 2% increase over 90% of the standard.

(d) Dearness allowance = 50% of piece wage.

The units completed by the three workers were as under :

A — 1900 units; B — 1760 units and C — 2120 units.

[C.U.B.Com. (Hons.) – 2017]

Solution Calculation of Monthly Remuneration of A, B and C

Particulars	A	B	C
Units produced	1,900	1,760	2,120
Piece wages @ ₹ 5 per unit (₹)	9,500	8,800	10,600
Bonus (Note 1)	250	–	800
Dearness allowance	4,750	4,400	5,300
Total	14,500	13,200	16,700

Working Note : (1) Calculation of Bonus

Particulars	A	B	C
Standard production p.m.	2,000	2,000	2,000
Actual production	1,900	1,760	2,120
Percentage of actual production	95%	88%	106%
Percentage of actual production above 90%	5%	–	16%
Bonus @ ₹ 100 for each 2% above 90%	250	–	800

Special Problems

Illustration 54

Wage negotiations are going on with the recognised labour union and the management wants you as the Cost Accountant of the Company to formulate an incentive scheme with a view to increase productivity.

The case of three typical workers Achyuta, Ananta and Govinda who produce respectively 180, 120 and 100 units of the company's product in a normal day of 8 hours is taken up for study.

Assuming that day wages would be guaranteed at ₹ 37.5 per hour and the piece rate would be based on a standard hourly output of 10 units, calculate the earnings of each of the three workers and the labour cost per 100 pieces under :

- Day Wages;
- Piece Rate;
- Halsey Scheme; and
- Rowan Scheme.

Also calculate under the above schemes the average cost of labour for the company to produce 100 pieces.

[C.A. (Inter) – Adapted]

Solution

Calculation of Earnings of Each Worker and Calculation of Labour Cost per 100 Pieces

(i) Day Wages Method

	Day Wages	Actual Output	Labour Cost per 100 pieces
Workers	(₹)	(Units)	(₹)
Achyuta (₹ 37.5 × 8 hours)	300	180	166.67
Ananta (₹ 37.5 × 8 hours)	300	120	250.00
Govinda (₹ 37.5 × 8 hours)	300	100	300.00
Total	900	400	

$$\begin{aligned}\text{Average Cost of Labour for the Company to Produce 100 pieces} &= \frac{\text{Total Labour Cost}}{\text{Total Output}} \times 100 \\ &= \frac{900}{400} \times 100 = ₹ 225\end{aligned}$$

(ii) Piece Rate Method

Workers	Actual Output (Units)	Piece Rate (Note 1)	Wage Earned (₹)
Achyuta	180	3.75	675
Ananta	120	3.75	450
Govinda	100	3.75	375
Total	400		1,500

$$\begin{aligned}\text{Average Cost of Labour for the Company to Produce 100 pieces} &= \frac{\text{Total Labour Cost}}{\text{Total Output}} \times 100 \\ &= \frac{1,500}{400} \times 100 = ₹ 375\end{aligned}$$

(iii) Halsey Scheme

Workers	Notes	Wages Earned (₹)	Actual Output (Units)	Labour Cost per 100 pieces (₹)
Achyuta	1(a)	487.50	180	270.83
Ananta	1(b)	375.00	120	312.50
Govinda	1(c)	337.50	100	337.50
Total		1,200.00	400	

$$\begin{aligned}\text{Average Cost of Labour for the Company to Produce 100 pieces} &= \frac{\text{Total Labour Cost}}{\text{Total Output}} \times 100 \\ &= \frac{1,200}{400} \times 100 = ₹ 300\end{aligned}$$

(iv) Rowan Scheme

Workers	Notes	Wages Earned (₹)	Actual Output (Units)	Labour Cost per 100 pieces (₹)
Achyuta	2(a)	466.67	180	259.26
Ananta	2(b)	400.00	120	333.33
Govinda	2(c)	360.00	100	360.00
Total		1,226.67	400	

$$\begin{aligned}\text{Average Cost of Labour for the Company to Produce 100 pieces} &= \frac{\text{Total Labour Cost}}{\text{Total Output}} \times 100 \\ &= \frac{1,226.67}{400} \times 100 = ₹ 306.67\end{aligned}$$

Working Notes :

	Achyuta	Ananta	Govinda
Time allowed	180/10 = 18 hours	120/10 = 12 hours	100/10 = 10 hours
Time taken	<u>8 hours</u>	<u>8 hours</u>	<u>8 hours</u>
Time saved	<u>10 hours</u>	<u>4 hours</u>	<u>2 hours</u>

(1) Wages under Halsey Scheme

Earnings = Hours Worked × Rate per Hour + 50% of Time Saved × Rate per Hour

(a) Achyuta : 8 × ₹ 37.50 + 50% of 10 hours × ₹ 37.50 = 487.50

(b) Ananta : 8 × ₹ 37.50 + 50% of 4 hours × ₹ 37.50 = 375.00

(c) Govinda : 8 × ₹ 37.50 + 50% of 2 hours × ₹ 37.50 = 337.50

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(2) Wages under Rowan Scheme

Earnings = Hours Worked $\times$ Rate per Hour + (Time Saved $\div$ Time Allowed) $\times$ Time Taken $\times$ Rate per Hour

(a) Achyuta : $8 \times ₹ 37.50 + (10 / 18 \times 8 \times ₹ 37.50) = ₹ 466.67$

(b) Ananta : $8 \times ₹ 37.50 + (4 / 12 \times 8 \times ₹ 37.50) = ₹ 400.00$

(c) Govinda : $8 \times ₹ 37.50 + (2 / 10 \times 8 \times ₹ 37.50) = ₹ 360.00$

Illustration 55

LG Ltd manufactures a single product. Currently the company employs a team of six direct worker who produce a total of 2,500 units of the product in a 40-hour week. The hourly rate of pay for each worker is ₹ 80. In an effort to improve productivity, and this to increase output in the normal 40-hour week, an incentive scheme has been suggested. The scheme, which the six workers have agreed to trial over a 4-week period, provides for differential piecework payments in addition to a reduced basic rate per hour. Details of the scheme are as follows :

Basic hourly rate ₹ 40 per hour.

Differential piece rate :

First 2,500 units of output in a week — ₹ 3.75 per unit.

Output 2,501 to 3,000 units in a week — ₹ 4.50 per unit on additional units over 2,500.

Output over 3,000 units in a week — ₹ 6 per unit on additional units over 3,000.

In the first week of the trial, total output was 3,080 units in the 40-hours worked.

Required :

(a) For existing time rate payment system, calculate :

(i) the labour cost per unit, based on the current weekly output of 2,500 units;

(ii) the % change in the labour cost per unit if weekly output in the 40-hours worked could be increased to 2,750 units.

(b) For incentive scheme, calculate :

(i) the labour cost per unit, based on the results of the first week of the trial;

(ii) the level of output in a 40-hour week at which total labour cost would be the same as under the existing time rate payment system.

Solution

(a) Time Rate Payment System

(i) Calculation of labour cost per unit when weekly output is 2,500 units

Total labour cost per week = (6 workers $\times$ 40 hours $\times$ ₹ 80 per hour) = ₹ 19,200.

$$\text{Labour Cost per Unit} = \frac{\text{Total Weekly Wages}}{\text{Total Weekly Output}} = \frac{19,200}{2,500} = ₹ 7.68$$

(ii) Calculation of labour cost per unit when weekly output is 2,750 units

Total labour cost per week = ₹ 19,200.

$$\text{Labour Cost per Unit} = \frac{\text{Total Weekly Wages}}{\text{Total Weekly Output}} = \frac{19,200}{2,750} = ₹ 6.98$$

$$\% \text{ of Reduction in Unit Cost} = \frac{7.68 - 6.98}{7.68} \times 100 = 9.11\%$$

(b) Incentive Scheme

(i) Calculation of labour cost per unit when weekly output is 3,080 units

(a) Basic wages (6 workers $\times$ 40 hours $\times$ ₹ 40 per hour) 9,600

(b) Differential piecework :

2,500 units @ ₹ 3.75 per unit 9,375

500 units @ ₹ 4.50 per unit 2,250

80 units @ ₹ 6.00 per unit 480

12,105

21,705

$$\text{Cost per Unit} = \frac{\text{Total Weekly Wages}}{\text{Total Weekly Output}} = \frac{21,705}{3,080} = ₹ 7.05$$

(ii) Level of output for common total labour cost	₹
Labour cost under current system	19,200
Less: Basic wages under incentive scheme	<u>9,600</u>
	9,600
Less: Initial piece work under incentive scheme (for 2,500 units)	<u>9,375</u>
	<u>225</u>
₹ 225 / ₹ 4.5 = 50 units (in excess of previous level)	
Level of output = 2,500 + 50 = 2,550 units	

Group Bonus Scheme

Now-a-days many factor operations require employees to work as groups or crews where it is not possible to measure the work of one individual employee. In this situation group bonus scheme can be introduced, as an individual bonus system could not be operated.

Group Bonus Schemes may be employed in the following situations :

1. Where output of individual employee cannot be measured but the output of the entire group can be measured easily.
2. Where output of an employee depends less upon his efforts, and more upon the combined efforts of a group.
3. Where the policy of the management is to encourage a team spirit.

Under group bonus scheme, production of the group as a whole is measured and the total bonus is determined by adopting an incentive scheme. Usually, the bonus earned by the group for production in excess of the target is divided among the group members equally or in accordance with their respective base rate.

Advantage of Group Bonus Scheme

1. The group bonus schemes reduce the amount of clerical work because it is not required to calculate the individual employee's bonus.
2. The group bonus schemes reduce the supervision necessary to operate on incentive scheme.
3. The group bonus schemes may contribute to better cooperation among the employees.
4. Even lazy employees tend to work harder if they are in a group.

Illustration 56

In an assembly shop four workmen (A, B, C, D) work together as a team and are paid on group piece rate. They also work individually on hourly rate jobs. In a 44 hour week, the following hours have been spent by them on group piece work. A : 40 hours; B : 40 hours; C : 30 hours and D : 20 hours. The balance of the time in the week has been booked by each worker on day work jobs. The hourly rates are as follows :

A = ₹ 3.00; B = ₹ 4.50; C = ₹ 6.00; D = ₹ 6.00.

The group piece rate is ₹ 6.00 per unit and the team has produced 150 units. Calculate the gross weekly earning of each workman taking into consideration that each individual is entitled to dearness allowance of ₹ 50 per week.

[C.U. B.Com. (Hons.) - Adapted]

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Solution

Group production - 150 units; Group earnings = 150 units × ₹ 6 = ₹ 900.

Statement Showing Time Spent in Group Work and Day Rate Jobs

	Total Time (Hours)	Time Spent in Group Earnings (Hours)	Time Spent in Day Rate Jobs (Hours)
A	44	40	4
B	44	40	4
C	44	30	14
D	44	20	24
Total	176	130	46

Statement Showing the Total Earnings of Each Workman

Workman	A (₹)	B (₹)	C (₹)	D (₹)
Day rate wages (Note 1)	12	18	84	144
Group piece wages (Note 2)	277	277	208	138
Dearness allowance	50	50	50	50
Total	339	345	342	332

Working Notes :

(1) Calculation of Date Rate Wages	₹	(2) Group Piece Wages	₹
A : 4 hours × ₹ 3	12	A : ₹ 900 / 130 × 40	277
B : 4 hours × ₹ 4.50	18	B : ₹ 900 / 130 × 40	277
C : 14 hours × ₹ 6	84	C : ₹ 900 / 130 × 30	208
D : 24 hours × ₹ 6	144	D : ₹ 900 / 130 × 20	138
Total	<u>258</u>	Total	<u>900</u>

Illustration 57

In a factory Group Bonus Scheme is in use which is calculated on the basis of earnings under time rate.

The following particulars are available for a group of 4 workers P, Q, R and S :

(i) Output of the group	16,000 units
(ii) Piece rate per 100 units	₹ 25.00
(iii) No. of hours worked by	
P	90
Q	72
R	80
S	100
(iv) Time rate per hour for	
P	₹ 8.00
Q	₹ 10.00
R	₹ 12.00
S	₹ 8.00

Calculate the total of Bonus and Wages earned by each worker.

[I.C.W.A. (Inter) - June, 1992]

Solution

Total Earnings of the Group under Piece Rate

Earnings = No. of units produced by the group × Rate per piece
 = 16,000 units × (₹ 25 / 100)
 = ₹ 4,000.

Time Wages of the Workers

Earnings = Hours worked × Rate per hour	
P's earnings = 90 hours × ₹ 8 per hour	720
Q's earnings = 72 hours × ₹ 10 per hour	720
R's earnings = 80 hours × ₹ 12 per hour	960
S's earnings = 100 hours × ₹ 8 per unit	800
	<u>3,200</u>

Total Wages and Bonus Earned by the Workers

P (4,000 / 3,200) × 720	900
Q (4,000 / 3,200) × 720	900
R (4,000 / 3,200) × 960	1,200
S (4,000 / 3,200) × 800	<u>1,000</u>
Total	<u>4,000</u>

Illustration 58

Both direct and indirect labour of a department in a factory are entitled to production bonus in accordance with a Group Incentive Scheme, the outlines of which are as follows :

- For any production in excess of the standard rate fixed at 10,000 tonnes per month (of 25 days) a general incentive of ₹ 10 per ton is paid in aggregate. The total amount payable to each separate group is determined on the basis of an assumed percentage of such excess production being contributed by it, namely, @ 70% by direct labour, @ 10% by inspection staff, @ 12% by maintenance staff and @ 8% by supervisory staff.
- Moreover, if the excess production is more than 20% above the standard, direct labour also gets a special bonus @ ₹ 5 per ton for all production in excess of 120% of standard.
- Inspection staff are penalized @ ₹ 20 per head for rejection by customer in excess of 1% of production.
- Maintenance staff are also penalized @ ₹ 20 per hour of machine breakdown.

From the following particulars for the month, work out the production bonus earned by each group.

- Actual working days - 20
- Production - 11,000 tons
- Rejection by customer - 200 tons
- Machine breakdown - 40 hours

[I.C.W.A. (Inter) - Adapted]

Solution

- Number of working days during the month = 20 days.
- Standard production rate per month of 25 days = 10,000.
- Standard production for the month of 20 days = 10,000 tons / 25 × 20 = 8,000 tons.
- Actual production for the month of 20 days = 11,000 tons.
- Excess production during the month = 11,000 tons - 8,000 tons = 3,000 tons.
- Excess production above 20% of standard = 3,000 tons - 20% of 8,000 tons = 1,400 tons.

Statement Showing the Bonus Earned by Each Group

Category	General Incentive Contribution			Special Incentive		Penalty (₹)	Total Bonus (₹)
	%	Tonne	Amount (₹)	Tonne	Amount (₹)		
(a) Direct labour	70	2,100	21,000	1,400	7,000	-	28,000
(b) Inspection staff	10	300	3,000	-	-	(1,800)	1,200
(c) Maintenance staff	12	360	3,600	-	-	(800)	2,800
(d) Supervisory staff	8	240	2,400	-	-	-	2,400
Total	100	3,000	30,000	1,400	7,000	(2,600)	34,400

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Working Notes :

(1) Actual rejection by customer	200 tons
Allowance rejection (1% of 11,000)	<u>110 tons</u>
Excess rejection	<u>90 tons</u>

Penalty = 90 tons @ ₹ 20 = ₹ 1,800.

- (2) Machine hours break down = 40 hours. Penalty = 40 hours @ ₹ 20 per hour = ₹ 800.

Labour Turnover

It often happens that some of the employees leave the organisation during the accounting period. There may be various reasons for leaving the organisation but the personnel manager must take necessary steps to find out the root cause. Every organisation should prepare monthly labour turnover report. The report should focus on the root causes of labour turnover, distinguishing the avoidable from the unavoidable. It also analyses whether employees are leaving for dissatisfaction or are being dismissed because of bad selection. The personnel manager should compile data of different departments and compare it with the previous data. Some labour turnover is good for the organisation because unsuitable employees should not be continued for a long time. Majority of the companies try to keep good employees by offering different incentives.

Causes of Labour Turnover

Causes of labour turnover can be classified into *three* categories :

- (i) Unavoidable causes;
- (ii) Avoidable causes; and
- (iii) Personal causes

Unavoidable causes are those which are beyond the control of the management. Some of the unavoidable causes are :

- (a) Change in the plant location. **For example**, Tata Motors Ltd. Shifted their Nano car plant from Singur in West Bengal to Sanand in Gujarat in 2008.
- (b) Disciplinary measures. **For example**, Maruti has terminated the service of 2000+ employees in their Manesar Plant at Haryana in 2012 for rioting inside the plant.
- (c) Lack of demand for the product because of change of customers' taste and technology.
- (d) Non-availability of raw materials. **For example**, many sugar mills in UP and Bihar have suspended their normal operations for non-availability of sugar cane.
- (e) Government / Court Order restricting the operation in certain areas. **For example**, mining activities in certain tribal areas of Odisha has been suspended by the Hon'ble Supreme Court.

Avoidable causes are those which the management can address in time. Some of the avoidable causes are :

- (a) Low remuneration and lack of other facilities.
- (b) Long working hours.
- (c) Working under constant pressure.
- (d) Unsuitable working hours. **For example**, 6 pm to 2 am. (It is very common practice in IT industry)
- (e) Unsuitable working conditions.
- (f) Bad work culture of the organisation. **For example**, a particular caste or religion is given preference in promotion, pay, etc.
- (g) Lack of medical and recreational facilities.
- (h) Lack of appreciation of good employees by the management.
- (i) Unfair evaluation of employees for promotion, benefits, etc.
- (j) Lack of training facilities and career advancement.

Personal causes are those which compel the employees to leave the organisation. Some of the personal causes are as follows :

- (a) Better job opportunity with higher pay and designation.
- (b) Children's education.
- (c) Family obligation (e.g., looking after old parents).
- (d) Marriage of female employees.
- (e) Health problem leading to pre-mature retirement.
- (f) Bad and in-human behavior of the higher authority.
- (g) Lack of job security.
- (h) Preference of Government job over private job, etc.

Effects of Labour Turnover on Cost of Production

Apart from direct cost of recruitment such as advertising in newspaper, agency fees, holding of examination, interview and so on, there are some 'indirect costs' or 'hidden costs' which are not always recognised. **For example**, training and education of employees may be very costly. In many organisations, employees are given a training course which may last for any duration from a week to several months. The cost of training, salary and other benefits during training period are huge. The newly appointed employees may not work efficiently right in the beginning, wastage or scrap may be more and some cost involvement will be there.

Treatment of Labour Turnover Cost in Cost Accounting

In the cost ledger, a separate account should be set up to record the cost of training. This account will be debited with the wages of the learner during the period of training, salary and other allowances of the instructors, the cost of materials, incidental expenses relating to facilities provided for training.

Generally, an average cost per worker trained is ascertained from the above account. **The cost of training is charged to different departments according to the number of employees trained as production overhead.**

Many organisations are treating the training and related cost as administrative overheads.

Remedial Steps to Minimise Labour Turnover

Labour turnover is unavoidable but high labour turnover is not a good sign for any organisation. It has been mentioned earlier that labour turnover affects the smooth working of the organisation. Therefore, it is the responsibility of the management that there should be minimum labour turnover. A study of the reasons for labour turnover will normally indicate the steps which management should take to reduce its occurrence. Generally, the following steps are taken to minimise the labour turnover :

1. **Exit Interview** : To ascertain the reasons for leaving the organisation, the personnel department may arrange an exist interview for each out-going employee.
2. **Job Analysis and Evaluation** : To find out suitable employee for particular job, the job evaluation and job analysis should be undertaken before recruitment.
3. **Scientific System of Recruitment, Placement and Promotion** : Different employees are suitable for different jobs. At the time of selecting employees, some scientific approach should be adopted. **For example**, very intelligent but 'shy' candidate may not be suitable for sales department. However, the same candidate may be suitable for back office work. At the time of selection and placement the objective should be clear. If right candidate is selected for right job, the chance of labour turnover will be minimum.
4. The work culture of the organisation should be healthy so that everybody can do his best. The promotion policy should be very transparent so that there is no ill-feeling amongst the employees. The right person should get the right treatment from the management. If best practice is followed, the employees will think twice before leaving the organisation.
5. The management should try to provide adequate medical and housing facilities to employees.
6. The management should encourage higher studies and skill development training of the employees.

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7. The management should try to provide education facilities for the children of the employees.
8. The establishment of grievance cell to address the complaints of the employees. Prompt action by management will create a sense of belonging among the employees.

Measurement of Labour Turnover

Labour turnover is normally measured as the ratio of the number of employees leaving in a particular period to average number of employees on the payroll. It should be noted that all employees who leave voluntarily or dismissed, must be included. The average number of employees can be calculated simply by adding the opening number of employees to the closing number and dividing the total by two. The moving average technique can also be adopted for this purpose. At the time of calculating average, normally part-time employees are taken as 'halves'. It means two part-time employees will be counted as one full-time employee.

There are different methods of calculating labour turnover. Some of these are :

- (i) Separation Method;
- (ii) Replacement Method; and
- (iii) Flux Method.

(i) **Separation Method** : Under this method, labour turnover is calculated by comparing the number of employees leaving the organisation in the period and the average number of employees in the period. The average number of employees can be calculated by adding the opening number of employees to closing number of employees and dividing the total by two.

The formula for calculating labour turnover is :

$$\text{Labour Turnover} = \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100$$

(ii) **Replacement Method** : There is another method of calculating labour turnover which is very rarely used by the organisations. Here, in the numerator only the number of employees replaced during the period is only taken into consideration. However, the denominator remains same as the previous methods.

The formula for calculating labour turnover is :

$$\text{Labour Turnover} = \frac{\text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100$$

(iii) **Flux Method** : Many organisations calculate labour turnover by taking both leaving employees and replaced employees in the numerator. However, the denominator remains same for previous formula.

The formula for calculating labour turnover is :

$$\text{Labour Turnover} = \frac{\text{Number of Employees Leaving} + \text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100$$

It should be appreciated that the first formula is much more logical than the third one, as management is primarily concerned with cost associated (e.g., training cost) with the leaving of the employees.

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 59

Banerjee & Co. gives the following information :

Number of workers on 1.4.2006	1,000
Number of workers on 31.3.2007	1,200
Number of workers resigned during the year	100
Number of workers discharged during the year	10
Number of workers recruited in the vacancies of those resigned and discharged during the year	75

Calculate the labour turnover rate by applying the following three method :

- (i) Separation method
- (ii) Replacement method; and
- (iii) Flux method

[C.U.B.Com. (General) - 2007]

Solution

Average Number of Employees = $(1,000 + 1,200) \div 2 = 1,100$.

(i) Separation Method

$$\begin{aligned} \text{Labour Turnover} &= \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{100 + 10}{1,100} \times 100 = \mathbf{10\%} \end{aligned}$$

(ii) Replacement Method

$$\begin{aligned} \text{Labour Turnover} &= \frac{\text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{75}{1,100} \times 100 = \mathbf{6.82\%} \end{aligned}$$

(iii) Flux Method

$$\begin{aligned} \text{Labour Turnover} &= \frac{\text{No. of Employees Leaving} + \text{No. of Employees Replaced in the Period}}{\text{Average No. of Employees in the Period}} \times 100 \\ &= \frac{(100 + 10) + 75}{1,100} \times 100 = \mathbf{16.82\%} \end{aligned}$$

Illustration 60

From the following data given by the Personnel Department, calculate the labour turnover rate by applying (i) Separation Method; and (ii) Replacement Method.

Average number of workers in a payroll of a month 2,000. During the month, 20 workers left, 80 workers were discharged and 300 workers were recruited. Of these, 50 workers are recruited in the vacancies of those leaving, while the rest were engaged for an expansion scheme.

[C.U.B.Com. (General) - 2014]

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Solution

(i) Separation Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{100}{2,000} \times 100 = \mathbf{5\%}\end{aligned}$$

(ii) Replacement Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{50}{2,000} \times 100 = \mathbf{2.5\%}\end{aligned}$$

Illustration 61

From the following data given by the Personnel Department, calculate the labour turnover under different alternative methods :

Number of workers on the payroll :

at the beginning of the month	1,800
at the end of the month	2,200

During the month, 20 workers left, 80 persons were discharged and 300 workers were recruited. Of these, 50 workers are recruited in the vacancies of those leaving, while the rest were engaged for an expansion scheme.

[C.U.B.Com. (General) - 2016]

Solution

$$\text{Average Number of Employees} = \frac{1,800 + 2,200}{2} = \mathbf{2,000}$$

(i) Separation Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{(20 + 80)}{2,000} \times 100 = \mathbf{5\%}\end{aligned}$$

(ii) Replacement Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{50}{2,000} \times 100 = \mathbf{2.5\%}\end{aligned}$$

(iii) Flux Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{No. of Employees Leaving} + \text{No. of Employees Replaced in the Period}}{\text{Average No. of Employees in the Period}} \times 100 \\ &= \frac{(20 + 80) + 50}{2,000} \times 100 = \mathbf{7.5\%}\end{aligned}$$

Illustration 62

From the following information, determine labour turnover ratio under different alternative methods :

Number of workers on 1st January, 2015	5,000
Number of workers on 31st December, 2015	6,250
Number of workers resigned during 2015	625
Number of workers discharged during 2015	50
Number of workers replaced due to resignation and discharge during 2015	575

[C.U.B.Com. (General) - 2017]

Solution

Average Number of Employees = $(5,000 + 6,250) \div 2 = 5,625$.

(i) Separation Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{(625 + 50)}{5,625} \times 100 = 12\%\end{aligned}$$

(ii) Replacement Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{575}{5,625} \times 100 = 10.22\%\end{aligned}$$

(iii) Flux Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{No. of Employees Leaving} + \text{No. of Employees Replaced in the Period}}{\text{Average No. of Employees in the Period}} \times 100 \\ &= \frac{(625 + 50)}{5,625} \times 100 = 22.22\%\end{aligned}$$

[For Honours Candidates Only]

Illustration 63

The following information is available from the records kept by the personnel department of a company. You are required to calculate labour turnover rates using different alternative methods :

No. of workers on the pay roll :

At the beginning of the month	4,200
At the end of the month	4,800

During the month 160 workers left the factory while 80 workers were discharged. 840 workers were recruited during the month, of whom recruitment of 180 workers was in the vacancies of those who were separated from the firm while the rest were appointed in accordance with an expansion plan of the company.

[C.U.B.com. (Hons.) - 2009]

Solution

Average number of employees = $(4,200 + 4,800) \div 2 = 4,500$.

(i) Separation Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{(160 + 80)}{4,500} \times 100 = 5.33\%\end{aligned}$$

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(ii) Replacement Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{180}{4,500} \times 100 = 4\%\end{aligned}$$

(iii) Flux Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{No. of Employees Leaving} + \text{No. of Employees Replaced in the Period}}{\text{Average No. of Employees in the Period}} \times 100 \\ &= \frac{(160 + 80) + 180}{4,500} \times 100 = 9.33\%\end{aligned}$$

Illustration 64

From the following data, calculate the labour-turnover rate by applying :

(a) Separation method (b) Replacement method (c) Flux method.

(i) Number of workers at the beginning of the year — 900.

(ii) Number of workers at the end of the year — 1,000.

During the year 10 workers left and 40 workers were discharged and 150 workers were recruited. Of these, 25 workers were recruited in the vacancies of those left, while the rest were engaged for an expansion.

[C.U.B.Com. (Hons.) - 2013]

Solution

Average number of employees = $(900 + 1,100) \div 2 = 1,000$.

(i) Separation Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{(10 + 40)}{1,000} \times 100 = 5\%\end{aligned}$$

(ii) Replacement Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{25}{1,000} \times 100 = 2.5\%\end{aligned}$$

(iii) Flux Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{No. of Employees Leaving} + \text{No. of Employees Replaced in the Period}}{\text{Average No. of Employees in the Period}} \times 100 \\ &= \frac{(10 + 40) + 25}{1,000} \times 100 = 7.5\%\end{aligned}$$

Illustration 65

From the following data, calculate the labour-turnover rate by applying :

(a) Separation method (b) Replacement method (c) Flux method.

Number of workers on the payroll :

at the beginning of the year — 1,800

at the end of the year — 2,000.

During the year 20 workers left, 80 workers were discharged and 300 workers were recruited. Of these, 50 workers were recruited in the vacancies of those left, while the rest were engaged for an expansion scheme.

[C.U.B.Com. (Hons.) - 2015]

Solution

Average number of employees = $(1,800 + 2,000) \div 2 = 1,900$.

(i) Separation Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{(20 + 80)}{1,900} \times 100 = 5.26\%\end{aligned}$$

(ii) Replacement Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{50}{1,900} \times 100 = 2.63\%\end{aligned}$$

(iii) Flux Method

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{No. of Employees Leaving} + \text{No. of Employees Replaced in the Period}}{\text{Average No. of Employees in the Period}} \times 100 \\ &= \frac{(20 + 80) + 50}{1,900} \times 100 = 7.89\%\end{aligned}$$

Special Problems

Illustration 66

M H K Ltd. has an average of 42 workers employed in one of the factories in a period during which seven workers left and were replaced. The company pays a rate of ₹ 46 per hour to all its direct employees. This is used as the standard rate. In addition, a factory-wide bonus scheme is in operation. A bonus of half of the efficiency ratio in excess of 100% is added as a percentage to the basic hourly rate (e.g., if the efficiency rate is 110%, then hourly rate is ₹ 48.30 [₹ 46 + (₹ 46 × 5%)]).

During the period 1,14,268 units of the company's single product were manufactured in 4,900 hours. The standard hours is 22 units.

You are required to calculate :

- (i) the labour turnover percentage for the period;
- (ii) the hourly wages rate paid for the period;
- (iii) the actual gross pay.

Solution

(i) Calculation of Labour Turnover Percentage

$$\begin{aligned}\text{Labour Turnover} &= \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{7}{42} \times 100 = 16.67\%\end{aligned}$$

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(ii) Calculation of Hourly Wage Rate	₹
Basic Pay per Hour	46.00
Bonus Pay (Note 1)	1.38
Total	47.38

(iii) Actual Gross Pay = 4,900 hours × ₹ 47.38 = ₹ 2,32,162.

Working Notes :

(1) Calculation of Bonus

Number of units produced = 1,14,268 units.

Time allowed = 22 units per hour.

Total time allowed = 1,14,268 / 22 = 5,194 hours.

Time taken = 4,900 hours.

$$\text{Efficiency} = \frac{\text{Time Allowed}}{\text{Time Taken}} \times 100 = \frac{5,194}{4,900} \times 100 = 106\%$$

Workers were 6% more efficient than expected. Therefore, they will receive an extra bonus of 3% per hour (half of 6%). Bonus = 3% of ₹ 46 = ₹ 1.38 per hour.

Illustration 67

From the following data provided to you, find out the Labour Turnover Rate by applying :

(a) Flux Method (b) Replacement Method; and (c) Separation Method.

No. of workers on the payroll :

At the beginning of the month 500

At the end of the month 600

During the month, 5 workers left, 20 persons were discharged and 75 workers were recruited. Of these, 10 workers were recruited in the vacancies of those leaving, while the rest were engaged for an expansion scheme.

[I.C.W.A. (Inter) - Adapted]

Solution

$$\text{Average number of workers during the month} = \frac{500 + 600}{2} = 550 \text{ workers}$$

Calculation of Labour Turnover Rate

(i) Flux Method

Labour Turnover =

$$\begin{aligned} & \frac{\text{Number of Employees Leaving} + \text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{(5 + 20) + 10}{550} \times 100 = \frac{35}{550} \times 100 = 6.36\% \end{aligned}$$

(ii) Replacement Method

$$\begin{aligned} \text{Labour Turnover} &= \frac{\text{Number of Employees Replaced in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{10}{550} \times 100 = 1.82\% \end{aligned}$$

(iii) Separation Method

$$\begin{aligned} \text{Labour Turnover} &= \frac{\text{Number of Employees Leaving in the Period}}{\text{Average Number of Employees in the Period}} \times 100 \\ &= \frac{5 + 20}{550} \times 100 = \frac{25}{550} \times 100 = 4.55\% \end{aligned}$$

Illustration 68

The management of In and Out Ltd are worried about their increasing labour turnover in the factory and before analyzing the causes and taking remedial steps, they want to have an idea of the profit foregone as a result of labour turnover in the last year.

Last year sales amounted to ₹ 83,03,300 and the P/V ratio was 20 per cent. The total number of actual hours worked by the Direct Labour force was 4.45 lakhs. As a result of the delays by the Personnel Department in filling vacancies due to labour turnover, 1,00,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which half of the hours were unproductive.

The costs incurred consequent on labour turnover revealed on analysis the following :

	₹
Settlement cost due to leaving	43,820
Recruitment costs	26,740
Selection costs	12,750
Training costs	30,490

Assuming that the potential production lost as a consequence of labour turnover could have been sold at prevailing prices, find the profit foregone last year on account of labour turnover.

[C.A. (Inter) - Adapted]

Solution

In and Out Ltd

Statement of Profit Foregone last year on Account of Labour Turnover

	₹
Contribution foregone (Note 3 c)	3,86,200
Settlement cost due to leaving	43,820
Recruitment costs	26,740
Selection costs	12,750
Training costs	30,490
Total Reduction in Profit	5,00,000

Working Notes :

- (1) Actual hours worked 4,45,000
Less: 15,000 Unproductive training hours 15,000
Actual productive hours 4,30,000
- (2) Sales per Productive Hour = $\frac{\text{Sales}}{\text{Actual Productive Hours}} = \frac{83,03,300}{4,30,000} = ₹ 19.31$
- (3) (a) Productive hours lost = 1,00,000 hours.
(b) Sales lost = 1,00,000 × 19.31 = ₹ 19,31,000.
(c) Loss of contribution = ₹ 19,31,000 × 20% = ₹ 3,86,200.

Job Evaluation

Minimum wages must be paid to each worker as per the provision of the Minimum Wages Act. However, many employers find it advantageous to pay their employees wages higher than the minimum wages. The nature and complexity of different jobs are different. Therefore, the wages / salary of different categories of employees should be different. For example, the pay scale of floor cleaners should **not** be the same as that of the mechanics or technicians. For fixing pay scale of different jobs, many large organisations employ principles of **Job Evaluation**. Job evaluation is the method of determining the relative labour value of each occupation, after considering the amount of skill, physical and mental effort, responsibility, complexity, danger involved and training. At the time of calculation of labour value, different points are assigned to different characteristics. The total of all points determine the value of each different occupation. Pay scales are determined on the basis of relative points values.

4.74 Employee Cost and Incentive Systems

Objective of Job Evaluation

Job evaluation is done with the following objectives :

1. To find out the relative worth of each occupation and to determine the logical pay scale.
2. To improve the relationship between employer and employees, as it is a scientific method of fixing pay.
3. Proper manpower planning is possible if there is a job evaluation system in place. It will help to recruit right candidate for right job with right pay. It will, in turn, reduce the labour turnover.
4. To iron out the anomalies and distortions in wages structure.
5. To provide a basis for wages negotiation with the labour union.
6. To ensure that the organisation's wages structure is at par with the industry.
7. To identify the particular needs of a job. *For example*, proper job evaluation can pinpoint whether a job requires more skill, more supervision work or more safety precautions.

Methods of Job Evaluation

There are different methods of job evaluation. However, the following *three* methods are widely used by many organisations. These methods are :

1. **Ranking method** : Under this method, different jobs of an organisation is arranged in an order. The ordering of the jobs can be either from the lowest to highest or highest to lowest.
2. **Grading method** : Under this method, a pre-determined number of grades are established. The different jobs are evaluated and graded accordingly.
3. **Points Rating method** : Under this method, selected jobs are taken up for evaluation at the beginning. Each job is broken according to job factors. Points are assigned to each factor in a job. After adding all the points, jobs are rated.

Merit Rating

Merit rating is the method of determining the relative worth of each employee. Under a merit rating scheme each employee is rated by two responsible officials separately at monthly or quarterly intervals. Merit rating is normally done by the foreman and by the works manager or other senior officials. The employees are informed before hand about the rating and employees might be rated under the following parameters :

1. Quantity of work
2. Quality of work
3. Knowledge of work
4. Attendance and punctuality
5. Attitude towards management, work and other employees
6. Sense of responsibility
7. General ability
8. Cooperation
9. Experience and skill

Different points are given to each parameter. *For example* :

- (i) Excellent : 10 points
- (ii) Very good : 8 points
- (iii) Good : 6 points
- (iv) Average : 4 points
- (v) Poor : 2 points
- (vi) Very poor : 0 points

Each employee is rated on the basis of various parameters and points. The total points scored by the employee is taken into consideration for ranking each employee or group of employees.

Objectives of Merit Rating

1. Assess the merit of each employee for promotion, award and special increment.
2. Find out the strengths and weaknesses of each employee.
3. Encourage employees to give their best and earn some more.
4. Improve overall efficiency of the entire work force.
5. Serve as a basis for indirect incentive scheme where the nature of job is such that it is impossible to install a direct incentive scheme.

Advantages of Merit Rating

1. It helps to assess the quality of employees. Promotion, incentives and increments given on the basis of merit rating will help to improve the moral of the employees.
2. Each employee will try to score good points which, in turn, will improve the labour efficiency.
3. Impartial merit rating will send a positive feeling about the management and will improve employer-employee relationship.
4. It will help to reduce labour turnover as the competent employees are directly rewarded.
5. The careful study of employees and qualities required of them leads to good work force.

Limitations of Merit Rating

1. Unfair rating will destroy the moral of the employees.
2. Favouritism in rating may lead to dissatisfaction and will reduce the efficiency of the employees.
3. Unscientific merit rating may backfire and may increase labour turnover. **For example**, if family background factor is given too much importance by the rating authority, it will not serve the real purpose of the merit rating.

Distinction between Job Evaluation and Merit Rating

S.No.	Job Evaluation	S.No.	Merit Rating
1.	Job evaluation is the method of determining relative labour value of each occupation	1.	Merit rating is the method of determining the relating value of each worker.
2.	The main objective of job evaluation is to determine the logical pay scale.	2.	The main objective of merit rating is to assess the merit of each employee for promotion, incentives, increment, etc.
3.	Job evaluation iron out the anomalies and distortion in pay structure.	3.	Merit rating tries to identify the strengths and weaknesses of the individual employee.
4.	Wrong job evaluation will affect all the employees falling in that category	4.	Wrong merit rating will affect the employee individually.
5.	Job evaluation is done by the personnel department as a part of Research and Development	5.	Merit rating is done by the foreman and works manager as a routine job.

Time Study

Time study is a technique of measurement of work by using different time measurement instruments. It was pioneered by F.W. Taylor. For the purpose of setting standard time to do a job, all normal time losses due to fatigue and personal needs should be considered. The Industrial Engineering Terminology Standard defines 'time study' as "**a work measurement technique consisting of careful time measurement of the task with a time measuring instrument, adjusted for any observed variance from normal effort or pace and to allow adequate time for such items as foreign elements, unavoidable or machine delays, rest to overcome fatigue, and personal needs.**"

Time Study Procedures

The following steps are followed for time study :

1. Define and document the standard method of doing the job after considering the ability of the operator and the surrounding conditions.
2. Divide the task into work element.
3. Examine each operation and its work element carefully to determine the best way to do the operation.
4. Measure and record, using a time-keeping device (e.g., decimal minute stopwatch, computer-aided electronic stop watch, etc.), the time taken by different operators to do each work element of an operation.
5. Evaluate the workers' performance relative to standard performance to determine the normal time.
6. Determine the allowance for relaxation and add it with the normal time to find out the standard time for the work.
7. All standard time of work element to compute the standard time for the task.

Motion Study

Motion study is a detailed study and analysis of the basic operations of a job or process with a view to eliminate the unnecessary operations. It was pioneered by Gilbreths. He used movie camera for filming the details recording the time. After studying carefully the movement he identified the areas for improvement. The main aim of motion study is refining of the methods and operations through training, to achieve further improvement.

THEORETICAL QUESTIONS

1. What do you mean by 'Card Time Recording System' ? (Page 4.3) *[C.U.B.Com. (Hons.) - 1993]*
2. Discuss the various advantages and disadvantages of remunerating labour under time rate system or piece rate system. (Page 4.13, 4.16) *[C.U.B.Com. (Hons.) - 1994]*
3. How is overtime wages treated in the Cost Accounts ? (Page 4.16) *[C.U.B.Com. (Hons.) - 1998]*
4. How is idle time cost treated in Cost Accounts ? (Page 4.15) *[C.U.B.Com. (Hons.) - 1999]*
5. Distinguish between Halsay Scheme and Rowan Scheme for providing incentive bonus to workers. (Page 4.24) *[C.U.B.Com. (Hons.) - 2002]*
6. Write a short note on 'Labour Turnover'. (Page 4.66) *[D.U.B.Com. (Hons.) - 2003]*
7. How are payments to workers in respect of overtime work and 'set up time' treated in Cost Accounting? (Page 4.15, 4.16) *[D.U.B.Com. (Hons.) - Adapted]*
8. What is idle time ? Explain the causes leading to idle time and its treatment in Cost Accounts. (Page 4.15) *[D.U.B.Com. (Hons.) - Adapted]*
9. Explain the nature and significance of 'Labour Turnover'. (Page 4.66) *[D.U.B.Com. (Hons.) - Adapted]*
10. State the purposes served by 'Time Keeping' and 'Time Booking' records of a factory. (Page 4.3, 4.5) *[D.U.B.Com. (Hons.) - Adapted]*
11. What are the effects of labour turnover on cost of production ? (Page 4.67) *[D.U.B.Com. (Hons.) - 2002]*
12. What are the various reasons for abnormal idle time ? How is it treated in Cost Accounts ? (Page 4.15) *[D.U.B.Com. (Hons.) - 2005]*
13. Discuss labour turnover and different methods of measuring it. (Page 4.66, 4.68) *[D.U.B.Com. (Hons.) - 2005]*
14. What do you mean by labour turnover ? What are the costs associated with it ? How would you treat these costs in Cost Accounting ? (Page 4.68) *[D.U.B.Com. (Hons.) - 2006]*
15. (a) Explain 'labour turnover'. What are its causes and resultant costs ? How is it measured ? (Page 4.67)

- (b) Describe the various methods of recording times. (Page 4.3)
- (c) How is abnormal idle time treated in Cost Accounts ? (Page 4.15) [D.U.B.Com. (Hons.) - 2007]
16. Discuss the essential features of Differential Piece Rate System of Wages Payment. (Page 4.15)
[I.C.W.A. (Inter) - Adapted]
17. What are the functions of Payroll Department ? (Page 4.6)
18. Discuss Individual Bonus System and Group Bonus System. (Page 4.63) [C.A. (Inter) - Adapted]
19. What are the reasons for booking workers on idle time in a factory ? How is idle time controlled and treated in Cost Accounts ? (Page 4.14) [C.A. (Inter) - Adapted]
20. State the main principles on which a sound system of wage incentive should be based. (Page 4.23)
[C.A. (Inter) - Adapted]
21. Explain what is meant by group bonus and state the objectives of introducing a group bonus scheme in a factory. (Page 4.63) [C.A. (Inter) - Adapted]
22. What are the main features of Halsay and Rowan methods of payment of remuneration ? State how Rowan Scheme is better than Halsay Scheme. Given time allowed 30 hours for a job and wage rate ₹ 1.00 per hour, illustrate your answer by assuming your own figures for time taken to do the job. (Page 4.23, 4.24) [C.A. (Inter) - Adapted]
23. What do you understand by time and motion study ? Explain how standard time is set under time study. State how time and motion study is useful to the management. (Page 4.78) [C.A. (Inter) - Adapted]
24. Distinguish between 'Straight Piece Rate' and 'Differential Piece Rate'. (Page 4.17, 4.19)
[I.C.W.A. (Stage I) - June, 1999]
25. What are the two basic principles of labour remuneration ? Show how one of them views the matter from the stand point of the workman and the other from that of the employer. (Page 4.23)
[I.C.W.A. (Stage I) - June, 2001]
26. Discuss the essential features of a successful incentive plan. (Page 4.23)
[I.C.W.A. (Stage I) - June, 2000]
27. Distinguish between Job Evaluation and Merit Rating. (Page 4.77) [C.A. (Inter) - Adapted]
28. What do you mean by time and motion study ? Why is it so important to management ? (Page 4.78)
[C.A. (Inter) - Adapted]
29. What is overtime premium ? Explain the treatment of overtime premium in Cost Accounting. Suggest steps for controlling overtime. (Page 4.16) [C.A. (Inter) - Adapted]
30. Mention some important points to be borne in mind when introducing an incentive scheme. (Page 4.23)
[I.C.W.A. (Stage I) - December, 2000]

PRACTICAL QUESTIONS

- 4.1 From the following particulars, find the amount of cash required for payment of wages in a factory for a particular month :

	₹
1. Wages for normal hours worked	40,000
2. Overtime wages	10,500
3. Leave wages	5,000
4. Contribution to Provident Fund :	
Employee's share	4,000
Employer's share	4,000
5. House rent to be recovered from 10 employees @ ₹ 200 per month.	

[D.U.B.Com. (Hons.) - 2005]

4.78 Employee Cost and Incentive Systems

4.2 Calculate labour cost per man day of 8 hours from the following particulars :

- a) Basic salary : ₹ 200 per day
- b) Dearness allowance : @ 5.00 per every point over 100 cost of living index per working class. Current cost of living index 500 points.
- c) Leave salary : 10% of (a) and (b)
- d) Employer's contribution to Provident Fund : 8% of (a), (b) and (c)
- e) Employer's contribution to ESI : 2.5% of (a), (b) and (c)
- f) Expenditure on amenities to labour : ₹ 200 per head per menseur
- g) Number of working days in a month : 25 days of 8 hours

4.3 (a) Calculate the labour hour rate of a worker P from the following data :

Basic pay ₹ 2,000 per month

D.A. ₹ 1,500 per month

Fringe ₹ 1,000 per month

Number of working days in a year 300. 30 days full pay and 20 days half-pay leave in a year is availed and allowed. Assume 8 hourly day.

(b) What would be the affect on hourly rate if only 30 days full pay leave is allowed ?

(c) How can frauds in wage payment be prevented ?

[C.A. (Inter) - Adapted]

4.4 A manufacturing company has approximately 600 weekly paid direct and indirect production workers. It incurred the following costs and deductions relating to the payroll for the week ended 2 May :

	₹	₹
Gross wages		1,80,460
Deductions :		
Employees' national insurance	14,120	
Employees' pension fund contributions	7,200	
Income tax	27,800	
Court order retentions	1,840	
Trade union subscriptions	1,200	
Private health care contributions	6,000	
Total deductions		58,160
Net wages paid		1,22,300

The employer's national insurance contribution for the week was ₹ 18,770.

From the wages analysis the following information was extracted :

	Direct workers	Indirect workers
	₹	₹
Paid for ordinary time	77,460	38,400
Overtime wages at normal hourly rates	16,800	10,200
Overtime premium (treat as overhead)	5,600	3,400
Shift premiums / allowances	8,500	4,500
Capital work-in-progress expenditure*	-	2,300
Statutory sick pay	5,700	3,300
Paid for idle time	4,300	-
	1,18,360	62,100

*Work done by building maintenance workers concreting floor area for a warehouse extension.

You are required to show journal entries to indicate clearly how each item should be posted into the accounts :

- (i) from the payroll, and
- (ii) from the Wages Control Account to other accounts, based on the wages analysis.

Note : Narrations for the journal entries are not required.

- 4.5 A worker produced 180 units in a week. The guaranteed weekly wage payment for 44 hours is ₹ 77. The expected time to produce one unit is 16 minutes which is further raised by 25% under the incentive scheme. What will be the earnings per hour of the worker under the Halsay and Rowan schemes ?

[C.U.B.Com. (Hons.) - 2000]

- 4.6 In a factory, a job can be executed either through workman Pradip or Arindam. Pradip takes 32 hours to complete the job while Arindam finishes it in 30 hours. The standard time to finish the job is 40 hours. The raw material input cost and hourly wage rate are same for both the workers. Pradip is entitled to receive bonus according to Halsey plan while Arindam is paid bonus as per Rowan plan. Works overheads are recovered on the job at ₹ 15 per labour hour worked. The factory cost of the job comes to ₹ 5,200 irrespective of the workmen engaged.

Find out hourly wage rate and cost of raw materials input.

[C.U.B.Com. (Hons.) - 2001]

- 4.7 Calculate the earnings of a worker under (i) Halsey Plan and (ii) Rowan Plan from the following particulars:

(1) Hourly rate of wages guaranteed ₹ 5.00 per hour.

(2) Standard time taken by the worker to produce 20 dozen articles - 48 hours.

- 4.8 From the following data, calculate work cost for jobs performed by Ajay and Sourav :

	Ajay	Sourav
Time allowed (per 100 units)	40 hours	42 hours
Rate per unit	₹ 3	₹ 4
Rate per hour	₹ 8	₹ 12
Actual time taken	48 hours	70 hours
Actual units produced	150 units	200 units
Material cost for jobs	₹ 668	₹ 1,020
Bonus plan	Halsey	Rowan
Factory overheads	150% of wages	100% of wages

[C.U.B.Com. (Hons.) - Adapted]

- 4.9 Calculate the normal and overtime wages payable to a workman on the basis of the following particulars:

Days	Hours worked
Monday	9
Tuesday	8
Wednesday	10
Thursday	11
Friday	9
Saturday	5

Normal working hours for week days is 8 hours per day, but for Saturday it is 5 hours only. Normal wage rate per hour is ₹ 25 per hour.

Overtime pay is at the undernoted rate :

(i) Upto 9 hours in a day at single rate and over 9 hours in a day at double rate;

(ii) Upto 48 hours in a week at single rate and over 48 hours at double rate;

whichever is more beneficial to the workman.

[C.U.B.Com. (Hons.) - Adapted]

4.80 Employee Cost and Incentive Systems

- 4.10 From the following particulars, you are required to work out the earnings of a worker for a week under :

(i) Straight piece rate;	
(ii) Differential piece rate;	
(iii) Halsey premium scheme (50% sharing); and	
(iv) Rowan premium scheme	
Weekly working hours	48 hours
Hourly wage rate	₹ 7.50
Piece rate per unit	₹ 3.00
Normal time taken per piece	24 minutes
Normal output per week	120 pieces
Actual output for the week	150 pieces
Differential piece rate	80% of piece rate when output is below normal and 120% of piece rate when output is above normal

[I.C.W.A. (Inter) - Adapted]

- 4.11 The production section of a factory working on the job-order system pays their workers under the Rowan Premium Bonus Scheme. Workers also get a dearness allowance of ₹ 1,200 per week of 48 hours. A worker's basic wage is ₹ 200 per day of 8 hours and his time sheet for a week is summarised below :

Job No.	Time allowed	Time taken
007	25 hours	20 hours
033	30 hours	20 hours
Idle time (waiting)	-	<u>8 hours</u>
		<u>48 hours</u>

Calculate the gross wages he has earned for the week and indicate the accounts to which the wage amounts will be debited.

[C.U.B.Com. (Hons.) - Adapted]

- 4.12 A skilled worker in XYZ Ltd is paid a guaranteed wage rate of ₹ 30 per hour. The standard time per unit for a particular product is 4 hours. P, a machineman, has been paid wages under the Rowan Incentive Plan and he had earned an effective hourly rate of ₹ 37.50 on the manufacture of that particular product. What could have been his total earnings and effective hourly rate, had he been put on Halsey Incentive Scheme (50%)?

[C.A. (Inter) - Adapted]

- 4.13 In a factory a job can be executed either through workman Pradip or Arindam. Pradip takes 32 hours to complete the job while Arindam finishes it in 30 hours. The standard time to finish the job is 40 hours. The raw material input cost and hourly wage rate are same for both workers. Pradip is entitled to receive bonus according to Halsey Plan while Arindam is paid bonus as per Rowan Plan. Works overheads are recovered on the job at ₹ 15 per labour hour worked. The factory cost of the job comes to ₹ 5,200 irrespective of the workmen engaged.

- (a) Find out hourly wage rate and cost of raw materials input.
(b) During the same period, the factory received a job order, the detail of which are given below :

Raw material cost	₹ 5,000
Standard labour time	200 hours
Actual time (job done by Arindam)	150 hours
Administration overhead	15% of works cost
Selling and distribution overhead	10% of total sales
Profit margin	20% on sales

What price do you recommend for the job ?

- 4.14 From the following particulars calculate the total earnings of a worker :

Wage bonus is being paid on the following scale on the basis of percentage of time saved on time allowed :

Time saved (% of standard)	Bonus (% of time save)
Upto 25%	10%
Above 25% and upto 35%	Plus 20% of time saved
Above 35%	Plus 30% of time saved above 35%

The worker whose wage rate is ₹ 24 per hour, takes 50 hours to complete a job. The standard time allowed is 100 hours.

[C.U.B.Com. (Hons.) - Adapted]

- 4.15 A company has its factory at two locations, Rowan Plan is in use at location A and Halsey Plan at location B. Standard time and basic rate of wages are same for a job which is similar and is carried out on similar machinery. Time allowed is 60 hours.

Job at location A is completed in 36 hours while at B it has taken 48 hours. Conversion costs at the respective places are ₹ 1,224 and ₹ 1,500. Overheads account for ₹ 20 per hour.

Required :

(a) to find out the normal wages; and (b) to compare the respective conversion costs.

[I.C.W.A. (Inter) - Adapted]

- 4.16 From the following particulars, you are required to calculate the Average Wage Rate the labour cost chargeable to Job No. P-301 which was completed in 2017 :

Basic wage rate is ₹ 15 per hour and overtime rates are as follows :

Below or after working hours	150% of basic wage rate
Sundays and other holidays	200% of basic wage rate

During the year 2012 the following labour hours were worked :

Normal time	4,00,000 hours
Overtime before or after working hours	50,000 hours
Overtime on Sundays and holidays	40,000 hours
Total	4,00,000 hours

For Job No. P-301, 4000 hours were spent as follows :

Normal time	3,000 hours
Before or after working days	700 hours
Sundays and holidays	300 hours

[C.U.B.Com. (Hons.) - Adapted]

- 4.17 The existing incentive system of Alpha Limited is as under :

Normal working week	5 days of 8 hours each plus 3 late shifts of 3 hours each
Rate of payment	Day work : ₹ 160 per hour Late shift : ₹ 225 per hour

Average output per operator for 49 hour week (including 3 late shifts) : 120 articles.

In order to increase output and eliminate overtime, it was decided to switch on to a system of payment by results.

The following information is obtained :

Time rate (as usual)	₹ 160 per hour
Basic time allowed for 15 articles	5 hours
Piece-work rate	Add 20% to basic piece-rate
Premium bonus	Add 50% to time

4.82 Employee Cost and Incentive Systems

Required :

Prepare a statement showing hours worked, weekly earnings, number of articles produced and labour cost per article for one operator under the following systems :

- (a) Existing time-rate
- (b) Straight piece-work
- (c) Rowan system
- (d) Halsey premium system

Assume that 135 articles are produced in a 40 hours week under Straight piece work, Rowan premium system and Halsey premium system above and worker earns half the time saved under Halsey premium system.

[C.A. (PE-II) - November, 2005]

- 4.18 A company is undecided as to what kind of wage scheme should be introduced. The following particulars have been compiled in respect of three systems, which are under consideration of the management :

Workers	A	B	C
Actual hours worked in a week	38	40	34
Hourly rate of wages	₹ 6	₹ 5	₹ 7.20
Production in units :			
Product P	21	-	60
Product Q	36	-	135
Product R	46	25	-
Standard time allowed per unit of each product is :			
Minutes	12	18	30

For the purpose of piece rate, each minute is valued at ₹ 0.10.

You are required to calculate the wages of each worker under :

- (i) Guaranteed hourly rate basis;
- (ii) Piece work earnings basis, but guaranteed at 75% of basic pay (guaranteed hourly rate if his earnings are less than 50% of basic pay);
- (iii) Premium bonus basis where the worker receive s bonus based on Rowan scheme.

[C.A. (Inter) - November, 2002]

- 4.19 The employees in a plastic toy-making unit are paid wages at the rate of ₹ 7 per hour for an eight-hour shift. Each employee produces 5 units per hour. The overhead in this department is ₹ 10 per shift direct labour hour. Employees and the management are considering the following piece rate wages proposal\:

Upto 45 units per day of 8 hours : ₹ 1.30 per unit.

From 46 to 50 units : ₹ 1.60 per unit.

From 51 to 55 units : ₹ 1.65 per unit.

From 56 to 60 units : ₹ 1.70 per unit.

Above 60 units : ₹ 1.75 per unit.

The working hours are restricted to 8 hours per day. Overhead rate does not change with increased production.

Prepare a statement indicating advantages to the employees as well as the management at production levels of 40, 45, 55 and 60 units.

- 4.20 Wage negotiations are going on in a company with the recognized labour union and the management requests you as the Cost Accountant of the company to formulate an incentive wage scheme with a view to increasing productivity.

The cost of three representatives, X, Y and Z who produce respectively 1,500 units, 1,200 units and 900 units in a normal week of 40 hours is taken up for study.

Assuming that day wages would be guaranteed at ₹ 5 per hour and the piece rate would be based on a standard hourly output of 25 units, calculate the earnings and labour cost per 100 pieces of each of the above three workers under :

(i) Piece-work with a guaranteed weekly wage; (ii) Halsey Premium Plan and (iii) Rowan Premium Plan. Also calculate the average wage cost for the company to produce 100 pieces under each of the above method.

[C.U.B.Com. (Hons.) - Adapted]

- 4.21 ZED Limited is working by employing 50 skilled workers. It is considering of introducing an incentive scheme either Halsey Scheme (with 50% bonus) or Rowan Scheme of wage payment for increasing the labour productivity to cope up the increasing demand for the product by 40%. It is believed that the proposed income scheme could bring about an average 20% increase over the present earnings of the workers; it could set as sufficient incentive for them to produce more.

Because of assurance, the increase in productivity has been observed as revealed by the figures for the month of April, 2004.

Hourly rate of wages (guaranteed)	₹ 30
Average time for producing one unit by one worker at the previous	1,975 hours
Performance (this may be taken as time allowed) :	
Number of working days in the month	24
Number of working hours per day of each worker	8
Actual production during the month	6,120 units

Required :

- (i) Calculate the effective rate of earnings under the Halsey Scheme and the Rowan Scheme.
(ii) Calculate the savings to the ZED Limited in terms of direct labour cost per piece.
(iii) Advise ZED Limited about the selection of the scheme to fulfill their assurance.

[C.A. (Inter) - May, 2004]

Labour Turnover

- 4.22 From the following information, calculate labour turnover rate and labour flux rate :

No. of workers as on 01.01.2017 = 7,600.

No. of workers as on 31.12.2017 = 8,400.

During the year, 80 workers left while 320 workers were discharged. 1,500 workers recruited during the year. Of these, 300 workers were recruited because of exits and the same recruited in accordance with expansion plans.

- 4.23 From the following data given by the personnel department, calculate the labour turnover rate by applying : (a) Separation Method; (b) Replacement Method; and (c) Flux Method.

No. of workers on the payroll :

At the beginning of the month 900

At the end of the month 1100

During the month, 10 workers left and 40 person were discharged and 150 workers were recruited. Of these 25 workers are recruited in the vacancies of those leaving, while the rest were engaged for an expansion.

[I.C.W.A. (Inter) - Adapted]

- 4.24 From the following information, calculate the labour turnover rate under Replacement Method and Flux Method :

(i) Number of workers at the beginning of the year : 3,800.

(ii) Number of workers at the end of the year : 4,200.

During the year, 40 workers leave while 160 workers are discharged. 600 workers are recruited during the year. Of these, 150 workers are recruited in the vacancies of those leaving and the rest were engaged for an expansion.

[B.U.B.Com. (Hons.) - Adapted]

4.84 Employee Cost and Incentive Systems

- 4.25 The cost accountant of Y Ltd. Has computed labour turnover rates for the quarter ended 31st March, 2018 as 10%, 5% and 3% respectively under Flux Method, Replacement Method and Separation Method. If the number of workers replaced during that quarter is 30, find out the number of (1) workers recruited and joined; and (2) workers left and discharged.

- 4.26 The profitability position of M/s. Pioneer Industries Ltd. for a year is as under :

	₹ (Lakhs)	₹ (Lakhs)
Annual turnover		200
Variable Costs :		
Direct material	60	
Direct labour	40	
Variable overheads	50	150
Marginal contribution	50	
Fixed overheads	10	
Profit for the year	40	

The profit for the year did not match with company's expectation and works manager attributed it to labour turnover.

Analysis of the data revealed the following :

Permanent workmen worked during the year	9,60,000 direct labour hours
Apprentice workmen worked	80,000 direct labour hours
	10,40,000 direct labour hours

The effectiveness of direct labour hours put in by apprentice workmen was 50% and delay in replacing against separation during the year resulted in loss of 20,000 direct labour hours.

Calculate the loss of profit on account of loss of production from labour turnover.

[I.C.W.A. (Stage - I) - December, 1999]

Guide to Answer

Practical Questions

- 4.1 Cash requirement : ₹ 49,500 (40,000 + 10,500 + 5,000 – 4,000 – 2,000).

- 4.2 Labour cost per man-day : ₹ 348.40.

- 4.3 (a) (i) Effective working days : 250
(ii) Effective working hours : $250 \times 8 = 2,000$ hours.
(iii) Total wages paid : ₹ 52,200.
(iv) Rate per day : ₹ 180.
(v) Rate per hour : ₹ 26.10
(b) (i) Effective working days : 270
(ii) Effective working hours : 2,160 hours.
(iii) Net amount paid in a year : ₹ 54,000.
(iv) Rate per hour : ₹ 25.00.
(v) Effect on hourly rate : ₹ 1.10.

- 4.4 (i) Wage Control Account Dr. ₹ 1,99,230
To Deductions (Different) A/c ₹ 76,930
To Bank A/c ₹ 1,22,300
(ii) Work-in-Progress A/c Dr. ₹ 94,260
Production Overheads A/c Dr. ₹ 1,02,670
Fixed Assets W.I.P. A/c Dr. ₹ 2,300
To Wages Control A/c ₹ 1,99,230

- 4.5 Total Wages : Halsey ₹ 81.00; Rowan ₹ 97.53.
 Bonus : Halsey ₹ 4; Rowan ₹ 20.53.
 Rate per Hour : Halsey ₹ 2.07; Rowan ₹ 2.22.
- 4.6 (i) Cost of material input = ₹ 4,000.
 (ii) Wages rate per hour = ₹ 20.
- 4.7 (i) Halsey plan : ₹ 270;
 (ii) Rowan plan : ₹ 288.
- 4.8 Work Cost : Ajay ₹ 1,748; Sourav ₹ 2,980.
 Direct labour : Ajay ₹ 432; Sourav ₹ 980.
- 4.9 (a) **First alternative** ₹
 (i) Normal wages 1,125
 (ii) Overtime wages 250
 Total 1,375
 (c) **Second alternative :**
 Total wages : ₹ 1,400 (₹ 1,200 + 200)
- 4.10 Earnings of the workers for the week :
 (i) Straight piece rate : ₹ 450
 (ii) Differential piece rate : ₹ 540
 (iii) Halsey Premium Scheme : ₹ 405
 (iv) Rowan Premium Scheme : ₹ 432.
- 4.11 (a) Gross wages earned by the workers for the week : ₹ 2,667.
 (b) Direct wages to be charged : ₹
 Job No. 007 1,100
 Job No. 033 1,167
2,667
- 4.12 Actual hours taken by P to produce 1 unit = 3 hours.
 Total earnings ₹ 105. Effective hourly rate ₹ 35.
- 4.13 (a) Wages rate per hour = ₹ 20.
 Cost of raw material = ₹ 4,000.
 (b) Recommended price : ₹ 17,570.
- 4.14 Normal wages : 50 hours × ₹ 24 1,200
 Bonus for 9 hours : 9 × ₹ 24 216
Total earning 1,416
- 4.15 (a) **Normal wages rate :**
 Location A : ₹ 10.00
 Location B : ₹ 10.00
 (b) **Total Conversion Cost :**
 Location A : ₹ 1,224
 Location B : ₹ 1,500
- 4.16 (a) Total wages for the year 2017 : ₹ 83,25,000
 (b) Total labour hours worked in 2017 : ₹ 4,90,000
 (c) Average wages rate for 2017 : ₹ 16,9898
- 4.17 **Weekly earnings of one operator :**
 (a) Existing time rate : ₹ 8,425
 (b) Straight piece rate : ₹ 8,640
 (c) Rowan scheme : ₹ 9,007.41
 (d) Halsey system : ₹ 8,600

4.86 Employee Cost and Incentive Systems

4.18		A	B	C
	(i) Guaranteed hourly rate	228	200	244.80
	(ii) Piece work	228	150	315.00
	(iii) Premium bonus	228	200	331.06

4.19 Advantages to the employees and management :

Output (Units)	Benefits to employees (₹)	Benefits to Management (₹)
40	(4.00)	4.00
45	2.50	14.50
55	34.75	16.25
60	46.00	22.00

4.20 Table showing earning for three workers and labour cost to produce 100 units :

		Piece Wages			Halsey Plan			Rowan Plan		
		X	Y	Z	X	Y	Z	X	Y	Z
Earnings	(₹)	300	240	200	350	260	200	400	280	200
Units produced		1,500	1,200	900	1,500	1,200	900	1,500	1,200	900
Labour cost per 100 units	(₹)	21.00	20.00	22.22	23.23	21.67	22.22	26.26	23.23	22.22

4.21 (i) Effective rate of earning per hour : Halsey plan : ₹ 33.89; Rowan plan : ₹ 36.17.

(ii) Savings in direct labour cost : Halsey plan : ₹ 6.10; Rowan plan : ₹ 2.50.

Rowan plan may be adopted.

4.22 Labour Turnover Rate

(a) Separation method : 5%; (b) Replacement method : 3.75%; (c) Flux method : 23.75%.

4.23 (a) Separation method : 5%; (b) Replacement method : 2.5%; (c) Flux method : 7.5%.

4.24 (a) Replacement method : 3.75%; Flux method : 8.75%.

4.25 (i) Number of workers recruited and joined : 42; (ii) Number of workers left and discharged : 18.

4.26 Loss of profit due to labour turnover : ₹ 4,63,077. Loss of potential sales : ₹ 12,00,000.

Accounting for Overheads

Section 1 : Definition and Classification of Overheads

Definition

Cost Accounting Standard on '*Classification of Cost*', CAS-1 (Revised 2015) issued by the Council of the Institute of Cost and Works Accountants of India has defined overheads as "*Overheads comprise costs of indirect materials, indirect employees costs and indirect expenses.*"

The Chartered Institute of Management Accountants (CIMA), U.K. has defined overheads as "*total of indirect materials, wages and expenses.*"

From the above definitions it is clear that the main components of overheads are :

- (a) Indirect materials cost
- (b) Indirect labours cost / Employees costs
- (c) Indirect expenses

Indirect Materials Cost

Cost Accounting Standard on "Production and Operation Overhead" — (CAS-3 - Revised 2015) para 4.10 defines *Indirect Material Cost* as "*Material cost that cannot be directly attributed to a particular cost object.*"

Indirect materials are those materials which do not form a part of the finished products but necessary for production. *Examples of indirect materials are:* Lubricating oil, grease, cleaning clothes and brushes etc. These are required to keep machinery in working conditions and to maintain the working area clean and safe. The indirect materials cost is not identifiable with the cost of a specific product. These costs are common to all products under same facility.

Sometimes, certain materials such as glue, thread, screws, bolts, etc., could be identified with the product, but the cost may be so insignificant or complex that it is treated as indirect materials and included in the overhead cost. This is because only small amount of glue and thread are used in the finished product. Keeping detailed records of consumption of minor materials, however, would require a great deal of more time and cost than the results would justify. It is more practical to treat the cost of these materials as overhead without charging them to specific products.

Indirect Labours Cost / Employees Costs

Cost Accounting Standard on "Production and Operation Overheads" — (CAS-3 - Revised 2015) para 4.8 defines *Indirect Employee Cost* as "*Employee Cost, which cannot be directly attributed to a particular cost object.*"

Indirect labours cost / Employees costs are the remuneration paid to those workers who are not directly involved in the actual manufacturing of the product. *Examples of indirect labour costs / employees costs are:* remuneration of supervisors, works managers, security staff, foremen and assistants, clerks, firemen, weighmen, etc. Although the service of these workers are essential to production, it would either be impractical or impossible to trace their costs to specific units of product.

5.2 Accounting for Overheads

It is important to note that in India in some industries, major shifts are taking place in the structure of labour costs. Sophisticated automated equipment, run and maintained by skilled indirect labour, is increasingly replacing direct labour. In these industries, indirect labour cost is a major portion of the total cost of production (for example, in printing industry indirect labour cost is increasing and direct labour cost is decreasing).

Indirect Expenses

Cost Accounting Standard on “Production and Operation Overheads” — (CAS-3 - Revised 2015) para 4.9 defines *Indirect Expenses* as “**Expenses, which cannot be directly attributed to a particular cost object.**”

Indirect expenses are those expenses which can not be identified with a specific product. These are common expenses for all products produced under same facility. *Examples* of indirect expenses are: rent, insurance, depreciation of plant, machinery and factory building, maintenance and repairs, power and light, etc.

Now-a-days, indirect expense is a growing part of the total cost of production because of the increasing use of labour-saving equipments such as computers and robots in designing and manufacturing of a product (as in case of motor car industry, welding is done by robots). The use of costly automated machineries results in higher insurance and depreciation charges. The maintenance costs of these sophisticated machineries are also very high.

Classification of Overheads

At present, overhead costs are significant for any product or service. To keep cost of production under control, the control of overheads costs are very very important. It is the goal of every management to secure control of overhead costs. For the purpose of achieving this goal, overheads are classified on the basis of:

(a) Functions; and (b) Behaviour.

(a) Classification on the Basis of Functions

The main functions of the business are production, administration, selling, distribution, research and development. Overheads are generally classified on the same line. On the basis of *functions*, overheads are classified into *four* categories :

- (i) Production / Manufacturing Overheads;
- (ii) Administrative Overheads;
- (iii) Selling and Distribution Overheads; and
- (iv) Research and Development Overheads.

Production / Manufacturing Overheads

Cost Accounting Standard on “Production and Operation Overheads” — (CAS-3 - Revised 2015) para 4.12 defines *Production or Operation Overheads* as “**Indirect costs involved in the production of a product or in providing services**”.

Production or Operation Overheads include *administration cost relating to production, factory, works or manufacturing and providing services*.

The terms ‘production overheads’, ‘operation overheads’, ‘factory overheads’, ‘works overheads’ and ‘manufacturing overheads’ denote the same meaning and are used interchangeably.

Manufacturing overheads are incurred to carry out manufacturing activities of an organization. Manufacturing overhead is a heterogeneous pool of indirect production cost. It includes items such as indirect materials, indirect employees costs and indirect expenses. In other words, manufacturing overhead includes all factory cost other than direct materials, direct employees costs and direct expenses. Manufacturing overhead is charged to products in a systematic manner.

Some of the **most common production / manufacturing overhead items** are as follows:

Indirect Materials	Indirect Labour / Employees Costs	Indirect Expenses
(i) Lubricants (ii) Soap and detergent (used for cleaning of the shop floor) (iii) Cotton waste, clothes and brushes (iv) Gloves (v) Maintenance materials (vi) Drilling soap, etc.	(i) Factory security staff salary (ii) Factory time keeper salary (iii) Factory supervisors salary (iv) Factory manager salary (v) Maintenance staff salary, etc.	(i) Depreciation of plant, machinery and furniture (ii) Rent, rates and taxes of factory (iii) Insurance premium of plant, machinery and building (iv) Group health insurance premium for factory employees (v) Factory utilities.

Administrative Overheads

Para 4.3 of CAS-1 : defines administrative overhead as “**Cost of all activities relating to general management and administration of entity.**”

Administrative overheads include expenses incurred in the direction and control of the entity. Some of the **most common administrative overhead items** are as follows:

Indirect Materials	Indirect Labour / Employee Cost	Indirect Expenses
(i) Stationery and printing (ii) Brushes (iii) Cleaning materials – liquid soap, detergents, etc. (iv) Room freshner	(i) Salary of executive director (ii) Salary of office staff (iii) Directors fees (iv) Recruitment cost (v) Salary of security staff	(i) Legal expenses (ii) Audit fees (iii) Postage (iv) Telephone charges, Internet broad band charges, etc. (v) Electricity (vi) Airconditioning expenses, etc.

Selling and Distribution Overheads

Selling and distribution overhead costs include all costs necessary to promote the product to secure the customer’s order and to deliver the product to the customers. It also includes after–sales service costs (e.g., free service, free replacement of parts). Some of the **most common selling and distribution costs** are as follows:

- (i) Advertisement cost
- (ii) Salary of selling staff
- (iii) Secondary packing expenses
- (iv) Carriage outward
- (v) Travel expenses of the selling staff
- (vi) Showroom expenses (e.g., rent, air conditioning, electricity etc.)
- (vii) Samples
- (viii) Commission to salesmen
- (ix) Warranty claim

Research and Development Overheads

Research and development comprises a variety of activities. **For example**, search for new products and new manufacturing processes; improvement of existing products, processes and equipments.

Some of the **common research and development costs** are : (i) Salaries of technical personnel and others; (ii) Specific materials used in research and development; (iii) Depreciation and maintenance costs of the equipments used in research and development.

5.4 Accounting for Overheads

(b) Classification on the Basis of Behaviour

Some overhead costs vary directly with the volume of output (*For example*, drilling soap will vary directly with the number of units produced), while others remain more or less fixed in amount. It will not vary with the output. (*For example*, rent, rates and taxes of the factory or salary of the security staff are not varying with the number of units produced.)

As per para 4.12 of CAS-3 (Revised 2015) “**Production or operation overheads shall be classified on the basis of behaviour such as variable production or operation overheads, semi-variable production or operation overheads and fixed production or operation overheads**”.

Variable Overhead: Variable overheads are varying in amount in direct portion to units produced. As per para 4.12 of CAS-3 (Revised 2015) “**Variable production or operation overheads comprise of expenses which vary in proportion to the change of volume of production or activity or service provided**”.

Examples of variable overhead are:

- (i) Materials handling cost;
- (ii) Packaging cost
- (iii) Power;
- (iv) Fuel;
- (v) Overtime premium;
- (vi) Supplies;
- (vii) Loose tools;
- (viii) Spoilage, salvage, etc.

The following are the *characteristics of variable overhead*:

- (i) Variable overhead cost per **unit** is constant.
- (ii) Variable overhead cost in **amount** will change in direct proportion to production.
- (iii) Variable overhead cost is easy to trace to a particular department.
- (iv) Controlling of variable overhead cost is easier and it is the responsibility of departmental head.

The concept of a variable overhead is shown in graphical form in Fig. 5.1.

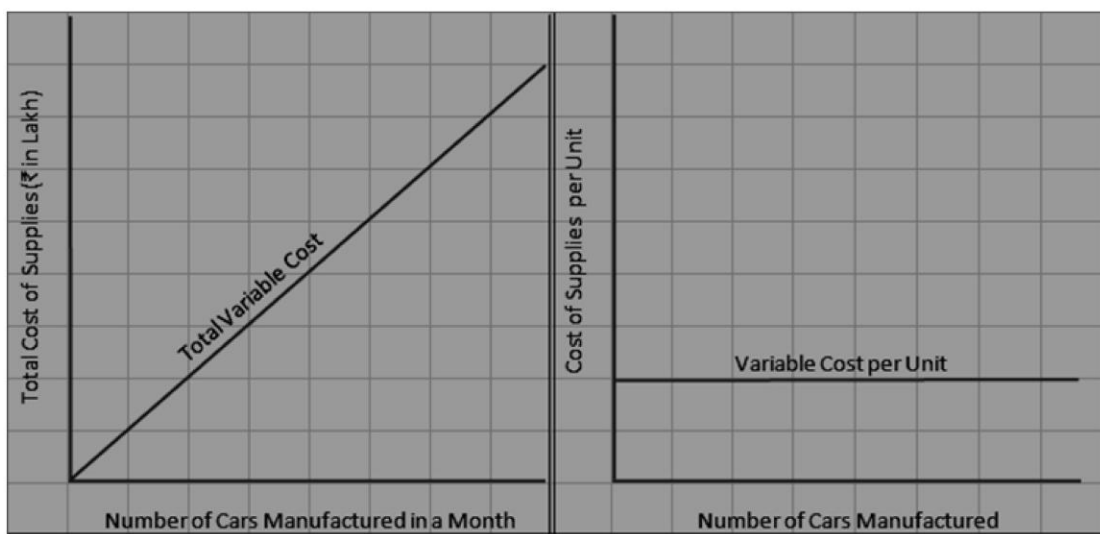


Fig. 5.1

Fixed Overhead: As per para 4.12 of CAS-3 (Revised 2015) “*Fixed overheads are indirect costs which do not vary with the change in the volume of production or activity or service provided*”. Fixed overheads are not affected by the change in output. Fixed overheads remain constant in total within a relevant output range. However, fixed overheads per unit will decrease with the increase in output or *vice versa*.

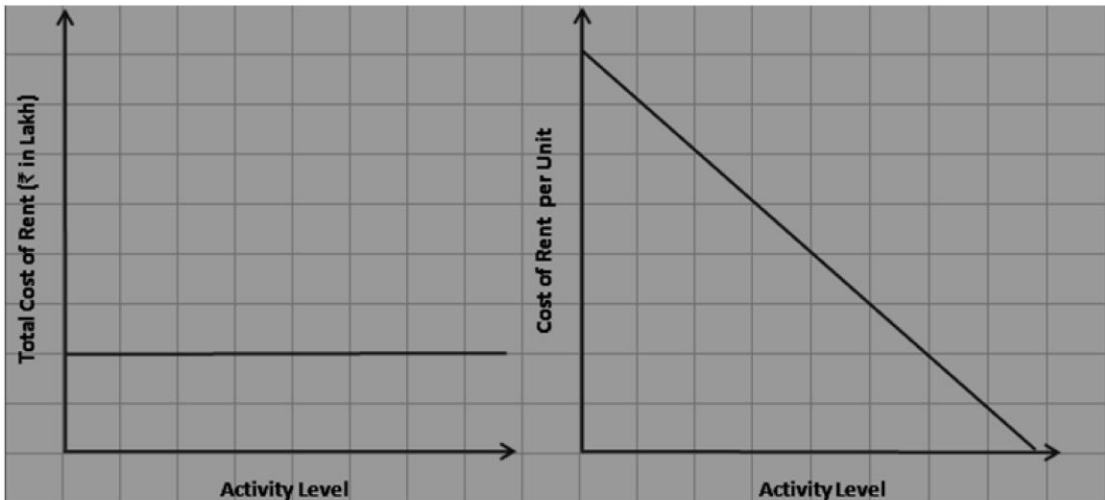
Examples of fixed overheads are :

- (i) Rent, rates and taxes of the factory;
- (ii) Salary of the security staff of the factory;
- (iii) Lighting of the factory;
- (iv) Depreciation of the plant and machinery, building of the factory.

The following are the **characteristics of fixed overhead**:

- (i) Fixed overhead per **unit** will decrease with the increase in output or *vice versa*.
- (ii) Fixed overhead in **amount** will remain same within a relevant range of output.
- (iii) Fixed overhead apportionment is arbitrary.
- (iv) Controlling of fixed overhead is difficult because most of the costs are based on time.

The concept of a fixed overhead is shown in graphical form in Fig. 5.2.



[Fig 5.2]

Semi-variable overhead: Semi-variable overheads include both fixed and variable elements. Fixed portion will remain constant but variable portion will change with activity. As per para 4.12 of CAS-3 (Revised 2015) “*Semi variable costs are the costs that contain both fixed and variable elements. They partly change with the change in the level of activity*”.

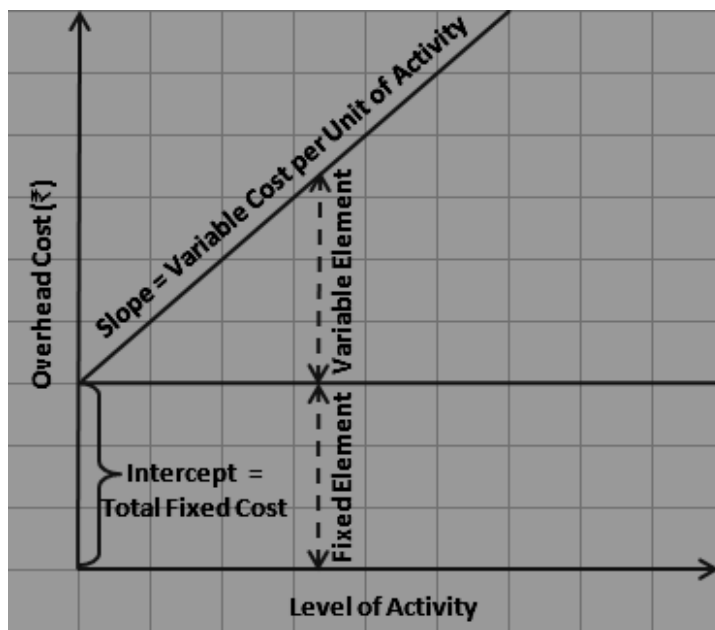
Examples of semi-variable overhead are :

- (i) Telephone expenses (minimum rental is fixed but cost of call is variable);
- (ii) Delivery van costs (depreciation is fixed but running costs are variable);
- (iii) Electricity cost (factory lighting cost is fixed but electricity used for running the machinery is variable).

It is to be noted that the fixed portion of semi-variable overhead represents the basic, minimum cost of just having a service ready and available for use. The variable portion represents the costs incurred for actual consumption of the service

5.6 Accounting for Overheads

The concept of a semi-variable overhead is shown in graphical form in Fig. 5.3.



[Fig. 5.3]

Section 2 : Accounting for Production / Operation / Manufacturing Overheads

Introduction

Manufacturing overhead is the total of indirect materials, indirect labours and indirect expenses incurred in the factory. All these indirect costs cannot be identified with any particular product but these are essential for production of articles. *Examples* are lubricating oil, security staff salary, salary of supervisor, etc.

In old production system, the main focus was on *labour cost*. The workman was basically concerned with conversion of raw material into a finished product. In this case, both the raw material cost and labour cost were major part of the total cost and manufacturing overhead was negligible. However, during the last decade there has been a sea change in the production process. Manufacturers have grown in size and this has resulted in a high degree of automation. All manufacturers are manufacturing different products from same facility and incurring huge amount of common cost which are now called *production or manufacturing overhead*. At present manufacturing overhead is as large as the cost of direct material and direct labour.

Let us take an *example* of a printing press. In sixties, there were 'letter press' machines. It was labour intensive and majority portion of the cost of printing was labour cost. In seventies 'offset' technology came into picture and labour cost was reduced drastically. However, the manufacturing overhead was a significant part of the total cost of printing. In nineties, 'web offset' printing technology had further reduced the labour cost. Manufacturing overhead is most important part of the total cost because of expensive machinery, high maintenance and operating cost.

Collection of Production / Operation / Manufacturing Overheads

Collection of overheads means the pooling indirect items of expenses from books of account and supportive corroborative records in logical groups having regards to their nature and purpose.

Different *source documents* are used in the accumulation of production / operation / manufacturing overheads. These are :

(i) **Purchase Voucher** : Invoice received from the vendors / suppliers is one of the main source of overhead accumulation. As and when an invoice is received from the vendor, a purchase voucher is prepared. On the purchase voucher, the specific account charge is indicated by account number.

(ii) **Stores Requisitions** : Different items of manufacturing overhead such as fuel, lubricants, cotton waste, repair materials are obtained from the stores by issuing a stores requisition. Shop floor managers, foremen and their subordinates are authorized to write stores requisitions. Such requisitions should specify the account number and department to which it is to be charged.

(iii) **Labour Time Ticket** : Indirect labourers may work for different departments on a particular day. Labour time ticket is used to record the time spent in each department. The respective departments are charged on the basis of these labour time tickets.

(iv) **Repairs and Maintenance Order** : In a factory different types of repairs and maintenance is done on a continuous basis. All cost relating to repairs and maintenance are recorded on special service repair orders. The order is used as a basis for making charges to different production and service departments.

(v) **Journal Proper / General Journal Vouchers** : Journal proper vouchers is used for making entries in journal proper in respect of depreciation, outstanding and prepaid expenses, etc. Account number, the department to be charged is stated on the face of the voucher.

(vi) **Cash Book** : Cash book should be scrutinized to find out different petty factory expenses. These expenses should be properly collected and charged to different departments.

Standing Order Number and Cost Accounting Number

Cost transactions are recorded on the basis of source documents (such as invoice, stores requisitions, etc.). To obtain meaningful and accurate information, it is necessary that all transactions must be classified at their inception. It is necessary to design a system of accounting headings suitably coded.

Here, it should be noted that Standing Order Numbers are applied to factory expenses headings. Cost Account Numbers are customarily applied to administrative, distribution expense headings.

Distribution of Production / Operation / Manufacturing Overheads

Proper distribution of production / operation / manufacturing overhead costs to different departments and finally assigning such overhead costs to product is extremely important. Distribution of overhead is one of the most complex problems of cost accounting. Proper care should be taken so that distribution is accurate and scientific.

Distribution of manufacturing overhead consist of *allocation* and *apportionment* of various overhead costs to production departments and service departments. After allocation and apportionment, all overheads of service departments are re-distributed to production departments. Finally, all of the manufacturing overhead costs accumulated in each production department are assigned to product.

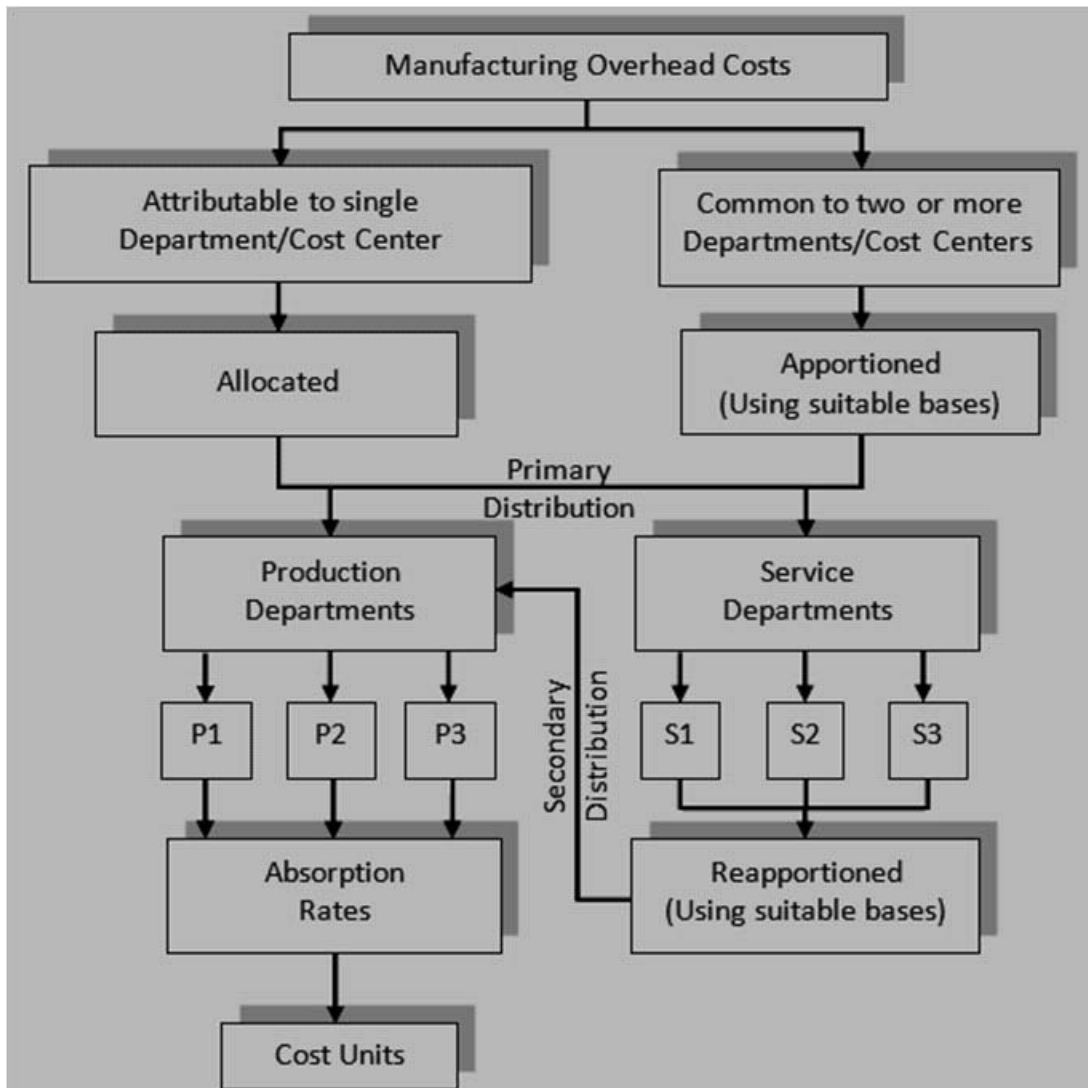
In this respect, the meaning of the terms – allocation and apportionment of overheads are very important.

If a particular overhead cost is incurred exclusively by a department, the item of overhead has to be charged to it. This process of charging entire amount of overhead cost to a particular department is known as *allocation*. CIMA (Chartered Institute of Management Accountants), U.K. has defined *allocation* as "the allotment of whole items of cost to cost centres or cost units." *For example*, depreciation of micro-oven, used in workers canteen, is charged to Canteen Department (a service department). This is a case of allocation.

5.8 Accounting for Overheads

Apportionment is the spreading of common overhead costs, between two or more departments, which cannot otherwise be allocated to any particular department. CIMA, U.K. has defined '**apportionment**' as "the allotment to two or more departments or cost centres of proportions of common items of cost on estimated basis of benefit received." *For example*, cost of power used in canteen or rent for area occupied by the canteen is treated as apportionment of cost because power is used by other departments also and source of power is same. Some **appropriate basis** is adopted for apportionment of common overhead.

The following diagram (Fig. 5.5) will show the entire process of **distribution and absorption** of manufacturing overheads.



[Fig. 5.5]

Primary and Secondary Distribution

The process of allocation and apportionment of different overhead costs to manufacturing and service departments is known as **Primary Distribution**. In making primary distribution no distinction is made between manufacturing and service departments.

The process of **re-allocation** of the total costs of each service department to manufacturing department and other service departments is known as **Secondary Distribution**.

Manufacturing / Production Departments

A manufacturing department is one in which manual and machine operations are performed directly upon any part of the products produced. It is also called productive department. All costs of these departments are charged to the product because they have contributed directly to its production.

The number of manufacturing departments depend upon the nature of the industry and the type of work performed. For example, in a **cement factory** there may be different manufacturing departments, such as :

1. Stone crushing; 2. Raw grinding and mixing; 3. Coal crushing and pulverizing; 4. Kiln burning and cooling; 5. Finish grinding; and 6. Storing and packing.

Service Departments

A service department is one which do not directly engage in production but provide a particular service to other departments. These departments may be production departments and other service departments. For example, maintenance department is a service department and it is providing services to different production departments and service departments.

All expenses incurred in respect of service departments are part of the total factory overheads and must be absorbed in the cost of the product by means of a factory overhead recovery rate (to be discussed after few pages). Examples of service departments are : time keeping, payroll, computer, cost accounting, canteen, maintenance, etc.

Allocation of Production / Operation / Manufacturing Overheads

There are many overhead costs which are easily identified with the originating department, whether manufacturing or service. The following overhead costs are falling in this category:

- (a) Indirect materials and supplies charged to specific department; (b) Indirect labour employed in a particular department; (c) Overtime of the production department; (d) Supervision cost of the department; (e) Depreciation of plant and equipment of a particular department; and (f) Repairs and maintenance of a particular department.

At the time of 'Primary Distribution' all these overheads are **allocated** to that specific department.

Apportionment of Production / Operation / Manufacturing Overheads

There are many overhead costs which are incurred for the factory as a whole, not for any particular department or cost centre. It is not possible to give a complete list of all possible items. Some of these items are :

- (a) Rent, rates and taxes; (b) Power; (c) Salary of security staff; (d) Salary of the works manager; (e) Depreciation, insurance of the building; and (f) Airconditioning expenses, etc.

The above expenses are not originating from a particular department, be it manufacturing or service. At the time of 'Primary Distribution', all these overheads are **apportioned** among different departments (manufacturing and service). There is no hard and fast rule for selecting the bases for apportionment of common factory costs. However, any base which is chosen for apportionment, should meet the following three tests :

- (i) It should be equitable.
- (ii) It should be practicable.
- (iii) It should not be too costly to use.

5.10 Accounting for Overheads

Distinction between Allocation and Apportionment of Expenses

Sl. No.	Allocation	Sl. No.	Apportionment
1.	Allocation is used when overhead can be easily identified with the originating department. <i>For example</i> , the overtime premium of a particular department.	1.	Apportionment is used when overhead can not be easily identified with a particular department. <i>For example</i> , the salary of security staff.
2.	In case of allocation, the entire amount of cost is allocated to specific department.	2.	In case of apportionment, the cost is divided among different departments.
3.	Allocation is easier and accurate.	3.	Apportionment is subjective and depend upon many factors.
4.	Very few overheads can be allocated.	4.	Quite a good number of common expenses are apportioned among different departments.
5.	Allocation process is time consuming and expensive.	5.	Apportionment process is very very simple and not expensive at all.

Some of the common production / operation / manufacturing overhead costs that requires apportionment, together with the bases most commonly used are given below in a table:

	Common Manufacturing Overhead Cost	Basis of Distribution
1.	Factory rent	Floor area (square feet)
2.	Depreciation – building	Floor area (square feet)
3.	Air–conditioning	Area (cubic feet)
4.	General supervision	Number of employees in each department
5.	Telephone	Number of telephones in each department
6.	Lighting	Light Points
7.	Power	Kilowatt Hours
8.	Workmen's compensation insurance	Department's direct wages
9.	Indirect materials	Direct materials
10.	Indirect wages	Direct wages
11.	Workers' welfare expenses	Number of workers
12.	Insurance – assets	Value of assets in each department
13.	Consumable stores	Direct materials
14.	Sundry expenses	Direct wages / direct labour hours

After selecting the bases, a survey of factory must be made for obtaining different statistical and accounting information to facilitate the distribution. Generally the following information is gathered:

- (i) Ground dimension and acreage of the factory;
- (ii) Floor area of buildings;
- (iii) Cubic content of buildings;
- (iv) Departmental occupancy of buildings;
- (v) Number of employees in each departments;
- (vi) Direct wages of each department;

Steps for Allocation and Apportionment of All Production / Operation / Manufacturing Overheads to Production and Service Departments

The following steps are followed for allocation and apportionment of all manufacturing overhead to production as well as service departments:

Step 1 : Prepare an '*Overhead Analysis Sheet*'. It is shown in Fig. 5.6 below:

Illustration Example 1

A manufacturing concern has three production departments : A, B and C and one service department D.

The following particulars are available :

Expenses :

(i) Indirect wages ₹ 1,200; (ii) Rent ₹ 10,000; (iii) Repairs ₹ 6,000; and (iv) Depreciation ₹ 4,500.

	Production Departments			Service Department
	A	B	C	D
Indirect wages (₹)	550	350	150	150
Area occupied (sq.ft.)	1,500	1,100	900	500
Value of plant (₹ lakhs)	4	3	2	1

Taking the above Illustration, the different expenses are to be distributed among different departments in the following manner :

Overhead Analysis Sheet Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Department
				A (₹)	B (₹)	C (₹)	D (₹)
Indirect Wages	Allocation		1,200	550	350	150	150
Rent	Area occupied	15:11:9:5	10,000	3,750	2,750	2,250	1,250
Repairs	Value of plant	4:3:2:1	6,000	2,400	1,800	1,200	600
Depreciation	Value of plant	4:3:2:1	4,500	1,800	1,350	900	450
Total departmental overheads			21,700	8,500	6,250	4,500	2,450

[Fig. 5.6]

Step 2 : Allocate specific departmental overheads to each department directly. If you look at the above sheet, you will find that *indirect wages* have been directly allocated to A, B, C and D departments.

Step 3 : Apportion common manufacturing costs (e.g., rent, repairs, supervision, etc.) to different departments (both production and service) using *appropriate base*. Find out the ratio of the selected base and use it for apportionment.

In the above sheet, rent has been apportioned on the basis of area occupied. It has been assumed that the ratio of area occupied by each department is 15 : 11 : 9 : 5 and total rent for the period is ₹ 10,000. The apportionment has been done as follows :

$$\text{Department A} = \frac{10,000}{40} \times 15 = ₹ 3,750 \quad \text{Department B} = \frac{10,000}{40} \times 11 = ₹ 2,750$$

$$\text{Department C} = \frac{10,000}{40} \times 9 = ₹ 2,250 \quad \text{Department D} = \frac{10,000}{40} \times 5 = ₹ 1,250$$

In the similar manner, all other overhead costs have been apportioned.

5.12 Accounting for Overheads

Step 4 : Add all columns to get departmental overhead of production and service departments.

If you look at the "Overhead Analysis Sheet" you will find total overheads of different departments as :

A:	₹ 8,500
B:	₹ 6,250
C:	₹ 4,500
D:	₹ 2,450
Total	₹ 21,700

Illustration 1

In a factory there are three production departments and one service department. The expenses for the departments during 2017 were as follows:

Rent ₹ 2,000; Power ₹ 1,800; Light ₹ 750; Depreciation ₹ 2,700; Supervision ₹ 9,000; Repair to Plant ₹ 2,250; Canteen Expenses ₹ 4,500.

With the above noted expenses and the following further particulars determine the total cost of each department:

	Production Departments			Service Department
	A	B	C	S
Area (sq.metre)	375	165	135	75
Cost of Plant (₹)	60,000	45,000	45,000	—
No. of Employees	8	6	4	2
Direct Wages (₹)	30,000	20,000	15,000	10,000
Light Points (No.)	8	7	6	4
H.P. of Machines	9	6	7.5	—

[C.U.B.Com. (General) – Adapted]

Solution

Overhead Analysis Sheet Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Department
				A (₹)	B (₹)	C (₹)	D (₹)
Direct Wages	Allocation		10,000	—	—	—	10,000
Rent	Area (sq.m.)	75:33:27:15	2,000	1,000	440	360	200
Power	H.P. of Machine	9:6:7.5:0	1,800	720	480	600	—
Light	Light Points	8:7:6:4	750	240	210	180	120
Depreciation	Cost of Plant	4:3:3:0	2,700	1,080	810	810	—
Supervision	No. of Employees	8:6:4:2	9,000	3,600	2,700	1,800	900
Repairs to Plant	Cost of Plant	4:3:3:0	2,250	900	675	675	—
Canteen Expenses	No. of Employees	8:6:4:2	4,500	1,800	1,350	900	450
Total Departmental Overheads			33,000	9,340	6,665	5,325	11,670

Illustration 2

A company has three production departments P1, P2 and P3 and one service department S. The following are the actual expenses for the month of December, 2017 : ₹

Depreciation	7,000
Rent, rates and taxes	4,500
Electricity	6,000
Sundries	1,300

Canteen expenses	5,500
Insurance on assets	1,400
Power	1,200

Other information are :

	Production Departments			Service Department
	P1	P2	P3	S
Value of assets (₹)	25,000	20,000	15,000	10,000
Floor Space (sq.mt.)	300	250	200	150
Light Points (Nos.)	10	8	8	4
H.P. of Machines	5	4	3	—
No. of Employees	40	30	20	10
Direct Wages (₹)	3,000	2,000	1,000	500

Apportion the above-mentioned costs among different departments.

[C.U.B.Com. (General) – Adapted]

Solution

Overhead Analysis Sheet

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Department
				A (₹)	B (₹)	C (₹)	D (₹)
Direct Wages*	Allocation		500	—	—	—	500
Depreciation	Value of assets	5 : 4 : 3 : 2	7,000	2,500	2,000	1,500	1,000
Rent, Rates and Taxes	Floor space	6 : 5 : 4 : 3	4,500	1,500	1,250	1,000	750
Electricity	Light points	5 : 4 : 4 : 2	6,000	2,000	1,600	1,600	800
Sundries	Direct wages	6 : 4 : 2 : 1	1,300	600	400	200	100
Canteen Expenses	No. of employees	4 : 3 : 2 : 1	5,500	2,200	1,650	1,100	550
Insurance on Assets	Value of assets	5 : 4 : 3 : 2	1,400	500	400	300	200
Power	H.P. of machines	5 : 4 : 3 : 0	1,200	500	400	300	—
Total Departmental Overheads			27,400	9,800	7,700	6,000	3,900

* Direct wages of service department will be treated as **overhead**. The direct wages of production departments will be shown under '**Prime Cost**'.

Illustration 3

A company has three production departments A, B and C and one service department D. The following are the actual expenses for the year 2017 :

	₹
Rent	10,000
Repairs to Machinery	6,000
Depreciation of Machinery	4,500
Supervision	15,000
Fire Insurance (for Stock)	5,000
Power	9,000
Light	1,000
Employees' State Insurance	1,500

5.14 Accounting for Overheads

Other information :

	Production Departments			Service Department
	A	B	C	D
Area (sq.ft.)	1,500	1,100	900	500
No. of Employees	20	15	10	15
H.P. of Machines	80	50	20	—
Direct Wages (₹)	60,000	40,000	30,000	20,000
Value of Machinery (₹)	2,40,000	1,80,000	1,20,000	60,000
Value of Stock (₹)	1,50,000	90,000	60,000	—
Light Points (Nos.)	40	30	20	10

Apportion the above-mentioned costs among different departments.

[C.U.B.Com. (General) – Adapted]

Solution

Overhead Analysis Sheet

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Department
				A (₹)	B (₹)	C (₹)	D (₹)
Direct Wages	Allocation		20,000	—	—	—	20,000
Rent	Area (sq.ft.)	15 : 11 : 9 : 5	10,000	3,750	2,750	2,250	1,250
Repairs to Machinery	Value of Machinery	4 : 3 : 2 : 1	6,000	2,400	1,800	1,200	600
Depreciation of Machinery	Value of Machinery	4 : 3 : 2 : 1	4,500	1,800	1,350	900	450
Supervision	No. of Employees	4 : 3 : 2 : 3	15,000	5,000	3,750	2,500	3,750
Fire Insurance (Stock)	Value of Stock	5 : 3 : 2 : 0	5,000	2,500	1,500	1,000	—
Power	H.P. of Machine	8 : 5 : 2 : 0	9,000	4,800	3,000	1,200	—
Light	No. of Light Points	4 : 3 : 2 : 1	1,000	400	300	200	100
Employees' State Insurance	No. of Employees	4 : 3 : 2 : 3	1,500	500	375	250	375
Total Departmental Overheads			72,000	21,150	14,825	9,500	26,525

Illustration 4

There are three production departments and one service department in a factory. The expenses for the month of December, 2017 were as given below :

Rent ₹ 5,200; Light ₹ 480; Power ₹ 1,800; Supervision Charges ₹ 9,450; Depreciation on Plant @ 12% p.a.

Other information :

	Production Departments			Service Department
	P1	P2	P3	S
No. of Employees	30	18	9	6
No. of Light Points	9	6	5	4
Cost of Plant (₹)	1,50,000	1,00,000	50,000	—
H.P. of Machines (Kw)	10	5	3	—
Direct Wages for December (₹)	40,000	30,000	20,000	10,000
Area (sq.ft.)	1,500	750	500	500
Direct Materials used in December (₹)	4,000	3,000	2,000	220

On the basis of the above information, prepare the Primary Overhead Distribution Summary for the month of December, 2017.

[C.U.B.Com. (General) – Adapted]

Solution

Overhead Analysis Sheet

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Department
				A (₹)	B (₹)	C (₹)	D (₹)
Direct Materials	Allocation	Direct	220	—	—	—	220
Direct Wages	Allocation	Direct	10,000	—	—	—	10,000
Rent	Area (sq.ft.)	6 : 3 : 2 : 2	5,200	2,400	1,200	800	800
Light	No. of Light Points	9 : 6 : 5 : 4	480	180	120	100	80
Power	KW	10 : 5 : 3 : 0	1,800	1,000	500	300	—
Supervision Charges	No. of Employees	10 : 6 : 3 : 2	9,450	4,500	2,700	1,350	900
Depreciation (Note 1)	Cost of Plant	3 : 2 : 1 : 0	3,000	1,500	1,000	500	—
Total Departmental Overheads			30,150	9,580	5,520	3,050	12,000

Working Note :

Total Value of Plant

Department P1— ₹ 1,50,000 + Department P2 — ₹ 1,00,000 + Department P3 — ₹ 50,000 = ₹ 3,00,000

Depreciation for the month of December = $12\% \times 3,00,000 \times \frac{1}{12} = ₹ 3,000$.

Re-apportionment of Service Department Overheads to Production Department

The next step is to re-apportion the overhead of service department(s) to production department(s). It is necessary because, no product is produced by the service department(s). Service department(s) is providing services to production department(s), without those, no production is possible.

Overheads of the service department(s) should be apportioned to production department(s) on the basis of service rendered or benefit received from the service department(s). You know that this process of re-apportionment is called **Secondary Distribution**.

We will discuss the process of re-apportionment of service department overheads to production department under **three** sub-headings:

- Where there is only **one** service department.
- Where there are **two** or more service departments with **non-reciprocal** service.
- Where there are **two** or more service departments with **reciprocal** service.

(i) When there is only One Service Department

If there is only one service department, the process of re-apportionment is simple. All overheads of service department is re-apportioned among production departments on the basis of some equitable base. Generally the following bases are adapted by the manufacturing organizations:

	Service Departments	Basis of Re-apportionment
1.	Repairs and maintenance	Hours worked / Area occupied
2.	Canteen, cafeteria	Number of employees in each production department
3.	Stores	Number of stores requisitions / Value of materials issued
4.	Inspection	Inspection hours / value of items inspected
5.	Personnel	Number of employees in each production department
6.	Accounts	Value of goods produced by each department
7.	Time-keeping	Number of employees; labour hours
8.	Factory hospital	Number of employees in each production department

5.16 Accounting for Overheads

9.	Tool room	Value of machinery of each production department
10.	Material handling	Value of materials consumed by each production department
11.	Crane service	Crane hours used by each production department
12.	Employee Training and Welfare	Number of employees in each production department
13.	Employee Transport Service	Number of employees in each production department
14.	Goods Transport Service	Truck hours used; Ton–Km.

It should be noted that the organisations, from past experiences, may calculate the percentage of benefit received by each production department. The overhead of service department is distributed accordingly.

Illustration 5

Calcutta Engineering Co. has three production departments, X, Y and Z, and one service department S. From the following particulars, calculate the overheads to be allocated to departments X, Y and Z:

Expenses	₹
Rent	34,000
Power	18,400
Depreciation on machinery	22,000
Indirect wages	5,300
Canteen expenses	5,700
Electricity	4,600

Further information :

	X	Y	Z	S
Floor space (sq.m.)	2,000	3,000	2,500	1,000
Light points	18	12	10	6
Cost of machines (₹)	80,000	50,000	60,000	10,000
Horse Power hours ratio	3	2	4	1
No. of workers	7	5	5	2
Direct wages (₹)	15,000	16,000	18,000	4,000

Services rendered by the service department are to be apportioned to the production departments as :
X – 50%, Y – 25%, and Z – 25% [C.U.B.Com. (Hons.) – Adapted]

Solution

Overhead Analysis Sheet

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Department
				X (₹)	Y (₹)	Z (₹)	S (₹)
Direct Wages	Allocation	—	4,000	—	—	—	4,000
Rent	Floor space	4:6:5:2	34,000	8,000	12,000	10,000	4,000
Power	H.P. ratio	3:2:4:1	18,400	5,520	3,680	7,360	1,840
Depreciation on Machinery	Cost of Machine	8:5:6:1	22,000	8,800	5,500	6,600	1,100
Indirect Wages	Direct Wages	15:16:18:4	5,300	1,500	1,600	1,800	400
Canteen Expenses	Number of Workers	7:5:5:2	5,700	2,100	1,500	1,500	600
Electricity	Light Points	18:12:10:6	4,600	1,800	1,200	1,000	600
Total Departmental Overheads			94,000	27,720	25,480	28,260	12,540

Secondary Distribution
Re-apportionment of Service Department Cost to Production Departments

Particulars	Total (₹)	Production Departments			Service Department
		X (₹)	Y (₹)	Z (₹)	S (₹)
Overhead as per Primary Distribution	94,000	27,720	25,480	28,260	12,540
Re-apportionment of Overhead of Department S in the ratio (50:25:25)		6,270	3,135	3,135	(12,540)
Total Departmental Overheads	94,000	33,990	28,615	31,395	Nil

(ii) When there are Two or More Service Departments with Non-reciprocal Service

It is very common that the service departments are providing services not only to production departments but also to other service departments.

For example, in a factory there are three production departments – A, B and C and two service departments – Maintenance and Canteen. Canteen department is providing services to A, B, C and Maintenance department. However, Maintenance department is providing services only to production departments – A, B and C but **not** to canteen department.

This type of service arrangement is called **non-reciprocal basis service**. Under non-reciprocal basis service there is no **two-way** distribution of overhead costs between service departments.

At the time of making secondary distributions, the following **general rules** are to be followed:

1. **First**, distribute the overheads of that service department which serves the **maximum** number of departments.
2. **Next**, distribute the total overheads (own + received from other service departments) of the department which serves the **second largest** number of departments.

The above process will continue till the overhead of **lowest** serving department's overheads are being apportioned to production departments.

The above method of re-apportionment of overhead is called '**Step Re-apportion Method**'. It is also called '**Specified Order of Closing Method**'.

Illustration 6

P Ltd. has three production departments (P1, P2 and P3) and two service departments (S1 and S2) in its factory. The actual production overhead cost for a period, totaling ₹ 4,87,430 have been allocated and apportioned to different departments as follows:

Particulars	Production Departments			Service Departments	
	P1	P2	P3	S1	S2
Expenses (₹)	1,76,860	96,250	1,34,770	42,150	37,400

The overheads of service department S1 are re-apportioned on the basis of the number of materials requisition notes (MRN) raised in the period.

The overheads of service department S2 are re-apportioned on the basis of the number of employees in other departments.

The following additional actual information is available for the period:

Department	No. of Employees	No. of MRNs
P1	20	4,970
P2	25	3,550
P3	50	5,680
S1	8	—
S2	5	—

You are required to re-apportion the overhead of service department amongst production departments.

5.18 Accounting for Overheads

Solution

There are two service departments – S1 and S2. S2 is serving maximum number of departments (four) – P1, P2, P3 and S1. Therefore, the overhead of S2 is to be distributed **first**.

S1 is serving only three production departments. Therefore, total overheads (own + share from S2) is to be distributed at **last**.

Secondary Distribution Re-apportionment of Service Department Overheads to Production Departments

Particulars	Production Departments			Service Departments	
	P1 (₹)	P2 (₹)	P3 (₹)	S1 (₹)	S2 (₹)
Allocated and apportioned	1,76,860	96,250	1,34,770	42,150	37,400
Re-apportionment :					
S2 (Note 1)	7,262	9,078	18,155	2,905	(37,400)
S1 (Note 2)	15,769	11,264	18,022	(45,055)	—
	1,99,891	1,16,592	1,70,947	—	—

Working Notes :

	₹		₹
(1) P1 = $37,400 / 103 \times 20$	7,262	(2) P1 = $\text{₹ } 45,055 / 14,200 \times 4,970$	15,769
P2 = $37,400 / 103 \times 25$	9,078	P2 = $\text{₹ } 45,055 / 14,200 \times 3,550$	11,264
P3 = $37,400 / 103 \times 50$	18,155	P3 = $\text{₹ } 45,055 / 14,200 \times 5,680$	18,022
S1 = $37,400 / 103 \times 8$	2,905		45,055
	<u>37,400</u>		

*excluding the employees of department S2 itself.

Illustration 7

From the following particulars, calculate the overheads allocable to production departments: P and Q. There are also two service departments S1 and S2. S1 renders service worth ₹ 6,000 to S2 and the balance to P and Q as 3 : 2. S2 renders service to P and Q as 9 : 1.

	P	Q	S1	S2
Floor space (sq.ft.)	2,500	2,000	500	500
Assets (₹ in lakhs)	5	2.5	1.5	0.5
H.P. of machines	500	250	200	50
No. of workers	100	50	50	25
Light and Fan points	50	30	20	20

Expenses and Charges :

	₹		₹
Depreciation	95,000	Rent, rates and taxes	18,000
Insurance	7,600	Power	10,000
Canteen expenses	5,400	Electricity	2,400

[C.U.B.Com. (Hons.) – Adapted]

Solution

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments		Service Departments	
				P (₹)	Q (₹)	S1 (₹)	S2 (₹)
Depreciation	Value of assets	10:5:3:1	95,000	50,000	25,000	15,000	5,000
Insurance	Value of assets	10:5:3:1	7,600	4,000	2,000	1,200	400
Canteen Expenses	Number of workers	4:2:2:1	5,400	2,400	1,200	1,200	600
Rent, Rates & Taxes	Floor space	5:4:1:1	18,000	8,183	6,545	1,636	1,636
Power	H.P. of machines	10:5:4:1	10,000	5,000	2,500	2,000	500
Electricity	Light points	5:3:2:2	2,400	1,000	600	400	400
Total Departmental Overheads			1,38,400	70,583	37,845	21,436	8,536

Secondary Distribution
Re-apportionment of Service Department Costs to Production Departments

Particulars	Production Departments		Service Departments	
	P (₹)	Q (₹)	S1 (₹)	S2 (₹)
Overhead as per Primary Distribution	70,583	37,845	21,436	8,536
Re-apportionment of overhead of S1 to S2, P & Q (Note 1)	9,262	6,174	(21,436)	6,000
	79,845	44,019	Nil	14,536
Re-apportionment of overhead of S2 to P and Q in ratio 9:1 (Note 2)	13,082	1,454	–	(14,536)
Total Overhead Costs	92,927	45,473	Nil	Nil

Working Notes :

(1) Total overhead of department S1	₹ 21,436	(2) Total Overhead of S2	₹
Less: Service provided to S2	6,000	Own	8,536
Overhead to be distributed to P and Q in the ratio 3:2	15,436	Share of S1	6,000
			14,536

P = $15,436/5 \times 3 = ₹ 9,262$; Q = $15,436/5 \times 2 = ₹ 6,174$

P = $₹ 14,536/10 \times 9 = ₹ 13,082$

Q = $₹ 14,536/10 \times 1 = ₹ 1,454$

Illustration 8

Excellent Manufacturing Works have two production departments: Mixing and Curing and three service departments: Time Office, Stores and Maintenance. The following details are available from the Departmental Distribution Summary for the month of July 2001 :

		₹	₹
Production Departments :	Mixing	1,44,000	
	Curing	96,000	2,40,000
Service Departments :	Time Office	48,000	
	Stores	60,000	
	Maintenance	36,000	1,44,000

The following relevant data is also available:

	Production Departments		Service Departments		
	Mixing	Curing	Time Office	Stores	Maintenance
No. of employees	20	15	10	8	5
No. of stores requisitions processed	120	100	–	–	30
Machine hour	3,600	2,400	–	–	–

The company consistently follows the methods of Secondary Distribution on **non-reciprocal basis**.

Show the apportionment of cost of service departments to production departments stating the basis of computation in the form of a note at the end of the exercise.

[I.C.W.A. (Stage – I) – Dec., 2001]

Solution

There are **three** service departments : (a) Time Office; (b) Stores and (c) Maintenance.

Time Office serves maximum number of departments (four) – Mixing, Curing, Stores and Maintenance.

Therefore, the overheads of 'Time Office' is to be distributed **first**.

Stores serves 3 departments – Mixing, Curing and Maintenance. Therefore, the total overheads of 'Stores' is to be distributed **next**.

Maintenance serves only 2 production departments – Mixing and Curing. Therefore, total overheads of 'Maintenance' is to be distributed at **last**.

Particulars	Total ₹	Production Departments		Service Departments		
		Mixing ₹	Curing ₹	Time Office ₹	Stores ₹	Maintenance ₹
Overhead as per Primary Distribution Summary	3,84,000	1,44,000	96,000	48,000	60,000	36,000
Apportionment of Time Office Expenses [Note (i)]		20,000	15,000	(48,000)	8,000	5,000
Apportionment of Stores Expenses [Note (ii)]		32,640	27,200	–	(68,000)	8,160
Apportionment of Maintenance Expenses [Note (iii)]		29,496	19,664	–	–	(49,160)
Total Overhead Costs	3,84,000	2,26,136	1,57,864	–	–	–

(i) **Time Office** expenses have been apportioned among Mixing, Curing, Stores and Maintenance in the ratio of *number of employees*. The ratio is 20 : 15 : 8 : 5. ₹

Total Overhead Costs of Stores Department ₹

Own	60,000
Share of 'Time Office'	<u>8,000</u>
	68,000

$$\text{Maintenance} = ₹ 68,000 / 250 \times 30 \quad 8,160$$

Own	36,000
Share of 'Time Office'	5,000
Share of 'Stores'	<u>8,160</u>
	49,160

$$\text{Curing} = ₹ 49,160 / 10 \times 4 = 19,664$$

There are two production departments (P1 and P2) and two services departments (Material Stores and Canteen) in a factory. Estimated overhead costs for the factory for a period, requiring apportionment to cost centres, are:

In addition to the above, the following overheads have been allocated to cost centres :

	P1	P2	Material Stores	Canteen
Overheads (₹)	5,35,000	4,45,000	3,40,000	4,20,000

Additional information:

Particulars	Total	P1	P2	Material Stores	Canteen
Floor area (m ²)	12,000	4,560	5,640	720	1,080
No. of employees	54	18	24	6	6
Share of other utilities overhead	100%	35%	45%	10%	10%
Machine hours	12,000	6,200	5,800	—	—
Share of Material stores overhead	100%	40%	60%	—	—

You are required to :

- Prepare a schedule showing the allocated and apportioned factory overhead costs for each cost centres;
- Re-apportion the service cost centre overheads.

[I.C.W.A. (Inter) – Adapted]

Solution

Overhead Analysis Sheet

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Particulars	Basis of Apportionment	Total (₹)	Production Departments		Service Departments	
			P1 (₹)	P2 (₹)	Material Stores (₹)	Canteen (₹)
Allocated		17,40,000	5,35,000	4,45,000	3,40,000	4,20,000
Apportioned :						
(i) Building depreciation and insurance	Floor area	2,10,000	79,800	98,700	12,600	18,900
(ii) Staff salaries	No. of employees	1,35,000	45,000	60,000	15,000	15,000
(iii) Power to operate machinery	Machine Hour	63,000	32,550	30,450	—	—
(iv) Other utilities	% given	47,000	16,450	21,150	4,700	4,700
Total Departl. Overheads		21,95,000	7,08,800	6,55,300	3,72,300	4,58,600

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Basis	Total (₹)	Production Departments		Service Departments	
			P1 (₹)	P2 (₹)	Material Stores (₹)	Canteen (₹)
Departmental overheads	As per above statement	21,95,000	7,08,800	6,55,300	3,72,300	4,58,600
Distribution of overheads of Canteen (Note 1)	No. of employees		1,71,975	2,29,300	57,325	(4,58,600)
					4,29,625	
Distribution of Overhead of Material Stores	% given		1,71,850	2,57,775	(4,29,625)	—
Total Departmental Overheads		21,95,000	10,52,625	11,42,375	Nil	Nil

Note (1) :

There are two service departments – Material Stores and Canteen. Canteen serves maximum number of departments (three) – P1, P2 and Material Stores. Therefore, overheads of Canteen is to be distributed **first**. The overhead of Material Stores is to be distributed at **last**.

(iii) When there are Two or More Service Departments with Reciprocal Service

In many cases, a service department may provide service to production departments as well as service departments and the same service department may receive service from other service department(s). **For example**, Canteen is providing service to the employees of factory office department (a service department) and factory office department is providing service to canteen by maintaining accounts and managing payroll. This is a case of **Reciprocal Basis Service**. Canteen and Factory office are interdependent. There is a **two-way** distribution of costs between two service departments.

When two or more service departments render services to each other, it is impossible to know the total overheads of each service department. In case of our example, the total overhead of Canteen cannot be determined until the total overhead of Factory Office has been determined. Again, the total overhead of Factory Office cannot be determined until the total overhead of Canteen has been determined. A **vicious circle** is created in determining the amount to be distributed.

Methods for Solving the Problem of Reciprocal Basis Service

There are **five** methods of solving the problem of reciprocal basis service. These are :

1. Repeated / Continuous Distribution Method
2. Simultaneous Equation Method / Algebraic Method
3. Direct Allocation Method
4. Trial and Error Method
5. Specified Order of Closing Method

1. Repeated / Continuous Distribution Method

Under this method, the overheads of service departments are re-apportioned among all other departments including service department by successive distribution. The steps involved are as follows :

- Step 1 :** Calculate the proportion at which the overhead costs of service departments are to be distributed to production departments and other service departments. (In examination it is given. In practice, it is generally calculated on the basis of past data and the policy of the management.)
- Step 2 :** Overhead cost of **first** service department is distributed among production departments and service departments in the proportion as determined in Step 1. This closes **temporarily** the account of **first** service department.
- Step 3 :** Distribute the **total** overhead of second service department (which is made up of primary charges plus a portion of first service department's overhead) among production departments and other service departments including **first** service department. This closes **temporarily** the account of **second** service department.
- Step 4 :** Apply the same procedure to all other service departments.
- Step 5 :** Repeat a second cycle of distributions beginning with **first** service department whose total consists of share of overheads of other service departments only.
- Step 6 :** The process as stated in Step 2 and Step 4 are to be **repeated** until the figures remaining undistributed in the service departments are very small to be of any consequences. Generally, the small amount left with service department is **equally** divided among production departments.

Illustration 10

A company has three production departments and two service departments. Distribution summary of overheads is as follows:

Production Departments	₹
A	13,600
B	14,700
C	12,800

Service Departments

X	9,000
Y	3,000

The expenses of service departments are charged on a percentage basis which is as follows:

	A	B	C	X	Y
X Dept.	40%	30%	20%	—	10%
Y Dept.	30%	30%	20%	20%	—

Apportion the cost of Service Departments by using the **Repeated Distribution Method**.

[C.U. B.Com. (Hons.) – Adapted]

Solution

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Ratio	Production Departments			Service Departments	
		A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Total departmental overheads	Given	13,600	14,700	12,800	9,000	3,000
Distribution of Overhead of Service Dept. X	4:3:2:0:1	3,600	2,700	1,800	(9,000)	900
Distribution of Overhead of Service Dept. Y	3:3:2:2:0	1,170	1,170	780	780	(3,900)
Distribution of Overhead of Service Dept. X	4:3:2:0:1	312	234	156	(780)	78
Distribution of Overhead of Service Dept. Y	3:3:2:2:0	23	23	16	16	(78)
Distribution of Overhead of Service Dept. X	4:3:2:0:1	6	5	3	(16)	2
Distribution of Overhead of Service Dept. Y	3:3:2:2:0	1	1	—	—	(2)
Total Overheads after Re-apportionment		18,712	18,833	15,555	—	—

2. Simultaneous Equation Method / Algebraic Method

Under this method a series of simultaneous equations are formulated after taking into consideration the overhead as per primary distribution and percentage of service received from other service departments.

Taking data of **Illustration 10**, let

x = Total overhead of 'X' department

y = Total overhead of 'Y' department

Total overhead transferred to service departments X and Y can be expressed as :

$$x = 9,000 + 20\% \text{ of } y \quad \dots (1)$$

$$y = 3,000 + 10\% \text{ of } x \quad \dots (2)$$

OR

$$x = 9,000 + 0.2y \quad \dots (3)$$

$$y = 3,000 + 0.1x \quad \dots (4)$$

Re-arranging equation (3) and (4), we get

$$x - 0.2y = 9,000 \quad \dots (5)$$

$$-0.1x + y = 3,000 \quad \dots (6)$$

Multiplying equation (5) by 5 and equation (6) by 1, we get

$$5x - y = 45,000$$

$$-0.1x + y = 3,000$$

$$\underline{4.9x = 48,000} \quad (\text{Adding we get})$$

x is therefore $(₹ 48,000 \div 4.9) = ₹ 9,796$.

Substituting the value in equation (4) we get

$$y = 3,000 + (9,796 \times 0.1)$$

$$= 3,000 + 980$$

$$= 3,980$$

Finally : $x = ₹ 9,796$ and $y = ₹ 3,980$.

5.24 Accounting for Overheads

The re-apportionment is done as follows :

Secondary Distribution Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Production Departments			Service Departments	
	A ₹	B ₹	C ₹	X ₹	Y ₹
Total departmental overheads	13,600	14,700	12,800	9,000	3,000
Distribution of Overhead of Service Dept. X (Note 1)	3,918	2,939	1,959	(9,796)	980
Distribution of Overhead of Service Dept. Y (Note 2)	1,194	1,194	796	796	(3,980)
Total Overheads after re-apportionment	18,712	18,833	15,555	Nil	Nil

Tutorial Note:

Students should note that the overhead of production departments will be same whether 'Repeated Distribution Method' or 'Simultaneous Equation Method' is used.

In the examination, if no particular method is asked for, you can follow either of these two methods. You can save time if you use 'Simultaneous Equation Method'.

Working Notes :

(1) Distribution of Overhead of Dept. X	₹	(2) Distribution of Overhead of Dept. Y	₹
A – 40% of ₹ 9,796	3,918	A – 30% of ₹ 3,980	1,194
B – 30% of ₹ 9,796	2,939	B – 30% of ₹ 3,980	1,194
C – 20% of ₹ 9,796	1,959	C – 20% of ₹ 3,980	796
Y – 10% of ₹ 9,796	<u>980</u>	X – 20% of ₹ 3,980	<u>796</u>
	<u>9,796</u>		<u>3,980</u>

Illustration 11

A company has three production departments and two service departments. For the month of March 2017, the departmental expenses were as follows:

Production Departments

A – ₹ 10,000

B – ₹ 15,000

C – ₹ 12,000

Service Departments

X – ₹ 25,000

Y – ₹ 10,000

The expenses of service departments are apportioned as follows:

	A	B	C	X	Y
X	40%	30%	20%	–	10%
Y	30%	40%	10%	20%	–

Show the apportionment of service departments expenses among production departments.

[C.U. B.Com. (Hons.) – Adapted]

Solution

In this Question, no particular method has been asked for. Therefore, you can follow either '*Simultaneous Equation Method*' or '*Repeated Distribution Method*'.

If 'Simultaneous Equation Method' is followed, the solution will be as follows:

Let

x = Total overhead of X department

y = Total overhead of Y department

Total overhead transferred to service departments X and Y can be expressed as :

$$x = 25,000 + 20\% \text{ of } y \quad \dots (1)$$

$$y = 10,000 + 10\% \text{ of } x \quad \dots (2)$$

OR

$$x = 25,000 + 0.2y \quad \dots (3)$$

$$y = 10,000 + 0.1x \quad \dots (4)$$

Re-arranging equation (3) and (4) we get

$$x - 0.2y = 25,000 \quad \dots (5)$$

$$-0.1x + y = 10,000 \quad \dots (6)$$

Multiplying equation (5) by 5 and equation (6) by 1, we get

$$5x - y = 1,25,000$$

$$-0.1x + y = 10,000$$

$$4.9x = 1,35,000 \text{ (Adding we get)}$$

$$x \text{ is therefore } (\text{₹ } 1,35,000 \div 4.9) = \text{₹ } 27,551.$$

Substituting the value in equation (4) we get

$$y = \text{₹ } 10,000 + (\text{₹ } 27,551 \times 0.1)$$

$$= \text{₹ } 10,000 + 2,755$$

$$= \text{₹ } 12,755$$

Finally : $x = 27,551$ and $y = 12,755$

The re-apportionment will be as follows :

Secondary Distribution
Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Production Departments			Service Departments	
	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Total departmental overheads	10,000	15,000	12,000	25,000	10,000
Distribution of Overhead of Service Dept. X (Note 1)	11,020	8,266	5,510	(27,551)	2,755
Distribution of Overhead of Service Dept. Y (Note 2)	3,826	5,102	1,276	2,551	(12,755)
Total Overheads after re-apportionment	24,846	28,368	18,786	Nil	Nil

Working Notes :

(1) Distribution of Overhead of Dept. X ₹

A – 40% of ₹ 27,551	11,020
B – 30% of ₹ 27,551	8,266
C – 20% of ₹ 27,551	5,510
Y – 10% of ₹ 27,551	<u>2,755</u>
	<u>27,551</u>

(2) Distribution of Overhead of Dept. Y ₹

A – 30% of ₹ 12,755	3,826
B – 40% of ₹ 12,755	5,102
C – 10% of ₹ 12,755	1,276
X – 20% of ₹ 12,755	<u>2,551</u>
	<u>12,755</u>

Illustration 12

A textile mill has two production departments, "spinning" and "weaving" and two service departments S1 and S2. Variable costs of operating the two service departments, their outputs and quantum of service rendered to other departments are as follows:

	From service departments	
	S1	S2
To Spinning	30%	25%
Weaving	20%	35%
S1	–	40%
S2	50%	–
Variable cost of service departments	₹ 1,20,000	₹ 2,60,000
Output of service departments (units)	10,000	20,000

5.26 Accounting for Overheads

Calculate

- Cost per unit of service produced by S1 and S2.
- Cost of service received by spinning and weaving departments.

Solution

Let

x = Total overhead of S1 department.

y = Total overhead of S2 department.

Total overhead transferred to service departments S1 and S2 can be expressed as :

$$x = ₹ 1,20,000 + 40\% \text{ of } y \quad \dots (1)$$

$$y = ₹ 2,60,000 + 50\% \text{ of } x \quad \dots (2)$$

OR

$$x = ₹ 1,20,000 + 0.4y \quad \dots (3)$$

$$y = ₹ 2,60,000 + 0.5x \quad \dots (4)$$

Re-arranging equation (3) and (4), we get

$$x - 0.4y = ₹ 1,20,000 \quad \dots (5)$$

$$-0.5x + y = ₹ 2,60,000 \quad \dots (6)$$

Multiplying equation (5) by 2.5 and equation 6 by 1, we get

$$2.5x - y = ₹ 3,00,000$$

$$-0.5x + y = ₹ 2,60,000$$

$$\underline{\hspace{1cm}} 2x = ₹ 5,60,000 \text{ (Adding we get)}$$

$$x \text{ is therefore } (₹ 5,60,000 \div 2) = ₹ 2,80,000.$$

Substituting the value in equation (4) we get

$$y = ₹ 2,60,000 + (.5 \times ₹ 2,80,000)$$

$$= ₹ 2,60,000 + 1,40,000$$

$$= ₹ 4,00,000$$

Finally :

Overhead of S1 = ₹ 2,80,000

Overhead of S2 = ₹ 4,00,000.

(i) Cost per unit of S1 service = ₹ 2,80,000 / 10,000 = ₹ 28.

Cost per unit of S2 service = ₹ 4,00,000 / 20,000 = ₹ 20.

(ii) Service received by Spinning Department :	₹
30% of S1 Service = 30% of ₹ 2,80,000	84,000
25% of S2 Service = 25% of ₹ 4,00,000	<u>1,00,000</u>
Total	<u>1,84,000</u>

Service received by Weaving Department :	₹
20% of S1 service = 20% of ₹ 2,80,000	56,000
35% of S2 service = 35% of ₹ 4,00,000	<u>1,40,000</u>
Total	<u>1,96,000</u>

Illustration 13

A company has three production cost centres A, B and C and two service cost centres X and Y. Costs allocated to service centres are required to be apportioned to the production centres to find out cost of production of different products.

It is found that benefit of service cost centres is also received by each other along with the production cost centres.

Overhead costs are allocated to the five cost centres and estimates of benefit of service cost centres received by each of them are as under :

Cost Centres	Overhead Costs as allocated (₹)	Estimates of Benefits received from service centres (%)	
		X	Y
A	80,000	20	20
B	40,000	30	25
C	20,000	40	50
X	20,000	—	5
Y	10,000	10	—

Required:

Work out final overhead costs of each of the production departments including reapportioned cost of service centres using (a) Continuous distribution method and (b) Simultaneous equation method.

[I.C.W.A. (Inter) – Adapted]

Solution (a) Secondary Distribution
Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Ratio	Production Departments			Service Departments	
		A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Total departmental overheads	Given	80,000	40,000	20,000	20,000	10,000
Distribution of Overhead of Service Dept. X	2:3:4:0:1	4,000	6,000	8,000	(20,000)	2,000
Distribution of Overhead of Service Dept. Y	4:5:10:1:0	2,400	3,000	6,000	600	(12,000)
Distribution of Overhead of Service Dept. X	2:3:4:0:1	120	180	240	(600)	60
Distribution of Overhead of Service Dept. Y	4:5:10:1:0	12	15	30	3	(60)
Distribution of overhead of Service Dept. X	Equally	1	1	1	(3)	—
Total Overheads after Re-apportionment		86,533	49,196	34,271	—	—

Solution (b)

Let

x = Total overhead of department 'X'.

y = Total overhead of department 'Y'.

Total overhead transferred to Service Departments X and Y can be expressed as :

$$x = 20,000 + 5\%y \quad \dots (1)$$

$$y = 10,000 + 10\%x \quad \dots (2)$$

OR

$$x = 20,000 + 0.05y \quad \dots (3)$$

$$y = 10,000 + 0.1x \quad \dots (4)$$

Re-arranging equation (3) and (4) we get

$$x - 0.05y = 20,000 \quad \dots (5)$$

$$-0.1x + y = 10,000 \quad \dots (6)$$

Multiplying equation 5 by 20 and equation (6) by 1, we get

$$20x - y = 4,00,000$$

$$-0.1X + y = 10,000$$

$$19.9x = 4,10,000 \text{ (Adding we get)}$$

$$x \text{ is therefore } (\text{₹ } 4,10,000 \div 19.9) = \text{₹ } 20,603.$$

5.28 Accounting for Overheads

Substituting the value in equation (4), we get

$$y = ₹ 10,000 + (0.1 \times 20,603) \\ = ₹ 10,000 + ₹ 2,060 = ₹ 12,060$$

Finally : $x = ₹ 20,603$ and $y = ₹ 12,060$

The re-apportionment is done as follows:

Secondary Distribution Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Production Departments			Service Departments	
	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Total departmental overheads	80,000	40,000	20,000	20,000	10,000
Distribution of Overhead of Service Dept. X	4,121	6,181	8,241	(20,603)	2,060
Distribution of Overhead of Service Dept. Y	2,412	3,015	6,030	603	(12,060)
Total Overheads after re-apportionment	86,533	49,196	34,271	–	–

3. Direct Method

Under this method, the overhead of service departments are re-apportioned only between production departments. It ignores the reciprocal service between service departments. This method is suitable when inter-departmental service is insignificant. The main advantage of this method is its simplicity.

Let us take the data of **Illustration 10** to demonstrate this method.

Overhead of service department X is ₹ 9,000.

It is providing services to different departments as follows:

A	40%
B	30%
C	20%
Y	10%
	<u>100%</u>

For distribution of overhead of X department, only A, B and C will be taken into consideration. Service to Y is to be ignored. The distribution will be :

	₹
A – ₹ 9,000 / 90% × 40%	4,000
B – ₹ 9,000 / 90% × 30%	3,000
C – ₹ 9,000 / 90% × 20%	<u>2,000</u>
	<u>9,000</u>

Similarly, the overhead of department Y ₹ 3,000 will be distributed as follows:

A – ₹ 3,000 / 80% × 30%	1,125
B – ₹ 3,000 / 80% × 30%	1,125
C – ₹ 3,000 / 80% × 20%	<u>750</u>
	<u>3,000</u>

The re-apportionment is done as follows :

Secondary Distribution Re-apportionment of Service Department Overhead to Production Department

Particulars	Production Departments			Service Departments	
	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Total departmental overheads	13,600	14,700	12,800	9,000	3,000
Distribution of Overhead of Service Dept. X	4,000	3,000	2,000	(9,000)	–
Distribution of Overhead of Service Dept. Y	1,125	1,125	750	–	(3,000)
Total Overheads after re-apportionment	18,725	18,825	15,550	Nil	Nil

Illustration 14

A company has three production departments and two service departments. The departmental distribution summary for a particular period has the following totals. You are required to compute the total share of overheads of the service departments to be distributed to production departments using **direct method**.

Productions departments :	Total
(P1 – ₹ 800; P2 – ₹ 700; P3 – ₹ 500)	₹ 2,000
Service Departments :	
(S1 – ₹ 234; S2 – ₹ 300)	₹ 534

The expenses of Service Departments are charged out on a percentage basis as follows:

	P1	P2	P3	S1	S2
S1	20%	40%	30%	—	10%
S2	40%	20%	20%	20%	—

[D.U.B.Com. (Hons.) – Adapted]

Solution

Overhead of service department S1 is ₹ 234. It is to be distributed to P1, P2 and P3 only.

The distribution will be as follows :	₹
P1 – ₹ 234 / 90% × 20%	52
P2 – ₹ 234 / 90% × 40%	104
P3 – ₹ 234 / 90% × 30%	78
	<u>234</u>

Overhead of service department S2 is ₹ 300. It is to be distributed to P1, P2 and P3 only.

The distribution will be as follows :	₹
P1 = ₹ 300 / 80% × 40%	150
P2 = ₹ 300 / 80% × 20%	75
P3 = ₹ 300 / 80% × 20%	75
	<u>300</u>

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Production Departments			Service Departments	
	P1 ₹	P2 ₹	P3 ₹	S1 ₹	S2 ₹
Total departmental overheads	800	700	500	234	300
Distribution of Overhead of Service Dept. S1	52	104	78	(234)	—
Distribution of Overhead of Service Dept. S2	150	75	75	—	(300)
Total Overheads after re-apportionment	1,002	879	653	Nil	Nil

4. Trial and Error Method

This method is similar to **Repeated Distribution Method**. Under this method only service department's overheads are continuously distributed (ignoring, for the time being, the production departments). The distribution process is carried on till the overhead of the service departments are exhausted. Let us take the data of **Illustration 10**. The distribution will be as follows :

Particulars	X (₹)	Y (₹)
Departmental Overhead	9,000	3,000
First Trial :		
(i) Distribution of overhead of X to Y (10% of ₹ 9,000)	(9,000)	900
(ii) Distribution of overhead of Y to X (20% of ₹ 3,900)	780	(3,900)

5.30 Accounting for Overheads

Second Trial :

(i) Distribution of overhead of X to Y (10% of ₹ 780)

(780)

78

(ii) Distribution of overhead of Y to X (20% of ₹ 78)

16

(78)

Third Trial :

(i) Distribution of overhead of X to Y (10% of ₹ 16)

(16)

2 (approx.)

*9,796

**3,980

* ₹ 9,000 + ₹ 780 (from first trial) + ₹ 16 (from second trial) = ₹ 9,796.

** ₹ 3,000 + ₹ 900 (from first trial) + ₹ 78 (from second trial) + ₹ 2 (from third trial) = ₹ 3,980.

The re-apportionment is done as follows :

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Basis	Production Departments			Service Departments	
		P1 (₹)	P2 (₹)	P3 (₹)	X (₹)	Y (₹)
Total departmental overheads	Given	13,600	14,700	12,800	9,000	3,000
Distribution of Overhead of Service Dept. X (Note 1)	% Given	3,918	2,939	1,959	(9,796)	980
Distribution of Overhead of Service Dept. Y (Note 2)	% Given	1,194	1,194	796	796	(3,980)
Total Overheads after re-apportionment		18,712	18,833	15,555	Nil	Nil

Working Notes :

(1) Distribution of Overhead of Dept. X ₹

A – 40% of ₹ 9,796	3,918
B – 30% of ₹ 9,796	2,939
C – 20% of ₹ 9,796	1,959
Y – 10% of ₹ 9,796	980
	<u>9,796</u>

(2) Distribution of Overhead of Dept. Y ₹

A – 30% of ₹ 3,980	1,194
B – 30% of ₹ 3,980	1,194
C – 20% of ₹ 3,980	796
X – 20% of ₹ 3,980	796
	<u>3,980</u>

5. Specified Order of Closing Method

Under this method, the overhead of service departments are re-apportioned to production and other service departments in a specified manner. Unlike 'Repeated Distribution Method', the service department is closed **permanently** after distribution of the overhead of that service department. This method is also called '**Step Ladder Method**'.

The main problem while using this method is to decide which service department should be closed first. There are many alternatives. The result will vary with the selection of the alternatives.

The alternatives are :

1. Close service department as per the policy of the company (*see Illustration 15 and 16*).
2. Close first the service department that serves the highest number of other departments. Next close the service department that serves the 2nd highest number of other departments. Follow this procedure until all service departments have been closed.
3. Close first that service department whose overhead as per primary distribution, is **highest**. This is adopted if all service departments are serving equal number of other departments.

Let us take the data of **Illustration 10**. There are two departments X and Y. X is serving A, B, C and Y. Similarly Y is serving A, B, C and X. Both the service departments are serving equal number of departments (four). If this method is adopted for distribution of overhead, we will select service department X because its overhead costs as per primary distribution is more than that of Y.

The distribution will be as follows :

Secondary Distribution
Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Ratio	Production Departments			Service Departments	
		A ₹	B ₹	C ₹	X ₹	Y ₹
Total departmental overheads		13,600	14,700	12,800	9,000	3,000
Distribution of Overhead of Service Dept. X	4:3:2:1	3,600	2,700	1,800	(9,000)	900
Distribution of Overhead of Service Dept. Y	3:3:2:0	1,463	1,462	975	–	(3,900)
Total Overheads after re-apportionment		18,663	18,862	15,575	Nil	Nil

Illustration 15

Deccan Manufacturing Ltd. have three departments which are regarded as production departments, Service Departments' costs are distributed to these production departments in the '*Specified Order of Closing Method*' of distribution. Estimates of factory overhead costs to be incurred by each department in the forthcoming year are as follows. Data required for distribution is also shown against each department :

Department	Factory overhead (₹)	Direct Labour Hours	No. of Employees	Area in sq.m.
Productions				
X	1,93,000	4,000	100	3,000
Y	64,000	3,000	125	1,500
Z	83,000	4,000	85	1,500
Services				
P	45,000	1,000	10	500
Q	75,000	5,000	50	1,500
R	1,05,000	6,000	40	1,000
S	30,000	3,000	50	1,000

The overhead costs of the four service departments are distributed in the same order, viz., P, Q, R and S respectively on the following basis :

Department

P
Q
R
S

Basis

Number of Employees
Direct Labour Hours
Area in square meters
Direct Labour Hours

You are required to prepare a Schedule showing the distribution of overhead costs of the four service departments to the three production departments.

[C.A. (Inter) – Adapted]

Solution

In this problem, it has been given that service department P's overhead cost *first* to be distributed. After P, Q's overhead costs to be distributed and after that R's overhead costs to be distributed and at last S's overhead costs to be distributed.

5.32 Accounting for Overheads

Deccan Manufacturing Limited
Secondary Distribution
Re-apportionment of Overhead of Service Departments to Production Departments

Particulars	Basis	Service Departments				Production Departments		
		P (₹)	Q (₹)	R (₹)	S (₹)	X (₹)	Y (₹)	Z (₹)
Allocated overheads		45,000	75,000	1,05,000	30,000	1,93,000	64,000	83,000
Distribution of Overhead of :								
Dept. P	No. of employees	(45,000)	5,000	4,000	5,000	10,000	12,500	8,500
Dept. Q	Direct labour hours	—	(80,000)	24,000	12,000	16,000	12,000	16,000
Dept. R	Area in sq.m.	—	—	(1,33,000)	19,000	57,000	28,500	28,500
Dept. S	Direct labour hours	—	—	—	(66,000)	24,000	18,000	24,000
Total						3,00,000	1,35,000	1,60,000

Illustration 16

Following particulars have been extracted from the books of Reliable Company :

Indirect Materials :

Shop No. 1	₹ 12,000	₹
Shop No. 2	18,000	
Shop No. 3	6,000	
Tool Room	3,600	
Stores	4,800	
Factory Office	<u>1,800</u>	46,200

Indirect Wages :

Shop No. 1	12,600	
Shop No. 2	17,600	
Shop No. 3	16,000	
Tool Room	11,100	
Stores	4,500	
Factory Office	<u>6,600</u>	68,400
Factory Rent		30,000
Insurance		6,000
Depreciation @ 10%		30,000
Power		27,000
Light and Heat		<u>12,000</u>
Total		<u>2,19,600</u>

Further information regarding the operations are given below :

Departments	Area (Sq.m.)	Book Value of Machinery	Effective H.P.	Direct Labour		Machinery Hours
				Hours	Cost	
Production		₹			₹	
Shop No. 1	1,000	75,000	90	3,00,000	90,000	1,60,000
Shop No. 2	750	1,35,000	90	3,00,000	60,000	2,40,000
Shop No. 3	1,500	30,000	—	2,00,000	50,000	—
Service						
Tool Room	500	45,000	20	—	50,000	—
Stores	750	7,500	—	—	—	—
Factory Office	500	7,500	—	—	—	—
	5,000	3,00,000	200	8,00,000	2,50,000	4,00,000

You are required to prepare an "Overhead Analysis Sheet". Show Primary and Secondary Distribution separately. The policy of the company to distribute overheads of service department in the following order:

First – Factory Office; next – Stores; and at last – Tool Room.

[I.C.W.A. (Inter) – Adapted]

Solution

**Reliable Company
Overhead Analysis Sheet
Primary Distribution**

Items of Overhead	Basis of Apportionment	Ratio	Total	Production Departments			Service Departments		
				Shop 1	Shop 2	Shop 3	Tool Room	Stores	Factory Office
			(₹)	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
Indirect Materials	Allocation	–	46,200	12,000	18,000	6,000	3,600	4,800	1,800
Indirect Wages	Allocation	–	68,400	12,600	17,600	16,000	11,100	4,500	6,600
Factory Rent	Area (sq.mt.)	4:3:6:2:3:2	30,000	6,000	4,500	9,000	3,000	4,500	3,000
Insurance	Book value of machine	10:18:4:6:1:1	6,000	1,500	2,700	600	900	150	150
Depreciation	10% of Book value of machinery	10:18:4:6:1:1	30,000	7,500	13,500	3,000	4,500	750	750
Power	Effective H.P.	9:9:0:2:0:0	27,000	12,150	12,150	–	2,700	–	–
Light and Heat	Area (sq.mt.)	4:3:6:2:3:2	12,000	2,400	1,800	3,600	1,200	1,800	1,200
Total Overheads			2,19,600	54,150	70,250	38,200	27,000	16,500	13,500

Secondary Distribution

Re-apportionment of Service Departments Overheads to Production Departments

Particulars	Basis of Apportionment	Production Departments			Service Departments		
		Shop 1	Shop 2	Shop 3	Tool Room	Stores	Factory Office
		(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
Overheads as per Primary Distribution	–	54,150	70,250	38,200	27,000	16,500	13,500
Overhead of Factory Office	Direct wages (9:6:5:0)	4,860	3,240	2,700	2,700	–	(13,500)
Overhead of Stores	Value of Indirect materials (20:30:10:6)	5,000	7,500	2,500	1,500	(16,500)	
Overhead of Tool Room	Book value of machine (15:27:6)	9,750	17,550	3,900	(31,200)		
Total Departmental Overheads		73,760	98,540	47,300	Nil	Nil	Nil

Secondary Distribution – Which Method ?

We have seen five methods of re-apportionment of service department overhead costs to production departments. If we compare all **five** methods, taking **Illustration 10** into consideration, it will be as follows:

Method of Re-apportionment	A (₹)	B (₹)	C (₹)
1. Repeated Distribution Method	18,712	18,833	15,555
2. Simultaneous Equation Method	18,712	18,833	15,555
3. Direct Method	18,725	18,825	15,550
4. Trial and Error Method	18,712	18,833	15,555
5. Specified Order of Closing Method	18,663	18,862	15,575

Differences in this particular **Illustration – 10** is very small in some method, i.e., '**Direct Method and Specified Order of Closing Method**'. However, in other three methods there is no difference. Therefore, any of the above methods can be adopted.

Absorption of Production or Operation Overheads

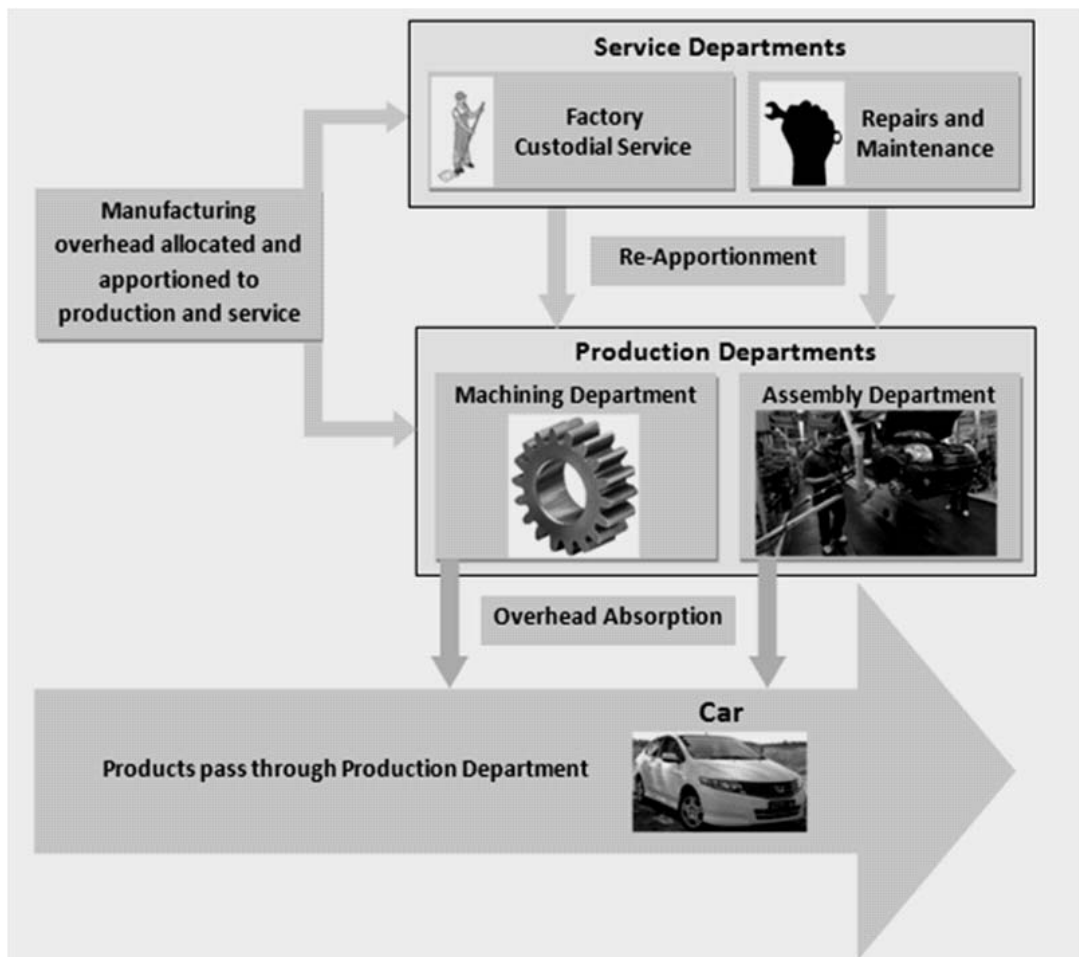
Absorption of overhead (also termed as *recovery*) is a process of charging overheads of production departments / cost centres to products or services. Para 4.2 of Cost Accounting Standard on “Production and Operation Overheads” – CAS-3 (Revised 2015) defines absorption as “Assigning of production or operation overheads to cost objects by means of appropriate absorption rate.”

Overhead absorption rate = Production or Operation Overheads of the Activity ÷ Volume of Activity.

Calculation of correct absorption rate is very vital for :

(i) Product pricing; (ii) Tendering; and (iii) Cost estimates, etc.

The above process of allocation, apportionment and re-apportionment of overhead ending with *the absorption of overhead in the cost of the product or services*. The following diagram (Fig. 5.7) will clear the concept.



[Fig. 5.7]

At the time of calculating absorption rate (recovery rate) the following **three** matters must be taken into consideration:

- (1) The selection of the **Base**;
- (2) Choice between **plantwide** or a **departmental rate**; and
- (3) Choice between an **actual** absorption rate or a **pre-determined** absorption rate.

Selection of the Base

Proper selection of 'base' is very important for accurate application of overhead cost to the product manufactured or service rendered. There should be close relationship between the overhead costs and the 'base'. Thus if the overhead items are related to supervision and use of manual labour, the proper base should be direct labour cost or direct labour hour. Similarly, if the overhead items are related to machine operations, the proper base should be machine hour.

For example, in a fancy furniture manufacturing factory the labour hours / labour cost should be the base for calculating overhead rate. However, for an automatic printing press, the base for calculating overhead rate should be machine hour.

Certain Guiding Principle should be followed in selecting a 'base':

1. There must be some direct relationship between the overhead costs incurred and 'base' to be selected.
2. The base should be representative of the overhead costs applicable to each unit manufactured or service rendered.
3. Data collection should be simple and practical for each job or service.
4. The overhead rate should be easily computed.
5. If possible, departmental rate should be used.
6. There must be consistency in selecting the base (year to year basis), unless there is a major change in the technology or policy of the company.

Different bases may be used for overhead absorption rate calculation. The **most common bases** are :

1. Direct labour cost
2. Direct labour hours
3. Machine hours
4. Units of production
5. Direct materials cost
6. Prime cost

Choice Between Plantwide or a Departmental Rate

At the time of calculation of overhead absorption rate, another important matter is to determine whether there will be a single rate for the whole factory or separate rate for each department within the plant.

When a single overhead rate is calculated for the whole factory, it is called "**Plantwide Rate**" or "**Blanket Overhead Rate**".

The blanket rate is suitable, if the size of the factory is small and it is manufacturing only one product or similar products. In case of a multiproduct company (like Sony, HP), blanket rate is not suitable because different products are produced in different departments and taking different time. If blanket rate is followed, it will lead to inaccurate recovery of overhead. The determination of cost and price of the products will not be accurate.

Nowadays many companies are manufacturing different products from same facility. Again, many companies are manufacturing different models of same product from same facility. In order to permit a more accurate application of overhead cost, these organizations prefer separate overhead rate for each production department. When separate overhead rate is calculated for each department, it is called "**Departmental Overhead Rate**".

In this case, overhead is charged to different products / jobs on the basis of time spent in **each department**.

Different Bases Used for Overhead Absorption Rate Calculation

1. Direct Labour Cost

It is one of the oldest methods and still appears to be the most popular base because it is simple and easy to use. In this case, overhead rate is computed as **a percentage of direct labour cost**. The percentage is calculated by dividing the estimated manufacturing overhead costs by the estimated direct labour costs.

The computation of the overhead rate may be expressed in a formula :

$$\text{Percentage of Direct Labour Cost} = \frac{\text{Budgeted / Estimated Manufacturing Overhead Costs}}{\text{Budgeted / Estimated Direct Labour Cost}} \times 100$$

Example 1 :

- (a) Estimated manufacturing overhead costs for the year 2010 is ₹ 48,00,000.
- (b) Estimated direct labour hours for the year 2010 is 2,00,000 hours
- (c) Estimated direct labour costs for the year 2010 is ₹ 2,40,00,000
- (d) Estimated machine hours for the year 2010 is 60,000
- (e) Estimated number of units to be produced during the year 2010 is 1,00,000

Using the data of **Example 1**, the percentage of direct labour cost will be :

$$\frac{48,00,000}{240,00,000} \times 100 = 20\%$$

Advantages of Using this Base

1. It is simple and easy to use.
2. It is very economical to compute because all information is available in respect of direct labour cost of each department and each job from the pay roll and the time tickets.

Limitations of Using this Base

1. It is not suitable where a large proportion of overhead costs relates to the use of machinery.
2. It is not suitable where the rate of hourly wages vary widely among different workers engaged on the same job or in the same department.
3. There are some overhead costs which are not influenced by the direct labour costs, e.g., depreciation of machinery, building, equipment, rent, rates and taxes of the factory building.

2. Direct Labour Hours

In this case, overhead rate is computed per **labour hour**. Here it is assumed that overhead costs are directly related to the direct labour hours. Overhead is charged to the job or product or service by multiplying this rate with the number of direct labour hours taken to do the job or product or service.

The computation of the overhead rate may be expressed in a formula :

$$\text{Overhead Rate per Direct Labour Hour} = \frac{\text{Budgeted / Estimated Manufacturing Overhead Costs}}{\text{Budgeted / Estimated Labour Hours}}$$

Taking the data of **Example 1**, the overhead rate per direct labour hour will be :

$$\frac{48,00,000}{2,00,000} = ₹ 24 \text{ per direct labour hour}$$

Advantages of Using this Base

1. It is easy to use and it is appropriate if labour operations are a major part of the production process.
2. It is appropriate when the wage rate of different workers vary widely though they are doing the same job.
3. Major elements of overhead cost are based on lapses of time (e.g., depreciation of machinery, rent, insurance, etc.). The direct labour hour method is taking this **time factor** into consideration to a great extent.

Limitations of Using this Base

1. It requires a record of the number of direct labour hours spent on each job or product or service, which means additional information must be compiled and analysed.
2. It ignores the contribution of value to product by factors other than direct labour. **For example**, machinery is not less important than its operator's time in case of automatic screw manufacturing machine.
3. It is not suitable for absorption of overhead relating to materials handling.

3. Machine Hours

In this case, overhead rate is computed per **machine hour**. Here, it is assumed that overhead costs are directly related to machine hours. Overhead is charged to the job or product or service by multiplying this rate with the number of machine hours taken to complete the job or product or service.

The computation of the overhead rate may be expressed in a formula:

$$\text{Overhead Rate per Machine Hour} = \frac{\text{Budgeted / Estimated Manufacturing Overhead Costs}}{\text{Budgeted / Estimated Machine Hours}}$$

Taking the data of **Example 1**, the overhead rate per machine hour will be :

$$\frac{48,00,000}{60,000} = ₹ 80 \text{ per machine hour}$$

Advantages of using this Base

1. In a modern factory where machines perform most of the work, this method is most accurate for allocating overhead costs to each job or product or service.
2. It provides a suitable method for estimating the cost of the job or product or service, thus avoiding either operating losses or the failure to obtain a job.
3. There are many items of overhead which are directly related to time (e.g., depreciation, rent, etc.). Machine hour rate method is taking this time factor into consideration to a great extent.
4. It provides a basis for the measurement of the monthly cost of **idle machines**.

Limitations of using this Base

1. The main limitation of this method is the additional clerical work which is required to keep a record of the number of machine hour on each job or product or service.
2. This method is not universally applicable; it can be used only when all operations are done by machine.
3. This method is not accurate if different kinds of machines are used for various jobs or products.
4. This method precludes use of a 'blanket rate' because of its nature.

5.38 Accounting for Overheads

4. Units of Production

In this case, overhead is computed per **unit of production**. Here, it is assumed that overhead costs are directly related to unit of production. The overhead rate is obtained by dividing the estimated manufacturing overhead costs by the estimated total number of units of production.

The computation of the overhead rate may be expressed in a formula :

$$\text{Overhead Rate per Unit} = \frac{\text{Budgeted / Estimated Manufacturing Overhead Costs}}{\text{Budgeted / Estimated Units of Production}}$$

Taking data from **example 1**, the overhead rate per unit will be :

$$\frac{48,00,000}{1,00,000} = ₹ 48 \text{ per unit}$$

Advantages of using this Base

1. This method is simplest and most direct.
2. Additional clerical work is not required for gathering required data.

Limitations of using this Base

1. This method is not suitable for a company which is manufacturing different products of different value from same factory. **For example**, Sony India Ltd. is manufacturing digital camera, handycam, projectors, laptops, etc. from same factory. The value of different products are different. In this case, use of this method will lead to wrong charging of overhead costs to different products.
2. The overhead rate is meaningful only if one or a few similar products are manufactured. If different products are taking different time, then this method is not suitable. **For example**, X product is taking 10 hours to manufacture but Y Product is taking 1 hour to manufacture. It would be inappropriate to charge overhead on the basis of units of production. Logically, product X should bear more overhead than product Y because many overhead costs are dependent upon time (e.g., depreciation, rent, supervision, etc.).

5. Direct Materials Cost

Under this method overhead is computed as **a percentage of direct materials cost**. The percentage is calculated by dividing estimated manufacturing overhead costs by the estimated direct material costs. Overhead is charged to the product on the basis of cost of direct materials consumed in producing the product.

The computation of overhead rate may be expressed in a formula as :

$$\text{Percentage of Direct Materials Cost} = \frac{\text{Budgeted / Estimated Manufacturing Overhead Costs}}{\text{Budgeted / Estimated Direct Materials Cost}} \times 100$$

Advantages of using this Base

1. This method is easy and simple to use.
2. This method is useful where quantity and cost of materials in each product does not vary widely.
3. This method can be used on a departmental or on a blanket basis.

Limitations of using this Base

1. In most of the cases there is no relation between overhead costs and cost of direct materials consumed by a product. Therefore, this method is not very scientific for absorption of overhead.
2. In this method, time factor has not been taken into consideration. **For example**, product A is taking 20 hours to manufacture but product B is taking 2 hours to manufacture. It would be inappropriate to charge overhead on the basis of direct materials cost.

- This method is inappropriate where some of the materials passes through all processes, and some of the materials passes through only some processes.

6. Prime Cost

Under this method, overhead is computed as **a percentage of prime cost**. The percentage is calculated by dividing estimated manufacturing overhead costs by the prime cost. Overhead is charged to the product on the basis of its prime cost (total of direct materials + direct labour + direct expenses).

The computation of overhead rate may be expressed in a formula as :

$$\text{Percentage of Prime Cost} = \frac{\text{Budgeted / Estimated Manufacturing Overhead Costs}}{\text{Budgeted / Estimated Prime Cost}} \times 100$$

Advantages of using this Base

- This method is simple and inexpensive as all data are immediately available without additional clerical job.
- This method is useful where prime cost of each product does not vary widely.

Limitations of using this Base

- Like direct materials cost method, this method does not consider time factor.
- This method gives same weightage to direct materials, direct labour and direct expenses. But in practice overhead costs are related to a great extent with direct labour cost. Therefore, it is inappropriate to charge overhead on the basis of prime cost.

Illustration 17

Unique Fabricators furnishes the following information for the year 2004 :

	Departments		
	Machining	Assembling	Stores & Maintenance
Direct Labour Cost	₹ 2,00,000	₹ 1,00,000	—
Floor Space Occupies	50%	30%	20%
Factory Overhead traceable to Departments	₹ 1,84,000	₹ 1,06,000	₹ 40,000

Factory rent, taxes and insurance not traceable to departments ₹ 25,000.

It has been decided that the costs of Stores and Maintenance can be equitably apportioned to other departments on the basis of direct labour cost.

The Machining Department operates 40 hours a week. There are five machines in the department and every machine remained idle for 80 hours during 2004 for holidays, repairs, etc.

Calculate Overhead Absorption rate for Machining Department based on **machine hours** and Overhead Absorption rate for Assembling Department based on **direct labour cost**.

[C.U. B.Com. (Hons.) – 2005]

Solution

Unique Fabricators

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments		Service Department
				Machining (₹)	Assembling (₹)	Stores and Maintenance (₹)
Factory Overhead (Traceable)	Allocation	—	3,30,000	1,84,000	1,06,000	40,000
Factory Rent, Rates & Taxes	Floor Space Occupied	5:3:2	25,000	12,500	7,500	5,000
Total Departmental Overheads			3,55,000	1,96,500	1,13,500	45,000

5.40 Accounting for Overheads

Secondary Distribution Re-apportionment of Service Department Overhead to Production Departments

Particulars	Basis of Apportionment	Production Departments		Service Department
		Machining	Assembling	Stores and Maintenance
		(₹)	(₹)	(₹)
Overhead as per Primary Distribution		1,96,500	1,13,500	45,000
Re-apportionment overhead of Stores and Maintenance dept.	Direct labour cost	30,000	15,000	(45,000)
Total overhead after re-apportionment		2,26,500	1,28,500	Nil

Calculation of Overhead Absorption Rate

Machining Department:

$$\text{Overhead Absorption Rate} = \frac{\text{Total Departmental Overhead}}{\text{Machine Hours}} = \frac{2,26,500}{10,000} = ₹ 22.65 \text{ per M.H.}$$

$$* \{(40 \times 52) - 80\} \times 5 = \mathbf{10,000 \text{ hours}}$$

Assembling Department:

$$\begin{aligned} \text{Overhead Absorption Rate} &= \frac{\text{Total Departmental Overhead}}{\text{Direct Labour Cost}} \times 100 = \frac{1,28,500}{1,00,000} \times 100 \\ &= 128.5\% \text{ of Direct Labour Cost} \end{aligned}$$

Illustration 18

The following information relates to the activities of a production department of a factory for a month :

	₹
Direct material consumed	1,80,000
Direct wages	1,50,000
Factory overhead chargeable to the department	1,26,000
Labour hours worked	12,000 hours
Machine hours worked	10,000 hours

The relevant data relating to one order carried out in the department during the period are as given below:

	₹
Material consumed	30,000
Direct wages	24,750
Labour hours worked	1,650 hours
Machine hours worked	1,200 hours

Compute factory overhead rates of recovery and the amount of overhead chargeable to the order by the following methods:

(i) Direct material cost percentage; (ii) Direct labour cost percentage; (iii) Labour hour rate; (iv) Machine hour rate.

[D.U.B.Com. (Hons.) – 2000]

Solution

$$\begin{aligned} \text{(i) Direct Material Cost Percentage} &= \frac{\text{Factory Overhead Chargeable to Department}}{\text{Direct Materials Consumed}} \times 100 \\ &= \frac{1,26,000}{1,80,000} \times 100 = 70\% \end{aligned}$$

$$(ii) \text{ Direct Labour Cost Percentage} = \frac{\text{Factory Overhead Chargeable to Department}}{\text{Direct Wages}} \times 100$$

$$= \frac{1,26,000}{1,50,000} \times 100 = 84\%$$

$$(iii) \text{ Labour Hour Rate} = \frac{\text{Factory Overhead Chargeable to Department}}{\text{Labour Hours Worked}}$$

$$= \frac{1,26,000}{12,000} = ₹ 10.50 \text{ per Labour Hour}$$

$$(iv) \text{ Machine Hour Rate} = \frac{\text{Factory Overhead Chargeable to Department}}{\text{Machine Hours Worked}}$$

$$= \frac{1,26,000}{10,000} = ₹ 12.60 \text{ per Machine Hour}$$

Overhead Chargeable to Order Under Different Method :

(i) **Direct Material Cost Percentage :**

$$\text{Materials consumed} \times 70\% = ₹ 30,000 \times 70\% = ₹ 21,000.$$

(ii) **Direct Labour Cost Percentage :**

$$\text{Direct wages} \times 84\% = ₹ 24,750 \times 84\% = ₹ 20,790.$$

(iii) **Labour Hour Rate :**

$$\text{Labour hours worked} \times ₹ 10.50 = 1,650 \times ₹ 10.50 = ₹ 17,325.$$

(iv) **Machine Hour Rate :**

$$\text{Machine hour worked} \times ₹ 12.60 = 1,200 \times ₹ 12.60 = ₹ 15,120.$$

Illustration 19

Saregama Ltd. manufacturers different products in a factory which has two production departments P1 and P2 and several service departments.

The total budgeted overhead costs (after the allocation, apportionment and re-apportionment of service department costs) and other information for production departments P1 and P2 are as follows:

Production Dept.	Budgeted Overhead	Basis of Overhead Absorption	Budgeted Activity
P1	₹ 7,80,000	Machine hours	16,250 machine hours
P2	₹ 1,73,400	Direct labour hours	14,450 direct labour hours

The prime cost of product 'X', one of the products made by Saregama Ltd. is as follows :

	₹
Direct materials	100
Direct labour :	
Department P1	14
Department P2	21
Prime Cost	135

One unit of product 'X' takes 30 minutes of machine time in production department P1. Direct labour is @ ₹ 7 per hour in department P1 and @ ₹ 6 per hour in department P2.

5.42 Accounting for Overheads

You are required to:

- Calculate the overhead absorption rates for production departments P1 and P2.
- Calculate total production cost for one unit of 'X'.

[I.C.W.A. (Inter) – Adapted]

Solution

(i) Calculation of Overhead Absorption Rate

Production Department – P1 :

$$\begin{aligned}\text{Overhead Absorption Rate (based on Machine Hour)} &= \frac{\text{Budgeted Overhead}}{\text{Budgeted Machine Hours}} \\ &= \frac{7,80,000}{16,250} = ₹ 48 \text{ per Machine Hour}\end{aligned}$$

Production Department – P2 :

$$\begin{aligned}\text{Overhead Absorption Rate (based on Labour Hour)} &= \frac{\text{Budgeted Overhead}}{\text{Budgeted Direct Labour Hours}} \\ &= \frac{1,73,400}{14,450} = ₹ 12 \text{ per Labour Hour}\end{aligned}$$

(ii) Calculation of Production Cost of X Product

	₹	
Prime Cost (given)		135
Production Overheads:		
Production department P1 (₹ 48 / 60 × 30)	24	
Production department P2 (21 / 6 × 12)	42	66
Total Production Cost per Unit		201

Illustration 20

A factory has three production department P1, P2 and P3 and two service departments S1 and S2. Budgeted overheads for the next year have been allocated / apportioned by the cost department among the five departments. The secondary distribution of service department overheads is pending and the following details are given to you:

Department	Overhead apportioned / allocated	Estimated level of activity
P1	₹ 48,000	5,000 labour hours
P2	₹ 1,12,000	12,000 machine hours
P3	₹ 52,000	6,000 labour hours
		Apportionment of service department costs
S1	₹ 16,000	P1 (20%), P2 (40%), P3 (20%), S2 (20%)
S2	₹ 24,000	P1 (10%), P2 (60%), P3 (20%), S1 (10%)

Calculate the overhead rate of each production department after completing the distribution of service department costs.

[I.C.W.A. (Stage 1) – Adapted]

Solution

Let

x = Total overhead of S1 department

y = Total overhead of S2 department

Total overhead transferred to service departments S1 and S2 can be expressed as :

$$x = 16,000 + 10\% \text{ of } y \quad \dots (1)$$

$$y = 24,000 + 20\% \text{ of } x \quad \dots (2)$$

OR

$$x = 16,000 + 0.1y \quad \dots (3)$$

$$y = 24,000 + 0.2x \quad \dots (4)$$

Re-arranging equation (3) and (4), we get

$$x - 0.1y = 16,000 \quad \dots (5)$$

$$0.2x + y = 24,000 \quad \dots (6)$$

Multiplying equation (5) by 10 and equation (6) by 1 we get,

$$10x - y = 1,60,000$$

$$0.2x + y = 24,000$$

$$\underline{9.8x = 1,84,000} \quad (\text{Adding we get})$$

Therefore, $x = (1,84,000 \div 9.8) = ₹ 18,775$.

Substituting in equation (4) we get

$$y = 24,000 + (18,775 \times 0.2)$$

$$= 24,000 + 3,755$$

$$= 27,755$$

Finally :

Total overhead of S1 = ₹ 18,775. Total overhead of S2 = ₹ 27,755

The re-apportionment of service departments overhead will be as follows :

Secondary Distribution

Re-apportionment of Service Departments Overheads to Production Departments

Particulars	Production Departments			Service Departments	
	P1 (₹)	P2 (₹)	P3 (₹)	S1 (₹)	S2 (₹)
Departmental overheads(given)	48,000	1,12,000	52,000	16,000	24,000
Distribution of Overhead of S1 (Note 1)	3,755	7,510	3,755	(18,775)	3,755
Distribution of Overhead of S2 (Note 2)	2,776	16,653	5,551	2,775	(27,755)
	54,531	1,36,163	61,306	Nil	Nil
Estimated level of activity	5,000 (Labour hours)	12,000 (Machine hours)	6,000 (Labour hours)		
Overhead Rate	10.91	11.35	10.22		

Working Note :

(1) Distribution of Overhead of S1

$$P1 = 20\% \times ₹ 18,775 \quad 3,755$$

$$P2 = 40\% \times ₹ 18,775 \quad 7,510$$

$$P3 = 20\% \times ₹ 18,775 \quad 3,755$$

$$S2 = 20\% \times ₹ 18,775 \quad \underline{3,755}$$

$$\underline{18,775}$$

(2) Distribution of Overhead of S2

$$P1 = 10\% \times ₹ 27,755 \quad 2,776$$

$$P2 = 60\% \times ₹ 27,755 \quad 16,653$$

$$P3 = 20\% \times ₹ 27,755 \quad 5,551$$

$$S1 = 10\% \times ₹ 27,755 \quad \underline{2,775}$$

$$\underline{27,755}$$

5.44 Accounting for Overheads

Illustration 21

PH Ltd. is a manufacturing company having three production departments, A, B and C and two service departments X and Y. The following is the budget for December 2017 :

	Total (₹)	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Direct Materials		1,000	2,000	4,000	2,000	1,000
Direct Wages		5,000	2,000	8,000	1,000	2,000
Factory rent	4,000					
Power	2,500					
Depreciation	1,000					
Other overheads	9,000					

Additional information:

Area (sq.ft.)	500	250	500	250	500
Capital value (₹ Lacs) of assets	20	40	20	10	10
Machine Hours	1,000	2,000	4,000	1,000	1,000
Horse power of machines	50	40	20	15	25

A technical assessment on the apportionment of expenses of service departments is as under :

	A	B	C	X	Y
Service Dept. X	45%	15%	30%	—	10%
Service Dept. Y	60%	35%	—	5%	—

Required:

- A statement showing distribution of overheads to various departments.
- A statement showing re-distribution of service departments expenses to production departments.
- Machine hours rates of the production departments, A, B and C.

[C.A. (Inter) – Adapted]

Solution (i)

PH Ltd.

Primary Distribution

Allocation and Apportionment of Overhead Costs to Production and Service Departments

Particulars	Basis	Total (₹)	Production Departments			Service Departments	
			A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Direct materials (Note 1)	Direct/Allocation	3,000	—	—	—	2,000	1,000
Direct wages (Note 1)	Direct/Allocation	3,000	—	—	—	1,000	2,000
Factory rent	Area (sq.ft.)	4,000	1,000	500	1,000	500	1,000
Power (Note 2)	HP × MH	2,500	500	800	800	150	250
Depreciation	Value of assets	1,000	200	400	200	100	100
Other Overheads (Note 3)	Machine Hours	9,000	1,000	2,000	4,000	1,000	1,000
Total		22,500	2,700	3,700	6,000	4,750	5,350

(ii)

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Total (₹)	Production Departments			Service Departments	
		A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Total Departmental Overheads	22,500	2,700	3,700	6,000	4,750	5,350
Re-distribution of overheads of Dept. X (Note 4)		2,269	757	1,513	(5,043)	504
Re-distribution of overheads of Dept. Y (Note 4)		3,512	2,049	—	293	(5,854)
Total	22,500	8,481	6,506	7,513	Nil	Nil

(iii) **Calculation of Machine Hour Rate**

$$\text{Machine Hour Rate} = \frac{\text{Estimated Overheads}}{\text{Estimated Machine Hours}}$$

$$\text{Dept. A : } \frac{8,481}{1,000} = ₹ 8.48; \text{ Dept. B : } \frac{6,506}{2,000} = ₹ 3.25; \text{ Dept. C : } \frac{7,513}{4,000} = ₹ 1.88 \text{ (Approx.)}$$

Working Notes :

- (1) Direct materials and direct wages for production departments A, B and C will be shown under **Prime Cost**. Any expenses of service department (direct or indirect) will be a part of **overhead**. Therefore, direct materials and direct wages of Department X and Y will be treated as overhead costs of respective departments.
- (2) Power can be distributed on the basis of H.P. but it is more logical to distribute it on the **basis of the product** of (H.P. × machine hour).
- (3) It is assumed that 'other overheads' have been incurred in relation to machine operations.
- (4) Let, the total overheads of Dept. X = x and the total overheads of Dept. Y = y .

Total overhead transferred to service departments X and Y can be expressed as :

$$x = ₹ 4,750 + 5\% \text{ of } y \quad \dots (1)$$

$$y = ₹ 5,350 + 10\% \text{ of } x \quad \dots (2)$$

OR

$$x - 0.05y = ₹ 4,750 \quad \dots (3)$$

$$-0.1x + y = ₹ 5,350 \quad \dots (4)$$

Multiplying equation (3) by 1 and equation (4) by 10, we get

$$x - 0.05y = 4,750$$

$$x + 10y = 53,500$$

$$\underline{9.95y = 58,250} \text{ (Adding, we get)}$$

$$\text{Therefore, } y = (58,250 \div 9.95) = ₹ 5,854$$

Substituting in equation (1), we get

$$x = ₹ 4,750 + 5\% \text{ of } ₹ 5,854$$

$$= ₹ 5,043$$

Finally :

Total overhead of Department X = ₹ 5,043

Total overhead of Department Y = ₹ 5,854

Distribution of Overhead of Department X :

	₹	
A – 45% of ₹ 5,043	2,269	
B – 15% of ₹ 5,043	757	(approx.)
C – 30% of ₹ 5,043	1,513	
Y – 10% of ₹ 5,043	<u>504</u>	
	<u>5,043</u>	

Distribution of Overhead of Department Y :

	₹
A – 60% of ₹ 5,854	3,512
B – 35% of ₹ 5,854	2,049
C – 0% of ₹ 5,854	Nil
Y – 5% of ₹ 5,854	<u>293</u>
	<u>5,854</u>

Illustration 22

From the following particulars, show distribution of overhead and calculate overhead rate per labour hour after re-distribution of service department expenses :

5.46 Accounting for Overheads

Particulars	Production Departments			Service Departments		
	Shop 1	Shop 2	Shop 3	Tool Room	Stores	Factory office
Direct Material (₹)	1,80,000	1,20,000	1,00,000	—	—	—
Direct Wages (₹)	1,00,000	80,000	60,000	40,000	—	—
Indirect Labour (₹)	25,200	35,200	32,000	22,200	9,000	6,600
Indirect Materials (₹)	24,000	36,000	12,000	7,200	9,600	3,600
Value of Machine (₹)	1,50,000	2,70,000	60,000	90,000	15,000	15,000
Area (sq.mt.)	2000	1500	3000	1000	1500	1000
Effective H.P.	180	180	—	40	—	—
Labour Hours	60,000	60,000	40,000	—	—	—
Machine Hours	32,000	24,000	12,000	—	—	—
No. of Employees	600	600	400	100	100	200

Other information : Insurance ₹ 12,000; Depreciation (10%) ₹ 60,000; Factory rent ₹ 60,000; Light and heat ₹ 24,000 and Power ₹ 54,000.

The expenses of service departments are to be apportioned to the shops as follows:

Toolroom, based on value of machines;

Stores, based on direct labour hours;

Factory office, based on direct wages.

[C.U. B.Com. (Hons.) – 2003]

Solution

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Departments		
				Shop 1 (₹)	Shop 2 (₹)	Shop 3 (₹)	Tool Room (₹)	Stores (₹)	Factory Office (₹)
Direct Wages (1)	Direct		40,000	—	—	—	40,000	—	—
Indirect Labour	Allocation		1,30,200	25,200	35,200	32,000	22,200	9,000	6,600
Indirect Material	Allocation		92,400	24,000	36,000	12,000	7,200	9,600	3,600
Insurance (Note 2)	Value of machine	10:18:4:6:1:1	12,000	3,000	5,400	1,200	1,800	300	300
Depreciation	Value of machine	10:18:4:6:1:1	60,000	15,000	27,000	6,000	9,000	1,500	1,500
Factory Rent	Area (sq.m.)	4:3:6:2:3:2	60,000	12,000	9,000	18,000	6,000	9,000	6,000
Light and Heat	Area (sq.m.)	4:3:6:2:3:2	24,000	4,800	3,600	7,200	2,400	3,600	2,400
Power	Effective H.P.	9:9:0:2:0:0	54,000	24,300	24,300	—	5,400	—	—
Total Overheads			4,72,600	1,08,300	1,40,500	76,400	94,000	33,000	20,400

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Basis	Ratio	Total (₹)	Production Departments			Service Departments		
				Shop 1 (₹)	Shop 2 (₹)	Shop 3 (₹)	Tool Room (₹)	Stores (₹)	Factory Office (₹)
Overhead as per Primary Distribution			4,72,600	1,08,300	1,40,500	76,400	94,000	33,000	20,400
Distribution of Overhead :									
Tool room	Value of machine	5:9:2		29,375	52,875	11,750	(94,000)	—	—
Stores	Direct labour hours	3:3:2		12,375	12,375	8,250	—	(33,000)	—
Factory Office	Direct wages	5:4:3		8,500	6,800	5,100	—	—	(20,400)
Total Overhead			4,72,600	1,58,550	2,12,550	1,01,500	Nil	Nil	Nil

Calculation of Labour Hour Rate

$$\text{Labour Hour Rate} = \frac{\text{Estimated Overhead}}{\text{Estimated Labour Hour}}$$

$$\text{Shop 1} = \frac{1,58,550}{60,000} = ₹ 2.6425; \quad \text{Shop 2} = \frac{2,12,550}{60,000} = ₹ 3.5425$$

$$\text{Shop 3} = \frac{1,01,500}{40,000} = ₹ 2.5375$$

Working Notes :

- (1) Direct wages of a service department is an item of overhead. ₹ 40,000 wages of tool room will be treated as overhead.
- (2) Insurance has been distributed on the basis of value of machines because insurance premium is depending upon the value of assets.

Illustration 23

R.K. Ltd. has three production departments – P1, P2 and P3 and two service departments S1 and S2. The following figures are extracted from the records of the company for a particular period :

	₹		₹
Rent and Rates	5,000	Power	1,500
Depreciation of Machinery	10,000	Canteen expenses	650
Lighting	600	Sundries	10,000

Other information:

	P1	P2	P3	S1	S2
Floor area (sq.ft.)	2,000	2,500	3,000	2,000	500
No. of light points	10	15	20	10	5
No. of employees	25	20	10	5	5
Direct wages (₹)	3,000	2,000	3,000	1,500	500
Indirect wages (₹)	250	500	100	250	150
H.P. of machines	60	30	50	10	—
Value of machineries (₹)	60,000	80,000	1,00,000	5,000	5,000
Production hours worked	1,892	3,244	5,903	—	—
Expenses of service departments S1 and S2 are apportioned as below:					
	P1	P2	P3	S1	S2
S1	20%	30%	40%	—	10%
S2	40%	30%	20%	10%	—

You are required to:

- (a) Compute overhead rate per production hour of each production department.
- (b) Determine total cost of product Y which is processed through departments P1, P2 and P3 for 4 hours, 6 hours and 11 hours respectively. Given that direct material cost is ₹ 1,000 and direct labour cost is ₹ 600.

5.48 Accounting for Overheads

Solution

R. K. Ltd.

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis	Ratio	Total (₹)	Production Departments			Service Departments	
				P1 (₹)	P2 (₹)	P3 (₹)	S1 (₹)	S2 (₹)
Direct Wages (Note 1)	Direct		2,000	—	—	—	1,500	500
Indirect Wages	Allocation		1,250	250	500	100	250	150
Rent & Rates	Floor Area	4:5:6:4:1	5,000	1,000	1,250	1,500	1,000	250
Depreciation of Machinery	Value of Machines	12:16:20:1:1	10,000	2,400	3,200	4,000	200	200
Lighting	Light Points	2:3:4:2:1	600	100	150	200	100	50
Power (Note 2)	H.P.	6:3:5:1:0	1,500	600	300	500	100	—
Canteen Expenses	No. of Emp.	5:4:2:1:1	650	250	200	100	50	50
Sundries	Direct wages	6:4:6:3:1	10,000	3,000	2,000	3,000	1,500	500
Total Overheads			31,000	7,600	7,600	9,400	4,700	1,700

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Production Departments			Service Departments	
	P1 (₹)	P2 (₹)	P3 (₹)	S1 (₹)	S2 (₹)
Overhead as per Primary Distribution	7,600	7,600	9,400	4,700	1,700
Distribution of Overhead of Service Department S1 (2:3:4:0:1) – Note 3	984	1,476	1,967	(4,919)	492
Distribution of Overhead of Service Department S2 (4:3:2:1:0) – Note 4	877	657	439	219	(2,192)
Total Overhead after Reapportionment (A)	9,461	9,733	11,806	Nil	Nil
Production Hours Worked (B)	1,892	3,244	5,903		
Overhead Recovery Rate (A ÷ B)	5.00	3.00	2.00		

Cost Sheet

Particulars	₹	₹
Direct Materials		1,000
Direct Labour		600
	Prime Cost	1,600
Factory Overheads:		
P1 (4 x ₹ 5)	20	
P2 (6 x ₹ 3)	18	
P3 (11 x ₹ 2)	22	60
Total Cost of Production		1,660

Working Notes :

- (1) Direct wages of service departments are part of the overhead as these are not manufacturing any product. However, direct wages of P1, P2 and P3 will be shown under **prime cost**, these are not overhead.
- (2) Power can be distributed, *alternatively*, on the basis of (H.P. × working hours). If this basis is adopted, overhead rate will differ.
- (3) Let
 x = total overhead of service department S1
 y = total overhead of service department S2
 Total overhead transferred to service departments, S1 and S2 can be expressed as :

$$x = 4,700 + 10\%y \quad \dots (1)$$

$$y = 1,700 + 10\%x \quad \dots (2)$$

OR

$$x = 4,700 + 0.1y \quad \dots (3)$$

$$y = 1,700 + 0.1x \quad \dots (4)$$

Re-arranging we get

$$x - 0.1y = 4,700 \quad \dots (5)$$

$$0.1x + y = 1,700 \quad \dots (6)$$

Multiplying equation (5) by 10 and equation (6) by 1 we get

$$10x - y = 47,000$$

$$0.1x + y = 1,700$$

$$\underline{9.9x = 48,700} \text{ (by adding we get)}$$

Therefore, $x = (48,700 \div 9.9) = ₹ 4,919$.

Substituting the value in equation (4) we get

$$y = 1,700 + (0.1 \times 4,919)$$

$$= 1,700 + 492$$

$$= 2,192$$

Finally, Overhead of S1 = ₹ 4,919; and Overhead of S2 = ₹ 2,192

(4) Overhead of Service Department S1 will be re-distributed as follows :

	₹
P1 – 20% of ₹ 4,919	984
P2 – 30% of ₹ 4,919	1,476
P3 – 40% of ₹ 4,919	1,967
S2 – 10% of ₹ 4,919	<u>492</u>
	<u>4,919</u>

(5) Overhead of Service Department S2 will be re-distributed as follows :

	₹
P1 – 40% of ₹ 2,192	877
P2 – 30% of ₹ 2,192	657
P3 – 20% of ₹ 2,192	439
S1 – 10% of ₹ 2,192	<u>219</u>
	<u>2,192</u>

Tutorial Note : Calculations of overhead of S1 and S2 can be done by '*Repeated Distribution Method*' also. In the examination any method can be adopted unless it is specifically asked.

Illustration 24

Atlas Engineering Ltd. accepts variety of jobs which require both manual and machine operations. The budgeted Profit and Loss Account for the period 2017–18 is as follows :

Particulars	₹	₹
Sales		7,50,000
Cost :		
Direct materials	1,00,000	
Direct labour	50,000	
	Prime Cost	
Production overheads	1,50,000	
	Cost of Production	
Administrative, Selling and Distribution Overheads	3,00,000	
	4,50,000	
	1,50,000	6,00,000
	Profit	1,50,000

Other budgeted data:

(i) Labour hours for the period	2,500
(ii) Machine hours of the period	1,500
(iii) Number of jobs for the period	300

5.50 Accounting for Overheads

An enquiry has been received recently from a customer and the production department has prepared the following estimate of the prime cost required for the job:

Direct materials	₹ 2,500
Direct labour	₹ 2,000
Prime Cost	₹ 4,500

Labour hours required for the job : 80 hours

Machine hours required for the job : 50 hours

You are required to :

- Calculate by different methods, six overhead absorption rates for absorption of production overhead and comment on the suitability of each.
- Calculate the production overhead cost of the order based on each of the above rates.
- Give your recommendation to the company.

[I.C.W.A. (Inter) – Adapted]

Solution

(a) Calculation of Overhead Absorption Rates under Different Methods

1. Direct Labour Cost Method

$$\begin{aligned}\text{Direct Labour Cost Percentage} &= \frac{\text{Budgeted Production Overhead Costs}}{\text{Budgeted Direct Labour Costs}} \times 100 \\ &= \frac{3,00,000}{50,000} \times 100 = 600\%\end{aligned}$$

Comments on the suitability of the Method

- This method is suitable where a large proportion of overhead costs relate to direct wages cost.
- This method is suitable where rate of hourly wages does not vary widely.

2. Direct Labour Hours Method

$$\begin{aligned}\text{Direct Labour Hour Rate} &= \frac{\text{Budgeted Production Overhead Costs}}{\text{Budgeted Direct Labour Hours}} \\ &= \frac{3,00,000}{2,500} = ₹ 120\end{aligned}$$

Comments on the suitability of the Method

- This method is suitable where a large proportion of overhead costs are fixed in nature (e.g., depreciation of building, insurance, rent, etc.)
- This method is appropriate when the wages rate of different workers vary widely though they are doing the same job.

3. Machine Hours Method

$$\begin{aligned}\text{Machine Hour Rate} &= \frac{\text{Budgeted Production Overhead Costs}}{\text{Budgeted Machine Hours}} \\ &= \frac{3,00,000}{1,500} = ₹ 200\end{aligned}$$

Comment on the suitability of the Method

- This method is suitable when machines perform most of the work.
- This method is suitable where a large proportion of overhead costs are fixed in nature and directly related to machines (e.g., depreciation of machine, space occupied by the machines, etc).

4. Units of Production Method

$$\text{Overhead Rate per Unit} = \frac{\text{Budgeted Production Overhead Costs}}{\text{Budgeted Units of Production}} = \frac{3,00,000}{300} = ₹ 1,000$$

Comment on the suitability of the Method

1. This method is suitable when only one product or a few similar products are manufactured.
2. This method is suitable when all the products are taking same time to manufacture.

5. Direct Materials Cost Method

$$\begin{aligned} \text{Direct Materials Cost Percentage} &= \frac{\text{Budgeted Production Overhead Costs}}{\text{Budgeted Direct Materials Cost}} \times 100 \\ &= \frac{3,00,000}{1,00,000} \times 100 = 300\% \end{aligned}$$

Comment on the suitability of the Method

1. This method is useful where quantity and cost of materials in each product does not vary widely.
2. This method is suitable where minimum time is taken to manufacture a product.

6. Prime Cost Method

$$\begin{aligned} \text{Prime Cost Percentage} &= \frac{\text{Budgeted Production Overhead Costs}}{\text{Budgeted Prime Costs}} \times 100 \\ &= \frac{3,00,000}{1,50,000} \times 100 = 200\% \end{aligned}$$

Comment on the suitability of the Method

1. This method is useful where prime cost of each product does not vary widely.
2. This method is suitable where manual labour is used to manufacture a product.

(b) Calculation of Production Overhead Cost of the Order under Different Methods

1. Direct Labour Cost Method

$$\text{Direct Labour Cost} \times \text{Direct Labour Cost Percentage} = ₹ 2,000 \times 600\% = ₹ 12,000$$

2. Direct Labour Hours Method

$$\text{Direct Labour Hours} \times \text{Overhead Rate per Labour Hour} = 80 \times ₹ 120 = ₹ 9,600$$

3. Machine Hours Method

$$\text{Machine Hours} \times \text{Overhead Rate per Machine Hour} = 50 \times ₹ 200 = ₹ 10,000$$

4. Units of Production Method

$$\text{Unit Produced} \times \text{Overhead Rate per Unit} = 1 \times ₹ 1,000 = ₹ 1,000$$

5. Direct Materials Cost Method

$$\text{Direct Materials} \times \text{Direct Materials Cost Percentage} = ₹ 2,500 \times 300\% = ₹ 7,500$$

6. Prime Cost Method

$$\text{Prime Cost} \times \text{Prime Cost Percentage} = ₹ 4,500 \times 200\% = ₹ 9,000$$

Recommendation

The company should adopt direct labour hour method for recovering overhead. If we see the nature of the job, it is clear that it is **labour** intensive. It takes 80 labour hours as compared to 50 machine hours to complete.

5.52 Accounting for Overheads

Illustration 25

Y Ltd. carries out jobs as per customers' specification. A particular job requires the following machine hours and direct labour hours in the two production departments :

Particulars	Department	
	Machining	Finishing
Direct labour hours	25	28
Machine hours	46	8

Direct labour in both departments is paid at a basic rate of ₹ 40 per hour.

The job requires the manufacture of 180 components. Each component requires 1.1 kg. of prepared material.

Loss on preparation is 10% of unprepared material which cost ₹ 25 per kg.

Overhead absorption rates are to be established from the following data :

Particulars	Department	
	Machining	Finishing
Production overheads (₹)	4,40,000	1,24,800
Direct labour hours	3,500	7,800
Machine hours	11,000	2,100

You are required to :

- Calculate the overhead absorption rate for each department and justify the absorption method used.
- Calculate the cost of the job.

[ACCA (Eng) – Adapted]

Solution

(i) Calculation of Overhead Absorption Rate

Machining Department (Choice of absorption method) : The department (by its nature) is machine-intensive and overheads incurred will probably have a link to the use of these machines. Therefore, **machine hour rate method** will be appropriate in this case :

$$\text{Machine Hour Rate} = \frac{\text{Production Overheads}}{\text{Machine Hours}} = \frac{4,40,000}{11,000} = ₹ 40$$

Finishing Department (Choice of absorption method) : The department is labour intensive because a particular job takes 28 hours of direct labour hours but takes 8 hours of machine hours only.

The overhead will be incurred in providing facilities to the workers who are working for the job. Therefore, **labour hour rate method** will be appropriate in this case :

$$\text{Labour Hour Rate} = \frac{\text{Production Overheads}}{\text{Direct Labour Hours}} = \frac{1,24,000}{7,800} = ₹ 16$$

(ii) Calculation of the Cost of the Job

Particulars	₹	₹
Direct materials (1.1 / 90% x ₹ 25 x 180)		5,500
Direct labour :		
Machining department (25 x ₹ 40)	1,000	
Finishing department (28 x ₹ 40)	1,120	2,120
Prime Cost		7,620
Production overhead :		
Machining department (46 x ₹ 40)	1,840	
Finishing department (8 x ₹ 16)	448	2,288
Total Job Cost		9,908

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 26

A manufacturing concern has three production departments : X, Y and Z and one service department S. The factory works 8 hours a day and 25 days in a month.

Calculate labour hour rate from the following particulars for the month.

	Production Deptt.			Service Deptt.
	X	Y	Z	S
Power and Lighting (₹)	800	1,400	1,520	880
Floor area (sq.ft.)	1,200	1,600	1,200	1,000
Number of workers	30	40	20	10
Service Deptt. serves other Departments	50%	30%	20%	—
Expenses : Rent ₹ 1,000; Indirect wages ₹ 1,200; Power and lighting ₹ 4,600.				

[C.U.B.Com. (General) - 2008]

Solution

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Department
				X (₹)	Y (₹)	Z (₹)	S (₹)
Rent	Area	6 : 8 : 6 : 5	1,000	240	320	240	200
Indirect Wages	No. of Workers	3 : 4 : 2 : 1	1,200	360	480	240	120
Power and Lighting	Allocation	Direct	4,600	800	1,400	1,520	880
Total Departmental Overheads			6,800	1,400	2,200	2,000	1,200

Secondary Distribution

Re-apportionment of Service Department Cost to Production Departments

Particulars	Total (₹)	Production Departments			Service Department
		X (₹)	Y (₹)	Z (₹)	S (₹)
Overhead as per Primary Distribution	6,800	1,400	2,200	2,000	1,200
Re-apportionment of Overhead of Department S in the ratio (5:3:2)		600	360	240	(1,200)
Total Departmental Overheads	6,800	2,000	2,560	2,240	Nil

Calculation of Labour Hour Rate

$$\text{Labour Hour Rate} = \frac{\text{Estimated Overheads}}{\text{Estimated Labour Hours}}$$

$$\text{Department X : } \frac{2,000}{6,000} = ₹ 0.33; \text{ Department Y : } \frac{2,560}{8,000} = ₹ 0.32; \text{ Department Z : } \frac{2,240}{4,000} = ₹ 0.56$$

Working Note :

(1) Calculation of Departmental Labour Hours Worked

Labour Hours Worked = No. of Days × Hours Worked × No. of Workers

Department X : $25 \times 8 \times 30 = 6,000$ hours

Department Y : $25 \times 8 \times 40 = 8,000$ hours

Department z : $25 \times 8 \times 20 = 4,000$ hours

5.54 Accounting for Overheads

Illustration 27

A factory has three production departments and two service departments. The cost for the year 2009 were given below :

Rent – ₹ 10,400;
 Lighting – ₹ 960
 Power – ₹ 5,400
 Depreciation on plant – ₹ 6,000
 Canteen expenses – ₹ 18,900
 Supervision charges – ₹ 6,300

With the above-noted expenses and particulars given below, find out the total overhead expenses of each of the production departments. Cost of the service department 'A' is apportioned among departments X, Y, Z and B in ratio of 3 : 3 : 2 : 2 and cost of the service department 'B' is apportioned to production departments in the ratio of 2 : 2 : 1.

	Production Deptt.			Service Deptt.	
	X	Y	Z	A	B
No. of employees	25	18	9	6	5
Cost of plant (₹)	1,50,000	1,00,000	50,000	—	—
Light Points	8	5	5	4	2
Horse power of machines	10	5	3	—	—
Wages paid (₹)	35,000	30,000	20,000	10,000	5,000
Direct Materials (₹)	20,000	10,000	10,000	5,000	5,000
Area occupied (sq.mt.)	1,000	750	750	500	250

[C.U.B.Com. (General) - 2010]

Solution

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis	Ratio	Total (₹)	Production Departments			Service Departments	
				X (₹)	Y (₹)	Z (₹)	A (₹)	B (₹)
Wages	Allocation	Direct	15,000	—	—	—	10,000	5,000
Direct Materials	Allocation	Direct	10,000	—	—	—	5,000	5,000
Rent	Area (sq.mtr.)	4:3:3:2:1	10,400	3,200	2,400	2,400	1,600	800
Power	Horse Power	10:5:3:0:0	5,400	3,000	1,500	900	—	—
Lighting	Light Points	8:5:5:4:2	960	320	200	200	160	80
Depreciation on Plant	Cost of Plant	3:2:1:0:0	6,000	3,000	2,000	1,000	—	—
Canteen Expenses	No. of Employees	25:18:9:6:5	18,900	7,500	5,400	2,700	1,800	1,500
Supervision	No. of Employees	25:18:9:6:5	6,300	2,500	1,800	900	600	500
Total Overheads			72,960	19,520	13,300	8,100	19,160	12,880

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Total (₹)	Production Departments			Service Departments	
		X (₹)	Y (₹)	Z (₹)	A (₹)	B (₹)
Overhead as per Primary Distribution	72,960	19,520	13,300	8,100	19,160	12,880
Re-apportionment of Overhead of Department A in the ratio of 3:3:2:2		5,748	5,748	3,832	(19,160)	3,832
Re-apportionment of Overhead of Department B in the ratio 2:2:1		6,685	6,685	3,342	—	(16,712)
Total Departmental Overhead	72,960	31,953	25,733	15,274	Nil	Nil

Illustration 28

ABC Ltd. has three production departments — P1, P2, P3 and two services departments — S1 and S2. The following figures are extracted from the records of the company for a particular period :

Rent and Rates – ₹ 5,000.

Depreciation on Machinery – ₹ 10,000.

Lighting – ₹ 600.

Power – ₹ 1,500.

Canteen expenses – ₹ 650.

Sundries – ₹ 10,000.

Other Information :

	P1	P2	P3	S1	S2
Floor area (sq.ft.)	2,000	2,500	3,000	2,000	500
No. of Light Points	10	15	20	10	5
No. of Employees	25	20	10	5	5
Direct Wages (₹)	3,000	2,000	3,000	1,500	500
Indirect Wages (₹)	250	500	100	250	150
H.P. of machines	60	30	50	10	—
Value of machineries (₹)	60,000	80,000	1,00,000	5,000	5,000
Productive hours worked	1,892	3,244	5,903	—	—

Expenses of Service Departments S1 and S2 are apportioned as below :

S1	30%	30%	40%
S2	40%	30%	30%

You are required to compute overhead rate per production hour of each production department.

[C.U.B.Com. (General) - 2012]

Solution

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis	Ratio	Total (₹)	Production Departments			Service Departments	
				P1 (₹)	P2 (₹)	P3 (₹)	S1 (₹)	S2 (₹)
Direct Wages	Allocation	Direct	2,000	—	—	—	1,500	500
Indirect Wages	Allocation	Direct	1,250	250	500	100	250	150
Rent and Rates	Floor Area (sq.ft.)	4:5:6:4:1	5,000	1,000	1,250	1,500	1,000	250
Depreciation on Machinery	Value of Machines	12:16:20:1:1	10,000	2,400	3,200	4,000	200	200
Lighting	No. of Light Points	2:3:4:2:1	600	100	150	200	100	50
Power	H.P. of Machine	6:3:5:1:0	1,500	600	300	500	100	—
Canteen Expenses	No. of Employees	5:4:2:1:1	650	250	200	100	50	50
Sundries	Direct Wages	6:4:6:3:1	10,000	3,000	2,000	3,000	1,500	500
Total Overheads			31,000	7,600	7,600	9,400	4,700	1,700

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Total (₹)	Production Departments			Service Departments	
		P1 (₹)	P2 (₹)	P3 (₹)	S1 (₹)	S2 (₹)
Overhead as per Primary Distribution	31,000	7,600	7,600	9,400	4,700	1,700
Re-apportionment of Overhead of Department S1 in the ratio of 3:3:4		1,410	1,410	1,880	(4,700)	
Re-apportionment of Overhead of Department S2 in the ratio 4:3:3		680	510	510		(1,700)
Total Departmental Overhead (A)	31,000	9,690	9,520	11,790	Nil	Nil
Productive Hours Worked (B)		1,892	3,244	5,903		
Overhead Rate per Hour (A÷ B) (₹)		5.122	2.935	1.997		

5.56 Accounting for Overheads

Illustration 29

A factory has three production department — A, B and C. Particulars regarding the three departments are given below :

Particulars	A	B	C
Floor area (sq.mt.)	4,000	8,000	12,000
No. of Workers	100	150	200
Cost of Plant (₹)	2,00,000	2,00,000	4,00,000
Machine Run (Hours)	3,000	2,000	5,000
Number of Light Points	20	30	50
Factory Wages Paid (₹)	9,00,000	12,00,000	2,50,000

Different expenses of the factory for a given year are as follows :

	₹
Factory Rent	24,000
Factory Indirect Wages	36,000
Electricity Charges	5,000
Maintenance of Machine	9,600
Employees' State Insurance	8,400
Depreciation of Machine	50,000
Canteen Expenses	1,800

You are required to allocate the expenses to the three departments.

[C.U.B.Com. (General) - 2013]

Solution

Primary Distribution Summary

Allocation and Apportionment of Factory Overhead Costs to Different Production Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments		
				A (₹)	B (₹)	C (₹)
Factory Rent	Floor Area (sq.ft.)	1 : 2 : 3	24,000	4,000	8,000	12,000
Factory Indirect Wages	Factory Wages	18 : 24 : 5	36,000	13,787	18,383	3,830
Electricity Charges	No. of Light Points	2 : 3 : 5	5,000	1,000	1,500	2,500
Maintenance of Machine	Cost of Plant	1 : 1 : 2	9,600	2,400	2,400	4,800
Employees' State Insurance	No. of Workers	2 : 3 : 4	8,400	1,867	2,800	3,733
Depreciation of Machine	Cost of Plant	1 : 1 : 2	50,000	12,500	12,500	25,000
Canteen Expenses	No. of Workers	2 : 3 : 4	1,800	400	600	800
Total Departmental Overhead			1,34,800	35,954	46,183	52,663

Illustration 30

PQ Ltd. has two production departments, X and Y and two service departments A and B. A renders service worth ₹ 15,000 to B and the balance to X and Y as 3 : 2. B renders services to X and Y as 9 : 1.

	X	Y	A	B
Floor space (sq.ft.)	5,000	4,000	1,000	2,000
Assets (₹ in lakh)	10	5	3	1
H.P. of machines	1,000	500	400	100
No. of workers	100	50	50	25
Light Points	50	30	20	20

The following figures are extracted from the records of the company for a particular period :

	₹
Depreciation	1,90,000
Rent, Rate and Taxes	36,000
Insurance	15,200
Power	20,000
Canteen Expenses	10,800
Electricity	4,800

From the above information, prepare a Statement showing the Distribution of the Service Department expenses to the Production Departments.
[C.U.B.Com. (General) - 2014]

Solution

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis	Ratio	Total (₹)	Production Departments		Service Departments	
				X (₹)	Y (₹)	A (₹)	B (₹)
Depreciation	Value of Assets	10 : 5 : 3 : 1	1,90,000	1,00,000	50,000	30,000	10,000
Rent, Rates and Taxes	Floor Space	5 : 4 : 1 : 2	36,000	15,000	12,000	3,000	6,000
Insurance	Value of Assets	10 : 5 : 3 : 1	15,200	8,000	4,000	2,400	800
Power	H.P. of Machine	10 : 5 : 4 : 1	20,000	10,000	5,000	4,000	1,000
Canteen Expenses	No. of Workers	4 : 2 : 2 : 1	10,800	4,800	2,400	2,400	1,200
Electricity	Light Points	5 : 3 : 2 : 1	4,800	2,000	1,200	800	800
Total Departmental Overheads			2,76,800	1,39,800	74,600	42,600	19,800

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Items of Overhead	Total (₹)	Production Departments		Service Departments	
		X (₹)	Y (₹)	A (₹)	B (₹)
Departmental Overhead as per Primary Distribution	2,76,800	1,39,800	74,600	42,600	19,800
Re-apportionment of Overhead of Department A		16,560	11,040	(42,600)	15,000
Re-apportionment of Overhead of Department B in the ratio 9 : 1		31,320	3,480	—	(34,800)
Total Departmental Overheads	2,76,800	1,87,680	89,120	Nil	Nil

Illustration 31

In a factory, there are three production departments and one service department. The costs in 2014 were as follows :

Power ₹ 1,800; Light ₹ 1,000; Repair to Plant ₹ 9,000; Rent ₹ 10,000; Depreciation ₹ 5,400; Supervision ₹ 15,000.

With the above-noted expenses and the following further information, determine the total overhead cost of production departments. Cost of the service department is apportioned to production departments in 2 : 2 : 1 ratio.

	Production Departments			Service Department
	A	B	C	S
Area (sq.mt.)	1,250	550	450	250
Cost of Plant (₹)	1,20,000	90,000	90,000	—
Direct Wages (₹)	30,000	20,000	15,000	10,000
H.P. of Machines	6	4	5	—
Light Points (Nos.)	8	7	6	4

5.58 Accounting for Overheads

Solution

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Department
				A (₹)	B (₹)	C (₹)	
Direct Wages	Allocation	Direct	10,000	—	—	—	10,000
Power	H.P. of machine	6 : 4 : 5 : 0	1,800	720	480	600	—
Light	No. of Light Points	8 : 7 : 6 : 4	1,000	320	280	240	160
Repair to Plant	Cost of Plant	4 : 3 : 3 : 0	9,000	3,600	2,700	2,700	—
Rent	Area (sq.mtr.)	25 : 11 : 9 : 5	10,000	5,000	2,200	1,800	1,000
Depreciation	Cost of Plant	4 : 3 : 3 : 0	5,400	2,160	1,620	1,620	—
Supervision	Direct Wages	6 : 4 : 3 : 2	15,000	6,000	4,000	3,000	2,000
Total Departmental Overheads			52,200	17,800	11,280	9,960	13,160

Secondary Distribution

Re-apportionment of Service Department Cost to Production Departments

Particulars	Total (₹)	Production Departments			Service Department
		A (₹)	B (₹)	C (₹)	
Departmental Overhead as per Primary Distribution	52,200	17,800	11,280	9,960	13,160
Re-apportionment of Overhead of Department S in the ratio (2:2:1)		5,264	5,264	2,632	(13,160)
Total Departmental Overheads	52,200	23,064	16,544	12,592	Nil

Illustration 32

An Industrial Concern has two production departments and one service department. The expenses of Service Department is to be apportioned to Production Department in the ratio of 3 : 2.

From the following information, prepare an overhead distribution summary and calculate labour hour rate.

Expenses :	₹
Power	1,000
Lighting	800
Rent and Rate	4,000
Indirect Wages	2,000
Sundries	5,000
Depreciation on Machine	6,000

	Production Departments		Service Department
	P1	P2	S
Working Hours	4,000	3,500	3,600
Direct Wages (₹)	3,000	2,600	3,000
Cost of Machine (₹)	25,000	20,000	15,000
H.P. of Machine	50	30	10
Light Points	18	12	10
Floor space (sq.mt.)	1,000	1,200	800

[C.U.B.Com. (General) - 2017]

Solution

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Department

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments		Service Department S (₹)
				P1 (₹)	P2 (₹)	
Direct Wages	Allocation	Direct	3,000	—	—	3,000
Power	H.P. of Machine	5 : 3 : 1	1,000	556	333	111
Lighting	Light Points	9 : 6 : 5	800	360	240	200
Rent and Rates	Floor space	5 : 6 : 4	4,000	1,333	1,600	1,067
Indirect Wages	Direct Wages	15 : 13 : 15	2,000	698	604	698
Sundries	Direct Wages	15 : 13 : 15	5,000	1,744	1,512	1,744
Depreciation	Cost of Machine	5 : 4 : 3	6,000	2,500	2,000	1,500
Total Departmental Overheads			21,800	7,191	6,289	8,320

Secondary Distribution

Re-apportionment of Service Department Overhead to Production Departments

Particulars	Total (₹)	Production Departments		Service Department S (₹)
		P1 (₹)	P2 (₹)	
Department Overhead as per Primary Distribution	21,800	7,191	6,289	8,320
Re-apportionment overhead of Department S in the ratio 3 : 2		4,992	3,328	(8,320)
Total overhead after re-apportionment	21,800	12,183	9,617	Nil

$$\text{Labour Hour Rate} = \frac{\text{Total Departmental Overhead}}{\text{Working Hours}}$$

$$P1 : \frac{12,183}{4,000} = ₹ 3.046; P2 : \frac{9,617}{3,500} = ₹ 2.748$$

[For Honours Candidates Only]

Illustration 33

C Ltd. is a manufacturing company having three production departments. A, B and C and two service departments X and Y. The following is the budget for December, 2010 :

	Total (₹)	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Direct material	—	3,000	6,000	12,000	6,000	3,000
Direct wages	—	15,000	6,000	24,000	3,000	6,000
Factory Rent	12,000					
Power	7,500					
Depreciation	10,000					
Other Overheads	27,000					

Additional information :

Area (sq.mnt.)	500	250	500	250	500
Capital value of Assets (₹ in thousands)	20	40	20	10	10
Machine Hours Worked	1000	2000	4000	1000	1000
Horse Power of Machines	50	40	20	15	25

A technical assessment for the apportionment of expenses of service departments is as under :

Service Department X	45%	15%	30%	—	10%
Service Department Y	60%	35%	—	5%	—

5.60 Accounting for Overheads

Required :

- A statement showing distribution of overheads to various departments.
- A statement showing re-distribution of service departments expenses to production departments.
- Machine hour rates of the production departments A, B and C.

[C.U.B.Com. (Hons.) – 2011]

Solution

C Limited

(i) Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis	Ratio	Total (₹)	Production Departments			Service Departments	
				A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Direct Material	Allocation	Direct	9,000	–	–	–	6,000	3,000
Direct Wages	Allocation	Direct	9,000	–	–	–	3,000	6,000
Factory Rent	Area (sq.mt.)	10:5:10:5:10	12,000	3,000	1,500	3,000	1,500	3,000
Power	HP x HW	10:16:16:3:5	7,500	1,500	2,400	2,400	450	750
Depreciation	Value of Assets	2:4:2:1:1	10,000	2,000	4,000	2,000	1,000	1,000
Other Overheads	Direct Wages	5:2:8:1:2	27,000	7,500	3,000	12,000	1,500	3,000
Total Overheads			74,500	14,000	10,900	19,400	13,450	16,750

Working Notes :

(1) Power consumption depends upon H.P. of the machine and hours worked. Therefore, power cost should be distributed on the basis of product of HP and hours worked. The product is calculated as follows :

	HP	×	Hours Worked	=	Product
A :	50	×	1,000	=	50,000
B :	40	×	2,000	=	80,000
C :	20	×	4,000	=	80,000
X :	15	×	1,000	=	15,000
Y :	25	×	1,000	=	25,000

Rate of Apportionment :

A : B : C : X : Y

10 : 16 : 16 : 3 : 5

Note : Alternatively, power cost can be apportioned on the basis of horse power. But it is not logical.

(ii) Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Total (₹)	Production Departments			Service Departments	
		A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Departmental Overhead as per Primary Distribution	74,500	14,000	10,900	19,400	13,450	16,750
Re-apportionment of Overhead of Department X		6,461	2,154	4,308	(14,359)	1,436
Re-apportionment of Overhead of Department Y		10,912	6,365	–	909	(18,186)
Total Departmental Overhead (A)	74,500	31,373	19,419	23,708	Nil	Nil

$$\text{Machine Hour Rate} = \frac{\text{Estimated Overheads}}{\text{Estimate Machine Hours}}$$

$$\text{Dept. A : } \frac{31,373}{1,000} = ₹ 31.37; \text{ Dept. B : } \frac{19,419}{2,000} = ₹ 9.71; \text{ Dept. C : } \frac{23,708}{4,000} = ₹ 5.93$$

Let,

x = total overhead of Department X

y = total overhead of Department Y.

Total overhead of service departments X and Y can be expressed as :

$$x = 13,450 + 5\% \text{ of } y \quad \dots (1)$$

$$y = 16,750 + 10\% \text{ of } x \quad \dots (2)$$

OR

$$x = 13,450 + 0.05y \quad \dots (3)$$

$$y = 16,750 + 0.1x \quad \dots (4)$$

Re-arranging equation (3) and (4) we get

$$x - 0.05y = 13,450 \quad \dots (5)$$

$$-0.1x + y = 16,750 \quad \dots (6)$$

Multiplying equation (5) by 20 and equation (6) by 1, we get

$$20x - y = 2,69,000$$

$$-0.1x + y = 16,750$$

$$19.9x = 2,85,750 \text{ (Adding we get)}$$

$$x = 14,359.$$

Substituting the value in equation (4) we get

$$y = 16,750 + (14,359 \times 0.1)$$

$$= 16,750 + 1,436$$

$$= 18,186$$

Finally, $x = ₹ 14,359$ and $y = ₹ 18,186$.

Distribution of Overhead of Dept. X

$$A : 45\% \times 14,359 = 6,461$$

$$B : 15\% \times 14,359 = 2,154$$

$$C : 30\% \times 14,359 = 4,308$$

$$Y : 10\% \times 14,359 = 1,436$$

$$\underline{14,359}$$

Distribution of Overhead of Dept. Y

$$A : 60\% \times 18,186 = 10,912$$

$$B : 35\% \times 18,186 = 6,365$$

$$C : 5\% \times 18,186 = 909$$

$$\underline{18,186}$$

Illustration 34

MRK Ltd. has three production departments — X1, X2 and X3 and two service departments — S1 and S2. The following figures are extracted from the records of the company :

Rent and Rates	₹ 5,000	Power	₹ 1,500		
Depreciation of Machinery	₹ 10,000	Canteen expenses	₹ 650		
Lighting expenses	₹ 600	Sundry expenses	₹ 10,000		
Other Information :	X1	X2	X3	S1	S2
Floor area (sq.ft.)	2,000	2,500	3,000	2,000	500
No. of light points	10	15	20	10	5
No. of employees	25	20	10	5	5
Direct wages (₹)	3,000	2,000	3,000	1,500	500
Indirect wages (₹)	250	500	100	250	150
H.P. of machines	60	30	50	10	—
Value of machines (₹)	60,000	80,000	1,00,000	5,000	5,000
Production hours worked	2,000	2,500	3,000	—	—
Expenses of service departments S1 and S2 are apportioned as below :					
S1	2	2	1	—	—
S2	2	1	2	—	—

You are required to :

- Compute overhead absorption rate per production hour of each department.
- Determine total cost of production 'YZ' which is processed through departments X1, X2 and X3 for 5 hours, 4 hours and 3 hours respectively. The material cost for the product 'YZ' is ₹ 5,000, direct labour cost is ₹ 20,000. Royalty on production ₹ 2,000 and chargeable expenses ₹ 1,000.

5.62 Accounting for Overheads

Solution

Primary Distribution

Allocation and Apportionment of Factory Overhead Costs to Production and Service Departments

Items of Overhead	Basis	Ratio	Total (₹)	Production Departments			Service Departments	
				X1 (₹)	X2 (₹)	X3 (₹)	S1 (₹)	S2 (₹)
Direct Wages (Note 1)	Allocation	Direct	2,000	—	—	—	1,500	500
Indirect Wages	Allocation	Direct	1,250	250	500	100	250	150
Rent and Rates	Area (sq.ft.)	4:5:6:4:1	5,000	1,000	1,250	1,500	1,000	250
Depreciation on Machinery	Value of Machines	12:16:20:1:1	10,000	2,400	3,200	4,000	200	200
Lighting Expenses	Light Points	2:3:4:2:1	600	100	150	200	100	50
Power (Note 2)	H.P. of Machine	6:3:5:1:0	1,500	600	300	500	100	—
Canteen Expenses	No. of Employees	5:4:2:1:1	650	250	200	100	50	50
Sundries	Direct Wages	6:4:6:3:1	10,000	3,000	2,000	3,000	1,500	500
Total Overheads			31,000	7,600	7,600	9,400	4,700	1,700

Secondary Distribution

Re-apportionment of Service Departments Overhead to Production Departments

Particulars	Total (₹)	Production Departments			Service Departments	
		X1 (₹)	X2 (₹)	X3 (₹)	S1 (₹)	S2 (₹)
Overhead as per Primary Distribution	31,000	7,600	7,600	9,400	4,700	1,700
Distribution of Overhead of Department S1 in the ratio of 2:2:1 among X1, X2 and X3		1,880	1,880	940	(4,700)	—
Distribution of Overhead of Department S2 in the ratio 2:1:2 among X1, X2 and X3		680	340	680	—	(1,700)
Total Departmental Overhead (A)	31,000	10,160	9,820	11,020	Nil	Nil
Productive Hours Worked (B)		2,000	2,500	3,000		
Overhead Rate per Hour (A ÷ B) (₹)		5.08	3.928	3.673		

Cost Sheet of Product 'YZ'

Direct Materials	5,000	
Direct Labour Cost	20,000	
Royalty on Production	2,000	
Chargeable Expenses	<u>1,000</u>	
Prime Cost		28,000.00
Factory Overhead :		
X1 : 5.08 × 5	25.40	
X2 : 3.928 × 4	15.71	
X3 : 3.673 × 3	<u>11.02</u>	<u>52.13</u>
Total Cost of Production		28,052.13

Working Notes :

- (1) Direct Wages of service departments are part of the overhead as these departments are not manufacturing any product. However, direct wages of X1, X2 and X3 will be treated as part of **Prime Cost** because these are not overhead.
- (2) In this problem, power cost has been apportioned on the basis of H.P. of machine. More logical basis should have been on the basis of (H.P. × Hours worked). Hours worked of Dept. S1 has not been given though the H.P. of the machine has been given. Therefore, only H.P. of machine has been taken into consideration for distribution of power cost.

Pre-determined Versus Actual Absorption Rate

Imagine that you have just set up a garment manufacturing unit. During the first month of operation, a customer calls to enquire about buying 500 pieces of uniforms for his employees. Before you can quote a price for each uniform, you need to ensure that the price you charge will cover all the cost of manufacturing uniforms. You can easily calculate the cost of cloth and direct labour. But what about production overhead ?

You will not be able to calculate the actual cost of many items of overhead at present. At the end of the year you can calculate the actual cost of overhead and actual number of output which should share these overheads.

So you will say the customer : "Sorry. I can't quote a price now. Please call back at the end of my accounting year so that I can work out the cost of uniform and I can quote the price for uniform." Of course, you can't afford to do this. You must find out a solution immediately. You should *estimate* the total overhead and total output of the entire accounting period. Based on those estimated figures you must calculate a production overhead absorption / recovery rate. Absorption rate calculated on the basis of these *estimated* / *budgeted* data is called **Pre-determined Absorption Rate**.

The absorption rate, which use actual overhead costs and actual base (direct labour hours, machine hours, units produced), is called **Actual Absorption Rate**.

Many companies are using pre-determined overhead absorption rate in place of actual overhead absorption rate for the following reasons :

1. Calculation of cost of product is possible as soon as the production is over.
2. When goods are produced on cost plus basis, prompt calculation of cost is necessary for billing purposes. Pre-determined overhead absorption rate is very helpful in this situation.
3. In a dynamic market, prompt calculation of cost is essential to fix price of the product. It is possible if a pre-determined overhead absorption is adopted.
4. Cost control is possible if the cost can be determined promptly. It is possible if the pre-determined overhead absorption rate is adopted.
5. Pre-determined overhead absorption rate is not affected by seasonal fluctuations from one month to another. In every month a uniform rate is applied.

Over and Under Absorption Overhead

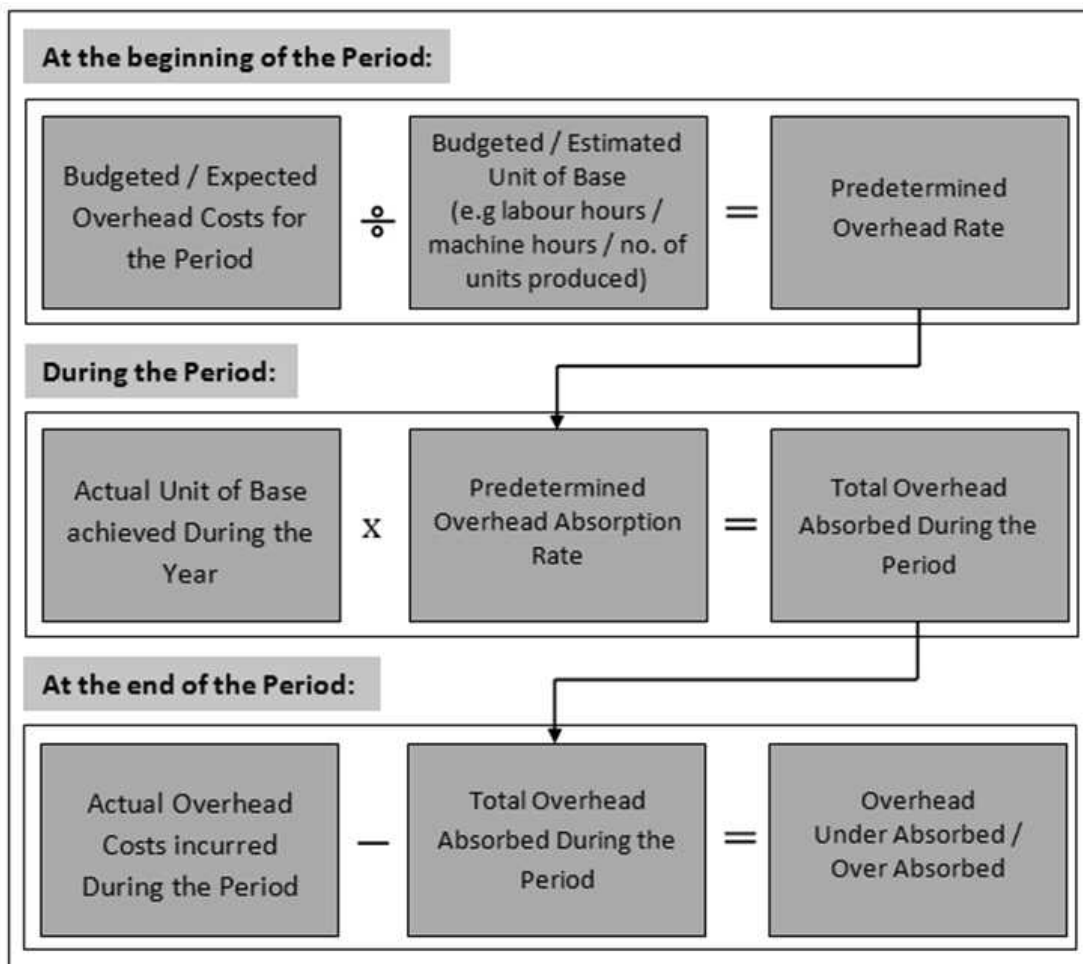
In an exceptional situation, actual overhead costs incurred is *equal* to total overhead absorbed. If there is any difference between the estimated costs / activities and actual costs / activities, the result is over or under absorption of overhead.

If the overhead incurred is *more* than overhead absorbed, an **under-absorption of overhead** will occur.

If the overhead incurred is *less* than overhead absorbed, an **over-absorption of overhead** will occur.

Fig. 5.8 (next page) will explain the entire process of calculation of over / under absorption of overhead.

5.64 Accounting for Overheads



[Fig. 5.8]

Illustration 35

In a factory total overhead expenses of three production departments are ₹ 20,000, ₹ 25,000 and ₹ 14,400 respectively. Overhead absorption rates per hour of the three departments are ₹ 10, ₹ 15 and ₹ 12 respectively and the departments worked in a year for 1,600 hours in Dept. A, 1,700 hours in Dept. B and 1,200 hours in Dept.C. Calculate the amounts of under/over absorption of overhead. [C.U.B.Com. (General) – 2017]

Solution Statement Showing Department-wise Under or Over Absorption of Overheads

Department	Overheads		Under Absorption	Over Absorption	Net Effect
	Incurred ₹	Absorbed ₹			
A	20,000	16,000	4,000	–	–
B	25,000	25,500	–	500	–
C	14,400	14,400	–	–	–
Total	59,400	55,900	4,000	500	3,500 (Under absorption)

Working Note :

(1) Overhead Absorbed : ₹

A : 1,600 × ₹ 10	16,000
B : 1,700 × ₹ 15	25,500
C : 1,200 × ₹ 12	14,400
	<u>55,900</u>

Illustration 36

During the year ended 31st March, 2014 the factory overhead costs of three production departments of an organisation are as under :

	₹
A	47,950
B	88,800
C	64,500

The basis of apportionment of overheads is given below :

Departments :

- A ₹ 5 per machine hour for 10,000 hours.
- B 75% of direct labour cost of ₹ 1,20,000.
- C ₹ 4 per piece for 15,000 pieces.

Calculate department-wise under or over absorption of overheads and present the data in a tabular form.

[C.U.B.Com. (General) – 2014]

Solution Statement Showing Department-wise Under or Over Absorption of Overheads

Department	Overheads		Under Absorption	Over Absorption	Net Effect
	Incurred (₹)	Absorbed (₹)	(₹)	(₹)	(₹)
A	47,950	50,000	–	2,050	
B	88,800	90,000	–	1,200	
C	64,500	60,000	4,500	–	
Total	2,01,250	2,00,000	4,500	3,250	1,250 (Under absorbed)

Working Note :

(1) Overheads Absorbed ₹

A : 10,000 × ₹ 5	50,000	(absorbed on the basis of machine hours)
B : 1,20,000 × 75%	90,000	(absorbed on the basis of direct labour cost)
C : 15,000 × ₹ 4	60,000	(absorbed on the basis of output)
	<u>2,00,000</u>	

Illustration 37

XYZ Ltd. furnished the following information of its factory :

Normal working hours	40 hours per week
Normal weekly loss of hours (due to maintenance)	4 hours per machine
Number of machines worked	15
Estimated annual overhead	₹ 1,55,520
Estimated direct wages rate	₹ 3.00 per hour
Number of weeeks worked per year	48 weeks
Actual result in respect of a 4-week period are :	
Overhead incurred	₹ 15,000
Wages incurred	₹ 7,000

5.66 Accounting for Overheads

You are required to :

- Calculate the overhead rate per machine hour.
- Calculate the amount of under / over absorption.

[C.U.B.Com. (Hons.) – 2015]

Solution

(a) Calculation of Overhead Rate per Machine Hour

Actual hours worked per week = 40 – 4 = 36 hours.

Total hours worked per year = 36 × 48 = 1,728 hours.

Total hours worked by 15 machines = 1,728 × 15 = **25,920 hours.**

$$\begin{aligned}\text{Overhead Absorption Rate} &= \frac{\text{Estimated Annual Overheads}}{\text{Estimate Hours Worked per Year}} \\ &= \frac{1,55,520}{25,920} = \text{₹ } 6\end{aligned}$$

(b) Calculation of the Amount of Under / Over Absorption of Overhead (4 weeks)

Estimated hours worked for 4 weeks = $\frac{25,920}{48} \times 4 = \text{2,160 hours.}$

Overhead Absorption during 4-weeks period = 2,160 × ₹ 6 12,960

Overhead incurred during 4-weeks period 15,000

Overheads under-absorbed 2,040

Calculation of the Amount of Under / Over absorption of Direct Wages

Estimated direct wages for 4-weeks period = 2,160 × ₹ 3 6,480

Actual direct wages incurred for 4-weeks period 7,000

Under-absorption of direct wages 520

Illustration 38

The factory overhead cost of three production departments of a company engaged in executing job orders for the accounting year for 2003–04 are as follows: A – ₹ 19,300; B – ₹ 4,200; C – ₹ 4,800

Overhead has been applied as under :

Department A — ₹ 1.50 per machine hour for 14,000 hours

B — ₹ 1.30 per direct labour hour for 3,000 hours

C — 80% of direct labour cost of ₹ 6,000

Find out the amount of department–wise under or over absorbed overhead and explain their treatment.

[C.U. B.Com. (Hons.) – 2004]

Solution Statement Showing Department–wise Under or Over Absorption of Overheads

Department	Overheads		Under Absorption	Over Absorption	Net Effect
	Incurred ₹	Absorbed ₹			
A	19,300	21,000	–	1,700	1,400 (Over absorbed)
B	4,200	3,900	300	–	
C	4,800	4,800	–	–	
Total	28,300	29,700	300	1,700	

Working Notes :

(1) Overheads Absorbed:	₹	
A : 14,000 × ₹ 1.50	21,000	(absorbed on the basis of machine hours)
B : 3,000 × ₹ 1.30	3,900	(absorbed on the basis of direct labour hours)
C : 6,000 × 80%	4,800	(absorbed on the basis of direct labour cost)
	<u>29,700</u>	

Accounting Treatment of Over-absorption of Overhead

Taking all departments (A, B and C) together, overheads have been over-absorbed by ₹ 1,400 (Net). This amount will be *credited* to costing Profit and Loss Account for the year 2003–04.

Illustration 39

P Ltd. has three production departments (X, Y and Z) in its factory. After completion of all overhead allocation and apportionment, the production department budgets for year 2017 included the following :

	Department		
	X	Y	Z
Overhead costs (₹)	51,240	87,120	66,816
Direct labour hours	—	—	11,520
Machine hours	4,200	5,280	—

A predetermined overhead absorption rate is established for each production department each year.

Actual data for Month 1 of year 2010 included :

	Department		
	X	Y	Z
Overhead costs (₹)	4,410	7,190	5,610
Direct labour hours	—	—	985
Machine hours	340	426	—

Required:

- Calculate, from the data provided, an appropriate predetermined overhead absorption rate for each production department for year 2017.
- Calculate the amount of the over / under absorption of overhead in Month 1 in each production department and in total for the factory.

Solution Calculation of Pre-determined Production Overhead Absorption Rates

$$\text{Predetermined Overhead Absorption Rate (Based on Machine Hours)} = \frac{\text{Budgeted Overheads}}{\text{Machine Hours}}$$

$$\text{Department X} = \frac{51,240}{4,200} = ₹ 12.20 \text{ per M.H.}; \text{ Department Y} = \frac{87,120}{5,280} = ₹ 16.50 \text{ per M.H.}$$

Predetermined Overhead Absorption Rate (Based on Direct Labour Hours)

$$= \frac{\text{Budgeted Overheads}}{\text{Direct Labour Hours}}$$

$$\text{Department Z} = \frac{66,816}{11,520} = ₹ 5.80 \text{ per direct labour hour}$$

5.68 Accounting for Overheads

Calculation of Over / Under Absorption of Overhead (Month 1)

Department	Overhead incurred (₹)	Overhead absorbed (₹)	Over / (Under) Absorption (₹)
X	4,410	4,148 (Note 1)	(262)
Y	7,190	7,029 (Note 2)	(161)
Z	5,610	5,713 (Note 3)	103
Total	17,210	16,890	(320)

Working Notes :

- (1) Overhead absorbed = Actual machine hours × Predetermined overhead absorption rate per hour
= 340 hours × ₹ 12.20 = ₹ **4,148**
- (2) Overhead absorbed = Actual machine hours × Predetermined overhead absorption rate per hour
= 426 hours × ₹ 16.50 = ₹ **7,029**
- (3) Overhead absorbed = Actual direct labour hours × Predetermined overhead absorption rate per hour
= 985 hours × ₹ 5.80 = ₹ **5,713**

Illustration 40

A production department of a manufacturing concern has three distinct machines, A, B and C. It is estimated that each machine will normally work for 50 weeks a year, 45 hours per week. But it is anticipated that the machines will remain idle 20% of this time due to normal repairs and maintenance.

The budgeted figure of the production department for the year ended 31st March, 2017 is as follows:

	₹
Rent and Rates	4,800
Lighting	900
Depreciation	10,500
Indirect Wages	4,500
Canteen Expenses	2,500
Repairs and Maintenance	6,300
Sundries	3,000
Power	12,000

Other information :

	Machine A	Machine B	Machine C
Space occupied (sq.ft.)	100	150	150
Light points	5	5	8
Cost of machines (₹)	25,000	30,000	50,000
HP of Machines	2	2.5	3
No. of Workers	3	3	4
Direct wages (₹)	6,000	4,000	5,000

During the 4 weeks of February 2017 at 80% capacity utilization total overheads incurred were:

For machine A ₹ 1,200; for machine B ₹ 900; and for machine C ₹ 2,000.

You are required to calculate for each machine :

- (a) Pre-determined overhead rate based on effective working hours; and
- (b) The amount of (under) / over absorption of overhead.

[C.U. B.Com. (Hons.) – Adapted]

Solution

**Primary Distribution
Apportionment of Overhead Costs to Different Cost Centres**

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Machine		
				A (₹)	B (₹)	C (₹)
Rent and Rates	Space occupied	2:3:3	4,800	1,200	1,800	1,800
Depreciation	Cost of Machine	5:6:10	10,500	2,500	3,000	5,000
Canteen Expenses	No. of workers	3:3:4	2,500	750	750	1,000
Sundries	Direct Wages	6:4:5	3,000	1,200	800	1,000
Lighting	Light Points	5:5:8	900	250	250	400
Indirect Wages	Direct Wages	6:4:5	4,500	1,800	1,200	1,500
Repairs and Maintenance	Cost of Machine	5:6:10	6,300	1,500	1,800	3,000
Power	H.P. of Machine	4:5:6	12,000	3,200	4,000	4,800
Total Overhead Costs			44,500	12,400	13,600	18,500

Calculation of Effective Working Hours :

Estimated machine hours (50 × 45)	2,250 hours
Less: Normal idle time : 20% of 2,250	<u>450 hours</u>
Effective working hours	<u>1,800 hours</u>

$$\text{Predetermined Overhead Rate} = \frac{\text{Budgeted Overheads}}{\text{Estimated Effective Working Hours}}$$

- (i) Machine A : ₹ 12,400 / 1800 = ₹ 6.89 (approx.)
(ii) Machine B : ₹ 13,600 / 1800 = ₹ 7.56 (approx.)
(iii) Machine C : ₹ 18,500 / 1800 = ₹ 10.28 (approx.)

Statement Showing Machine-wise Under or Over Absorption of Overheads

Machine	Overheads		Under Absorption ₹	Over Absorption ₹	Net Effect ₹
	Incurred ₹	Absorbed ₹			
A	1,200	992	208	—	
B	900	1,088	—	188	
C	2,000	1,480	520	—	
Total	4,100	3,560	728	188	540 (Under absorbed)

Working Note :

(1) Overhead Absorbed :

In February, machine worked for 4 weeks, i.e., (4 × 45)	180 hours
Less: Normal idle time 20% of 180 hours	<u>36 hours</u>
	<u>144 hours</u>

Machine A : 144 × ₹ 6.89 = ₹ 992
Machine B : 144 × ₹ 7.56 = ₹ 1,088
Machine C : 144 × ₹ 10.28 = ₹ 1,480

Illustration 41

In Moon Light manufacturing company, the output produced through three machine departments A, B and C. The company follows predetermined factory overhead absorption rates of the machine departments. Hourly rates fixed up for the year 2001 are ₹ 16.00 per hour for Dept. A, ₹ 18.80 per hour for Dept. B and ₹ 17.50 per hour for Dept. C.

5.70 Accounting for Overheads

The actual expenses of these machine departments for the year 2001 are as follows :

	₹		₹
Depreciation on Machinery	20,000	Repairs to Machinery	12,000
Rent of Factory Shed	18,000	Lighting	4,000
Indirect Materials	10,000	Canteen Expenses	15,000
Indirect Wages	12,000	Insurance of Machines	8,000
Power	16,000	Sundry Expenses	18,000

The particulars relating to the machine departments are given below :

Departments	Machine A	Machine B	Machine C
Area Occupied (st.ft.)	800	600	400
Value of Machinery (₹)	80,000	60,000	60,000
Direct Wages (₹)	50,000	40,000	30,000
Direct Materials (₹)	60,000	80,000	60,000
No. of Light Points	9	5	6
Power of Machines (H.P.)	20	40	20
No. of Workers	12	8	10
Actual Working Hours	3,000	2,500	2,000

Your are required to :

- calculate overhead absorption rate per working hour for the departments;
- compute the price to be charged for a job which requires materials of ₹ 1,500 and wages of ₹ 1,000 assuming the office and administration overheads charged @ 20% on works cost, selling and distribution overhead @ 20% on cost of production and profits @ 25% on sale. (The job requires 15, 12 and 10 hours of time in machines A, B and C respectively); and
- determine over or under absorption of factory overhead.

[C.U.B.Com. (Hons.) – 2002]

Solution

Primary Distribution

(a) Apportionment of Overhead Costs to Different Cost Centres

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Machine		
				A (₹)	B (₹)	C (₹)
Depreciation on Machinery	Value of machine	4:3:3	20,000	8,000	6,000	6,000
Rent of Factory Shed	Area occupied	4:3:2	18,000	8,000	6,000	4,000
Indirect Materials	Direct materials	3:4:3	10,000	3,000	4,000	3,000
Indirect Wages	Direct wages	5:4:3	12,000	5,000	4,000	3,000
Power	H.P.	1:2:1	16,000	4,000	8,000	4,000
Repairs to Machinery	Value of machine	4:3:3	12,000	4,800	3,600	3,600
Lighting	Light points	9:5:6	4,000	1,800	1,000	1,200
Canteen Expenses	No. of workers	6:4:5	15,000	6,000	4,000	5,000
Insurance of Machine	Value of machine	4:3:3	8,000	3,200	2,400	2,400
Sundry Expenses	Direct wages	5:4:3	18,000	7,500	6,000	4,500
Total Overhead Costs		(A)	1,33,000	51,300	45,000	36,700
Actual Working Hours		(B)		3,000	2,500	2,000
Actual Overhead Rate		(A÷ B)		17.1	18.00	18.35

(b) Cost Sheet

Particulars	₹	₹
Direct materials		1,500
Direct Wages		1,000
	Prime Cost	2,500
Factory Overhead :		
Machine A : 15 x ₹ 17.10	257	
Machine B : 12 x ₹ 18.00	216	
Machine C : 10 x ₹ 18.35	184	657
	Works Cost	3,157
Administrative Overhead @ 20% of Works Cost		631
	Cost of Production	3,788
Selling and Distribution Overhead @ 20% of Cost of Production		758
	Cost of Sales	4,546
Profit (25% on Sales or 1/3rd of Cost)		1,515
	Sales	6,061

Note : Price of the job has been calculated on the basis of actual overhead rate.

Statement Showing Department-wise Under or Over Absorption of Overheads

Department	Overheads		Under Absorption (₹)	Over Absorption (₹)	Net Effect (₹)
	Incurred (₹)	Absorbed (₹)			
A	51,300	48,000	3,300	—	
B	45,000	47,000	—	2,000	
C	36,700	35,000	1,700		
Total	1,33,000	1,30,000	5,000	2,000	3,000 (Under absorbed)

Working Notes :

(1) **Overhead Absorbed = Actual working hours × Pre-determined overhead rate**

Machine A: 3,000 × ₹ 16.00 = ₹ 48,000; Machine B: 2,500 × ₹ 18.80 = ₹ 47,000

Machine C: 2,000 × ₹ 17.50 = ₹ 35,000

Illustration 42

The pre-determined production overhead rates for the period, used to absorb overheads are :

P1 — ₹ 246 per machine hour

P2 — ₹ 134 per direct labour hour

P3 — ₹ 108 per direct labour hour

Machine hours and direct labour hours in each production department are :

Production Departments	Actual Overhead (₹)	Machine Hours		Direct Labour Hours	
		Budgeted	Actual	Budgeted	Actual
P 1	199,89,100	81,000	82,500	36,500	36,800
P 2	116,59,200	19,600	18,800	86,500	84,400
P 3	170,94,700	36,100	37,200	1,56,000	1,59,900

Calculate for the period for each production department :

(i) The amount of overhead absorbed.

(ii) The amount of any over or under absorption of overheads.

[C.A. (Inter) – Adapted]

5.72 Accounting for Overheads

Solution

Overhead absorbed in Department P1

Actual machine hours × Overhead absorption rate per machine hour
 $= 82,500 \times ₹ 246 = ₹ 202,95,000$

Overhead absorbed in Department P2

Actual labour hours × Overhead absorption rate per labour hour
 $= 84,400 \times ₹ 134 = ₹ 113,09,600$

Overhead absorbed in Department P3

Actual labour hours × Overhead absorption rate per labour hour
 $= 1,59,900 \times ₹ 108 = ₹ 172,69,200$

Statement Showing the Amount of Over / Under Absorption Overhead

Production Department	P1	P2	P3
Actual overhead incurred (₹)	199,89,100	116,59,200	170,94,700
Overhead absorbed (₹)	202,95,000	113,09,600	172,69,200
	3,05,900 (over absorbed)	3,49,600 (under absorbed)	1,74,500 (over absorbed)

Illustration 42

In a factory, there are two production departments X and Y. Overheads allocated, apportioned and re-apportioned to these two production departments for a period were as follows :

	Production Department	
	X	Y
Budgeted (₹)	2,42,730	1,45,665
Actual (₹)	2,44,785	1,44,495

A machine hour rate is used in production department X and a direct labour hour rate in production department Y. Machine and direct labour activity in each production department is :

	Production Department	
	X	Y
Machine hours :		
Budget	8,700	1,760
Actual	8,960	1,725
Direct labour hours :		
Budget	6,220	8,300
Actual	6,276	7,870

You are required to calculate for each production department for the period :

- the pre-determined production overhead absorption rate;
- the production overheads absorbed;
- the over / under absorption of production overhead.

Solution

(i) Calculation of Predetermined Production Overhead Absorption Rate

Production Department X :

$$\text{Overhead Absorption Rate} = \frac{\text{Budgeted Overheads}}{\text{Budgeted Machine Hours}} = \frac{2,42,730}{8,700} = ₹ 27.90$$

Production Department Y :

$$\text{Absorption Rate} = \frac{\text{Budgeted Overheads}}{\text{Budgeted Direct Labour Hours}} = \frac{1,45,665}{8,300} = ₹ 17.55$$

(ii) Production Overhead Absorbed

Production Department X :

$$\begin{aligned} \text{Overhead Absorbed} &= \text{Actual Machine Hours} \times \text{Overhead Absorption Rate} \\ &= 8,960 \times ₹ 27.90 = ₹ 2,49,984 \end{aligned}$$

Production Department Y :

$$\begin{aligned} \text{Overhead Absorbed} &= \text{Actual Direct Labour Hours} \times \text{Overhead Absorption Rate} \\ &= 7,870 \times ₹ 17.55 = ₹ 1,38,119 \end{aligned}$$

(ii) Calculation of Over / Under Absorption of Production Overhead

Production Department	X (₹)	Y (₹)
Actual overhead incurred	2,44,785	1,44,495
Overhead absorbed	2,49,984	1,38,119
	(5,199)	6,376
	[over absorbed]	[under absorbed]

Illustration 44

K Ltd. manufactures different products which pass through two production departments in its factory. These two departments are engaged with filling and sealing operations. There are two service departments in the factory – maintenance and canteen.

Predetermined overhead absorption rates, based on direct labour hours, are established for two production departments:

The budgeted expenditure and budgeted direct labour hours for the period just ended are as follows:

Particulars	Production Department	
	Filling	Sealing
Budgeted expenditure including the apportionment of service department overheads	₹ 1,04,800	₹ 51,250
Budgeted direct labour hour	13,100	10,250

Service Department Overheads are apportioned as follows :

	Filling	Sealing	Maintenance	Canteen
Maintenance	70%	27%	—	3%
Canteen	60%	32%	8%	—

During the period just ended, actual overhead cost and direct labour hours were as follows :

Particulars	Filling	Sealing	Maintenance	Canteen
Actual overhead costs (₹)	74,260	38,115	25,050	24,375
Direct labour hours (actual)	12,820	10,075	—	—

You are required to calculate the overheads absorbed in the period and the extent of the under / over absorption in each of the two production departments.

[C.A. (Inter) – Adapted]

5.74 Accounting for Overheads

Solution

Calculation of Overhead Absorption Rate

$$(a) \text{ Overhead Absorption Rate} = \frac{\text{Budgeted Overheads}}{\text{Budgeted Direct Labour Hours}}$$

$$(i) \text{ Filling Department} = \frac{1,04,800}{13,100} = ₹ 8 \quad (ii) \text{ Sealing Department} = \frac{51,250}{10,250} = ₹ 5$$

(b) Amount of Overhead Absorbed = Overhead Absorption Rate × Actual Labour Hour

$$(i) \text{ Filling Department} = ₹ 8 \times 12,820 = ₹ 1,02,560$$

$$(ii) \text{ Sealing Department} = ₹ 5 \times 10,075 = ₹ 50,375$$

(c) Calculation of Overheads Incurred

Particulars	Basis	Filling (₹)	Sealing (₹)	Maintenance (₹)	Canteen (₹)
Actual overhead costs	Given	74,260	38,115	25,050	24,375
Overheads of Maintenance Department	70:27:3	17,535	6,764	(25,050)	751
Overheads of Canteen Department	60:32:8	15,076	8,040	Nil	25,126
Overheads of Maintenance Department	70:27:3	1,407	543	2,010	(25,126)
Overheads of Canteen Department	60:32:0	39	21	(2010)	60
				–	(60)
		1,08,317	53,483	Nil	Nil

Calculation of Overhead Under / Over Absorbed

Production Department	Filling) (₹)	Sealing (₹)
Overheads incurred (c)	1,08,317	53,483
Overheads absorbed (b)	1,02,560	50,375
Under absorbed	5,757	3,108

Disposal of Over / Under Absorption of Overheads

When a pre-determined overhead rate is adopted for recovery of overhead, it is very common that there is under absorption or over absorption of overhead.

Under / over absorption of overheads can be disposed of, in **three** ways :

1. Transfer to Costing Profit and Loss Account
2. Use of supplementary rate
3. Carry forward to next period

1. Transfer to Costing Profit and Loss Account

Under this method any under / over absorption of overheads are charged or credited to Costing Profit and Loss Account for the period. In case of under absorption, it is **debited** to Costing Profit and Loss Account. In case of over absorption, it is **credited** to Costing Profit and Loss Account.

2. Use of Supplementary Rate

Under this method a supplementary overhead rate is calculated by taking into consideration under absorbed / over absorbed overhead and base for calculation of original overhead rate (e.g., labour hours, machine hours, number of products). Supplementary rate is calculated as follows :

$$\text{Supplementary Rate} = \frac{\text{Actual Overhead} - \text{Overhead Absorbed}}{\text{Base (Machine hour, labour hour, etc.)}}$$

Generally, supplementary overhead rate is computed at the end of each month and it is used to adjust the value of finished product / job, WIP of the concerned period.

The main advantage of this method is that the entire overhead of the period is charged to products produced during that period.

This method is ineffective when the net amount of over / under absorbed overhead is computed at the end of the accounting period because it is too late to recompute all the costs by using supplementary overhead rate.

3. Carry Forward to Next Period

Under this method net amount of under / over absorbed overhead is carried forward to next period. This method is not scientific and almost all companies *avoid* this method.

Disposal of Under / Over Absorption of Overhead : Which Method ?

Accounting Standard of most countries recommend that the over / under absorption of overheads should be regarded as a period cost adjustment and it should be charged to or credited to Costing Profit and Loss Account of the concerned period.

Illustration 45

Your company uses a historical cost system and applies overheads on the basis of predetermined rates. The following are the figures from the Trial Balance as at 30.9.2010 :

Manufacturing overheads	4,26,544	Dr.
Manufacturing overheads applied	3,65,904	Cr.
Work-in-progress	1,41,480	Dr.
Finished goods stocks	2,30,732	Dr.
Cost of goods sold	8,40,588	Dr.

Give two methods for the disposal of the unabsorbed overheads and show the profit implications of each method.

[C.A. (Inter) – Adapted]

Solution

Actual manufacturing overheads	₹ 4,26,544
Less: Manufacturing overheads applied	₹ 3,65,904
Under absorption of overheads	₹ 60,640

Two methods of disposal of unabsorbed overheads are :

- Transfer to Costing Profit and Loss Account of the years.
- Use of supplementary rate.

(a) Transfer to Costing Profit and Loss Account

₹ 60,640 unabsorbed manufacturing overheads will be charged to Costing Profit and Loss Account. The profits for the period will be *reduced* by ₹ 60,640.

(b) Use of Supplementary Rate

A supplementary overhead recovery rate may be calculated by using available data. Generally, direct labour hours or machine hours or number of units produced are used as base for calculating supplementary overhead rate. However, in this problem none of these are available. Therefore, we will use here total cost of goods produced. The supplementary rate will be :

$$= \frac{60,640}{(1,41,480 + 2,30,732 + 8,40,588)} = \frac{60,640}{12,12,800} = ₹ 0.05$$

5.76 Accounting for Overheads

Additional overhead to be charged to :

	₹
(i) Work-in-Progress (₹ 1,41,480 × 0.05)	7,074
(ii) Finished stock (₹ 2,30,732 × 0.05)	11,537
(iii) Cost of goods sold (₹ 8,40,588 × 0.05)	<u>42,029</u>
	<u>60,640</u>

If this method is adopted, profit will be **reduced** by ₹ 42,029 (cost of goods sold will be increased by this amount).

The **revised cost** of work-in-progress will be : ₹ 1,41,480 + ₹ 7,074 = ₹ **1,48,554**.

The **revised cost** of finished goods will be : ₹ 2,30,732 + ₹ 11,537 = ₹ **2,42,269**.

Illustration 46

The total overhead expenses of a factory are ₹ 4,46,380. Taking into account the normal working of the factory, overhead was recovered in production at ₹ 1.25 per hour. The actual hours worked were 2,93,104. How would you proceed to close the books of account assuming that besides 7,800 units produced of which 7,000 were sold, there was 200 equivalent units in work-in-progress ?

On investigation, it was found that 50% of the unabsorbed overhead was on account of increase in the cost of indirect materials and indirect labour and the remaining 50% was due to factory inefficiency. Also give the profit implication of the method suggested.

[C.A. (Inter) – November, 2000]

Solution

Statement of Under Absorption of Factory Overhead during the year

Particulars	₹
Total factory overhead incurred	4,46,380
Less: Factory overhead recovered (2,93,104 × ₹ 1.25)	<u>3,66,380</u>
Under absorption of Factory Overhead	80,000

It has been given in the problem that 7,800 units were completely finished and equivalent units of WIP is 200 units. Therefore total units (equivalent) produced during the period = **8,000 units**.

Total unabsorbed overhead is ₹ 80,000. 50% of ₹ 80,000 = ₹ 40,000 was due to factory inefficiency and 50% of ₹ 80,000 = ₹ 40,000 was due to increase in the cost of indirect materials and indirect labour.

Accounting Treatment

- ₹ 40,000 unabsorbed overhead due to factory inefficiency will be charged to Costing Profit and Loss Account **directly**.
- Another ₹ 40,000 will be apportioned among work-in-progress, cost of goods sold and finished goods stock by using supplementary overhead rate. The supplementary overhead rate will be as follows :

$$\text{Supplementary Rate} = \frac{\text{Under Absorbed Overhead}}{\text{Equivalent Units Produced}} = \frac{40,000}{8,000} = ₹ 5 \text{ per unit}$$

Share of Unabsorbed Overhead :

	₹
(i) W.I.P. (200 × ₹ 5)	1,000
(ii) Cost of goods sold (7,000 × ₹ 5)	35,000
(iii) Finished goods stock (800 × ₹ 5)	<u>4,000</u>
	<u>40,000</u>

The profit will be reduced by ₹ 35,000 due to increase in cost of goods sold. Value of WIP will be increased by ₹ 1,000 and the value of finished goods stock will be increased by ₹ 4,000.

Illustration 47

ABC Ltd. manufactures a single product and absorbs the production overheads at a predetermined rate of ₹ 10 per machine hour.

At the end of financial year 2009-10 it has been found that actual production overheads incurred were ₹ 6,00,000. It included ₹ 45,000 on account of written off obsolete stores and ₹ 30,000 being the wages paid for the strike period under an award.

The production and sales data for the year 2009-10 is as under :

Production :

Finished goods	20,000 units
Work-in-progress (50% complete in all respects)	8,000 units

Sales :

Finished goods	18,000 units

The actual machine hours worked during the period were 48,000. It has been found that one-third of the under absorption of production overheads was due to lack of production planning and the rest was attributable to normal increase in costs.

You are required to :

- Calculate the amount of under absorption of production overheads during the year 2009-10; and
- Show the accounting treatment of under absorption of production overheads.

[C.A. (Inter) – Adapted]

Solution

Calculation of Under Absorption of Production Overheads during the year 2009-10

Particulars	₹	₹
Total production overhead incurred in 2009-10		6,00,000
Less: Abnormal items :		
(i) Written off obsolete stores	45,000	
(ii) Wages paid for strike period	30,000	75,000
Net Production Overhead actually incurred	(A)	5,25,000
Production overhead absorbed (48,000 x ₹ 10)	(B)	4,80,000
Under absorption of Production Overhead (A – B)		45,000

It has been given in the problem that 20,000 units were completely finished and 8,000 units were 50% complete.

Therefore, equivalent production = 20,000 + (50% of 8,000) = **24,000 units**.

Actual machine hours worked = 48,000 hours.

Time taken by each equivalent unit = 48,000 / 24,000 = **2 hours**.

It has also been given that one-third of under absorbed overheads were due to lack of production planning and the balance were attributable to normal increase in cost. The segregation will be as follows :

	₹
(1) Due to lack of production planning (1/3 of ₹ 45,000)	15,000
(2) Due to increase in cost (45,000 – 15,000)	30,000
	<u>45,000</u>

Apportionment of unabsorbed overheads of ₹ 30,000 should be made (by calculating supplementary overhead rate) over work-in-progress, finished goods and cost of sales.

$$\text{Supplementary Rate} = \frac{\text{Under Absorbed Overhead}}{\text{Machine Hour / Equivalent Units}}$$

$$= \frac{30,000}{48,000} = ₹ 0.625 \text{ per hour} \quad \text{OR} \quad = \frac{30,000}{24,000} = ₹ 1.25 \text{ per unit}$$

5.78 Accounting for Overheads

Share of :	₹
(i) Work-in-progress = 4,000 equivalent units @ ₹ 1.25 per unit OR (4,000 × 2 hours × 0.625 per hour)	5,000
(ii) Cost of goods sold = 18,000 units @ ₹ 1.25 per unit OR (18,000 × 2 hours × 0.625 per hour)	22,500
(iii) Finished goods stock (20,000 – 18,000) = 2,000 units @ ₹ 1.25 per unit	<u>2,500</u>
	<u>30,000</u>

Accounting Treatment :

- (1) Under absorption due to production planning ₹ 15,000 will be charged to **Profit and Loss Account**.
- (2) ₹ 5,000 will be **added** with the value of work-in-progress.
- (3) ₹ 22,500 will be **added** with the cost of goods sold. Profits will be reduced by ₹ 22,500.
- (4) ₹ 2,500 will be **added** with the cost of finished goods stock.

The journal entry will be :

Profit and Loss Account	Dr.	₹ 15,000	
Work-in-Progress Account	Dr.	₹ 5,000	
Finished Goods Stock Account	Dr.	₹ 2,500	
Cost of Goods Sold Account	Dr.	₹ 22,500	
To Production Overhead Control Account			₹ 45,000
(Being the disposal of under absorbed production overhead)			

Absorption of Production Overheads and Production Capacity

Cost Accounting Standard on 'Production and Operation Overhead' (CAS-3) (Revised 2015) states that :

- (a) The variable production or operation overheads shall be absorbed to products or services based on actual production [para 6.3.1].
- (b) The fixed production or operation overheads shall be absorbed based on the normal capacity. [para 6.3.2].

In respect of the above, the meaning of : (1) Maximum capacity; (2) Practical capacity; (3) Normal capacity, and (4) Actual capacity are extremely important.

- (1) **Maximum Capacity** : Maximum capacity is the capacity upto which a plant or a group of machines constituting manufacturing unit can be worked theoretically if there is no idle time. It is to be noted that maximum capacity is purely notional and has *no bearing in the calculation of absorption of overheads*.
- (2) **Practical Capacity** : Practical capacity is the capacity which an organization can sustain month after month. It is calculated after taking into consideration all possible normal loss such as time loss due to repair and maintenance, break-down, labour shortage, materials shortage, etc. It is to be noted that practical capacity is not determined by the ability to sell but by the ability to produce after taking all normal limiting factors (such as materials, labour, etc.) into consideration.
- (3) **Normal Capacity** : Normal capacity is the capacity which is calculated after deducting *idle capacity* from practical capacity. Idle capacity may arise from long term sales trend. Normal capacity is the *average capacity* utilization based on period sufficiently long (e.g., four to five years)
- (4) **Actual Capacity** : Actual capacity is the capacity which has been achieved during the current period.

Illustration 48

A manufacturing unit produces electronic circuits @ 6 pieces per hour. The unit works in single shift of 8 hours during a six-day week and remain closed for 18 days a year on account of holidays. Average idle hours per month is 20 for cleaning and maintenance of equipments.

Average annual output of 12,000 pieces during last ten years were achieved. Actual output achieved during the year was 10,800 pieces.

You are required to calculate :

- Maximum capacity;
- Practical capacity;
- Normal capacity; and
- Actual capacity in terms of hours.

[I.C.W.A. (Inter) – Adapted]

Solution

Statement Showing the Calculation of Different Capacity

S.N.	Capacity	Calculation		Hours
1.	Maximum Capacity	Total number of days in a year x Working hours per day [365 x 8]		2,920
2.	Practical Capacity	Maximum Capacity in a year (hours) Less: Idle time in a year: (i) Sunday (52 x 8 hours) 416 (ii) Holidays (18 x 8 hours) 144 (iii) Cleaning and Maintenance (12 x 20 hours) 240	2,920 800	 2,120
3.	Normal Capacity	Average annual output ÷ Output per hour [12,000 units ÷ 6]		2,000
4.	Actual Capacity	Actual output ÷ Output per hour for the year [10,800 ÷ 6]		1,800

Illustration 49

The standard departmental overhead rate is ₹ 15 per hour. Based on the following details provided to you, work out the activity level at which the overhead rate has been fixed.

Activity Level

6,000 hours
8,000 hours
10,000 hours

Overhead Allowance

₹ 1,20,000
₹ 1,44,000
₹ 1,68,000

[I.C.W.A. (Inter) – Adapted]

Solution

Calculation of Variable and Fixed Overhead

Activity Level	Overhead Allowance
8,000 hours	₹ 1,44,000
6,000 hours	₹ 1,20,000
Change 2,000 hours	₹ 24,000

$$\text{Variable Overhead} = \frac{\text{Change in Overhead Allowance}}{\text{Change in Activity Level}} = \frac{24,000}{2,000} = ₹ 12 \text{ per hour}$$

Taking activity level 6000 hours, the fixed overhead will be :

$$₹ 1,20,000 - (6,000 \times 12) = ₹ 1,20,000 - 72,000 = ₹ 48,000.$$

It has been given that standard departmental overhead rate is ₹ 15. We have calculated that variable overhead rate per hour is ₹ 12. Therefore, **fixed overhead per hour is ₹ 3** (₹ 15 – ₹ 12).

Since total fixed overhead is ₹ 48,000, the activity level should be : ₹ 48,000 / ₹ 3 = **16,000 hours**.

Illustration 50

PQR Ltd. has its own power plant, which has two users, Cutting Department and Welding Department. When the plans were prepared for the power plant, top management decided that its practical capacity should be 1,50,000 machine hours. Annual budgeted practical capacity fixed costs are ₹ 9,00,000 and budgeted variable costs are ₹ 4 per machine hour. The following data are available :

5.80 Accounting for Overheads

	Cutting Department	Welding Department	Total
Actual Usage in 2002–03 (Machine hours)	60,000	40,000	1,00,000
Practical capacity for each department (Machine hours)	90,000	60,000	1,50,000

Required:

- Allocate the power plant's cost to the cutting and welding department using a single rate method in which the budgeted rate is calculated using practical capacity and costs are allocated based on actual usage.
- Allocate the power plant's cost to the cutting and welding departments, using the dual rate method in which fixed costs are allocated based on practical capacity and variable costs are allocated based on actual usage.
- Allocate the power plant's cost to the cutting and welding departments, using the dual rate method in which the fixed cost rate is calculated using practical capacity, but fixed costs are allocated to the cutting and welding department based on actual usage. Variable costs are allocated based on actual usage.
- Comment on your results in requirements (i), (ii) and (iii).

[C.A. (Inter) – May, 2003]

Solution

(i) Statement Showing the Allocation of Power Plant's Cost to Cutting and Welding Departments by Using Single Rate Method on Actual Usage of Machine Hours

Particulars	Department		Total (₹)
	Cutting (₹)	Welding (₹)	
Power Plant's Cost allocated on the basis of single overhead rate (Note 2) based on actual machine hours used	6,00,000 (60,000 × ₹ 10)	4,00,000 (40,000 × ₹ 10)	10,00,000

Working Notes :

(1) Calculation of Fixed Overhead Rate based on Practical Capacity

$$\text{Fixed Overhead Rate} = \frac{\text{Budgeted Fixed Cost}}{\text{Practical Capacity}} = \frac{9,00,000}{1,50,000} = ₹ 6$$

(2) Budgeted Overhead (Single) rate per machine hour (using Practical Capacity)

= Fixed overhead rate based on practical capacity + Budgeted variable cost per machine hour
= ₹ 6 + ₹ 4 = ₹ 10.

(ii) Statement Showing the Allocation of Power Plant's Cost to Cutting and Welding Departments by Using Dual Rate Method

Particulars	Department		Total (₹)
	Cutting (₹)	Welding (₹)	
(i) Fixed overhead cost @ ₹ 6 on Practical Capacity (Note 1)	5,40,000	3,60,000	9,00,000
(ii) Variable overhead cost @ ₹ 4 on actual usage of machine hours (Note 2)	2,40,000	1,60,000	4,00,000
Total	7,80,000	5,20,000	13,00,000

Working Notes:

(1) Fixed Overhead Costs :

Cutting Department : 90,000 × ₹ 6 = ₹ 5,40,000
Welding Department : 60,000 × ₹ 6 = ₹ 3,60,000

(2) Variable Overhead Costs :

Cutting Department : 60,000 × ₹ 4 = ₹ 2,40,000
Welding Department : 40,000 × ₹ 4 = ₹ 1,60,000

(iii) Statement Showing the Allocation of Power Plant's Cost to Cutting and Welding Departments by using Dual Rate Method (Based on Actual Usage)

Particulars	Department		Total (₹)
	Cutting (₹)	Welding (₹)	
(i) Fixed Overhead Cost @ ₹ 6 on actual usage of machine hour (Note 1)	3,60,000	2,40,000	6,00,000
(ii) Variable Overhead Cost @ ₹ 4 on actual usage of machine hour (Note 2)	2,40,000	1,60,000	4,00,000
Total	6,00,000	4,00,000	10,00,000

Working Notes:

(1) Fixed Overhead Costs :

Cutting Department : $60,000 \times ₹ 6 = ₹ 3,60,000$

Welding Department : $40,000 \times ₹ 6 = ₹ 2,40,000$

(2) Variable Overhead Costs :

Cutting Department : $60,000 \times ₹ 4 = ₹ 2,40,000$

Welding Department : $40,000 \times ₹ 4 = ₹ 1,60,000$

(iv) Comments

In requirement (i), single rate has been used and overhead has been allocated on the basis of actual machine hours used. The main advantage of this approach is that the user departments are allocated fixed capacity cost on the basis of actual usage. Unused capacity cost of ₹ 3,00,000 [$₹ 6 (1,50,000 - 1,00,000)$] can be identified easily.

In requirement (ii), overhead has been allocated on the basis of practical capacity. It is not possible to identify the unused capacity cost.

In requirement (iii), overhead has been allocated on the basis of actual usage. Unused capacity cost ₹ 3,00,000 can be identified easily.

Special Problems

Illustration 51

Modern Funitures (P) Ltd. manufactures quality furniture as per customer's order. It has three production departments – A, B and C and two service departments X and Y.

Budgeted overhead cost for the year 2017 are as follows :

	₹
Rent and Rates	64,000
Machine Insurance	30,000
Depreciation	90,000
Production Supervisor's Salaries	1,20,000
Telephone Charges	16,000
Lighting	32,000

The following information is available in respect of production departments as well as service departments.

	Departments				
	A	B	C	X	Y
Floor area occupied (sq.m.)	3,000	1,800	600	600	400
Value of the machine (₹ '000)	120	50	40	20	10
Direct labour hours budgeted	3,200	1,800	1,000	—	—
Labour rate per hour	₹ 38	₹ 35	₹ 34	₹ 30	₹ 30
Estimated telephone calls	3,000	1,800	600	600	400
Allocated Overheads :					
Specific to each department (₹ '000)	14	8.5	6	4	3
Service department X's Overhead apportioned	50%	25%	25%	—	—
Service department Y's Overhead apportioned	20%	30%	50%	—	—

5.82 Accounting for Overheads

You are required to prepare : (i) A statement showing the overhead cost budgeted for each department. Also calculate suitable overhead absorption rates; and (ii) Two pieces of furniture are to be manufactured for customers. Direct costs are as follows :

	Computer Table	Dressing Table
Direct materials	₹2,770	₹2,540
Direct labour	20 hours Dept. A 12 hours Dept. B 10 hours Dept. C	16 hours Dept. A 10 hours Dept. B 14 hours Dept. C

Calculate total cost of each table.

(iii) If the firm quotes prices to customers that reflect a required profit of 25% on selling price, calculate quoted selling price of each table.

Solution

Primary Distribution

Statement Showing the Distribution of Overhead to Production and Service Departments

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Production Departments			Service Departments	
				A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Rent and Rates	Floor area occupied	15:9:3:3:2	64,000	30,000	18,000	6,000	6,000	4,000
Machine Insurance	Value of machine	12:5:4:2:1	30,000	15,000	6,250	5,000	2,500	1,250
Depreciation	Value of machine	12:5:4:2:1	90,000	45,000	18,750	15,000	7,500	3,750
Prod. Supervisor's Salary	Direct labour hour	16:9:5:0:0	1,20,000	64,000	36,000	20,000	–	–
Telephone Charges	Estimated Tel. calls	15:9:3:3:2	16,000	7,500	4,500	1,500	1,500	1,000
Lighting	Floor area occupied	15:9:3:3:2	32,000	15,000	9,000	3,000	3,000	2,000
Allocated Overheads			35,500	14,000	8,500	6,000	4,000	3,000
			3,87,500	1,90,500	1,01,000	56,500	24,500	15,000

Secondary Distribution

Re-apportionment of Service Department Overhead Costs to Production Departments

Particulars	Basis	Total (₹)	Production Departments			Service Departments	
			A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Departmental Overhead		3,87,500	1,90,500	1,01,000	56,500	24,500	15,000
Re-distribution of Overhead of X Department	A:B:C (50%:25%:25%)		12,250	6,125	6,125	(24,500)	–
Re-distribution of Overhead of Y Department	A:B:C (20%:30%:50%)		3,000	4,500	7,500	–	(15,000)
		(A)	2,05,750	1,11,625	70,125	Nil	Nil
Budgeted Labour Hours		(B)	3,200	1,800	1,000		
Overhead Absorption Rate (A ÷ B)*			64.30 (approx.)	62.01 (approx.)	70.13 (approx.)		

* From the available information, overhead absorption rate based on Direct Labour Hour can only be calculated.

(ii) Calculation of Cost of Each Table

Particulars	Computer Table	Dressing Table
Direct Materials	2,770	2,540
Direct Labour :		
Department A @ ₹ 38 per hour	760	608
Department B @ ₹ 35 per hour	420	350
Department C @ ₹ 34 per hour	340	476
Prime Cost	4,290	3,974

Production Overhead :		
Department A @ ₹ 64.30 per hour	1,286	1,029
Department B @ ₹ 62.01 per hour	744	620
Department C @ ₹ 70.13 per hour	701	982
Total Cost of Production	7,021	6,605

(iii) Calculation of Selling Price

Particulars	Computer Table	Drawing Table
Cost	7,021	6,605
Add: Profit 25% of Selling Price, i.e., 1/3 of Cost	2,340	2,202
Selling Price	9,361	8,807

Illustration 52

A company has two production departments and two service departments. The data relating to a period are as follows :

		Production Department		Service Department	
		PD1	PD2	SD1	SD2
Direct materials	(₹)	80,000	40,000	10,000	20,000
Direct wages	(₹)	95,000	50,000	20,000	10,000
Overheads	(₹)	80,000	50,000	30,000	20,000
Power requirement at normal capacity operations	(Kwh)	20,000	35,000	12,500	17,500
Power consumption during the period	(Kwh)	13,000	23,000	10,250	10,000

The power requirement of these departments are met by a power generation plant. The said plant incurred an expenditure which is not included above, of ₹ 1,21,875 out of which a sum of ₹ 84,375 was variable and the rest fixed.

After apportionment of power generation plant costs to the four departments, the service department overheads are to be redistributed on the following basis:

	PD1	PD2	SD1	SD2
SD1	50%	40%	—	10%
SD2	60%	20%	20%	—

You are required to:

- Apportion the power generation plant costs to the four departments.
- Re-apportion service department cost to production departments.
- Calculate the overhead rates per direct labour hour of production departments, given the direct wage rates of PD1 and PD2 are ₹ 5 and ₹ 4 per hour respectively.

[D.U.B.Com. (Hons.) – 2005], [C.A. (Inter) – Adapted]

Solution

Primary Distribution

Allocation and Apportionment of Power Generation Costs to Departments

Particulars	Basis	Total (₹)	Production Department		Service Department	
			PD1 (₹)	PD2 (₹)	SD1 (₹)	SD2 (₹)
1. Fixed Expenses	Normal Capacity (4:7:2.5:3.5)	37,500	8,824	15,441	5,515	7,720
2. Variable Expenses	Power Consumption (13:23:10.25:10)	84,375	19,500	34,500	15,375	15,000
		1,21,875	28,324	49,941	20,890	22,720

5.84 Accounting for Overheads

Statement Showing the Total Overheads of Each Department

Particulars	Basis	Total (₹)	Production Department		Service Department	
			PD1 (₹)	PD2 (₹)	SD1 (₹)	SD2 (₹)
Direct Materials (Note 1)	Direct	30,000	–	–	10,000	20,000
Direct Wages (Note 1)	Direct	30,000	–	–	20,000	10,000
Power Generation Cost	As per above Table	1,21,875	28,324	49,941	20,890	22,720
Allocated Overheads	Given	1,80,000	80,000	50,000	30,000	20,000
Total Departmental Overheads		3,61,875	1,08,324	99,941	80,890	72,720

Secondary Distribution

Re-apportionment of Service Department Overheads to Production Departments

Particulars	Total (₹)	Production Department		Service Department	
		PD1 (₹)	PD2 (₹)	SD1 (₹)	SD2 (₹)
Total departmental overheads	3,61,875	1,08,324	99,941	80,890	72,720
Re-distribution of overheads of Dept. SD1 (Note 2)		48,691	38,953	(97,382)	9,738
Re-distribution of overheads of Dept. SD2 (Note 2)		49,475	16,491	16,492	(82,458)
Total	3,61,875	2,06,490	1,55,385	Nil	Nil

(iii) Calculation of Overhead Rates per Direct Labour Hour

Particulars	PD1 (₹)	PD2 (₹)
Direct Wages (₹) (A)	95,000	50,000
Direct Wages rate per hour (B)	5	4
Direct Labour Hour [(A) / (B)] (C)	19,000	12,500
Total Overheads (₹) (D)	2,06,490	1,55,385
Overhead Rate per Direct Labour Hours [(D)/(C)]	10.87	12.43

Working Notes :

(1) Direct materials and direct wages of production departments PD1 and PD2 will be shown under Prime Cost. Any expenses of service department (direct or indirect) will be a part of overhead.

(2) Let, the total overhead of SD1 = x
and the total overhead of SD2 = y

$$x = ₹ 80,890 + 20\% \text{ of } y \quad \dots (1)$$

$$y = ₹ 72,720 + 10\% \text{ of } x \quad \dots (2)$$

OR

$$x - 0.2y = ₹ 80,890 \quad \dots (3)$$

$$-0.1x + y = ₹ 72,720 \quad \dots (4)$$

Multiplying, equation (3) by 1 and equation 4 by 10 we get,

$$x - 0.2y = ₹ 80,890$$

$$-x + 10y = ₹ 7,27,200$$

$$\underline{\underline{9.8y = 8,08,090}} \quad (\text{Adding we get})$$

$$\text{Therefore, } y = (₹ 8,08,090 \div 9.8) = ₹ 82,458.$$

Substituting the value of y in equation (1) we get :

$$x = ₹ 80,890 + 20\% \text{ of } ₹ 82,458 = ₹ 97,382.$$

Finally,

$$\text{Total overheads of SD1} = ₹ 97,382$$

$$\text{Total overheads of SD2} = ₹ 82,458$$

Overheads of Service Department SD1

will be redistributed as follows:

	₹
PD1 – 50% of ₹ 97,382	48,691
PD2 – 40% of ₹ 97,382	38,953
SD2 – 10% of ₹ 97,382	9,738
	<u>97,382</u>

Overheads of Service Department SD2

will be distributed as follows :

	₹
PD1 – 60% of ₹ 82,458	49,475
PD2 – 20% of ₹ 82,458	16,491
SD1 – 20% of ₹ 82,458	16,492
	<u>82,458</u>

Cost Center Machine Hour Rates

So far, we have seen that, if the work in the production department is largely labour-intensive, the direct labour hour rate or direct labour cost method is used to recover the departmental overhead. Similarly, if work in the production department is machine dominated the machine hour rate is used to recover departmental overhead. In this case, overhead is calculated for each **production department separately** on the basis of its nature of work.

In recent years the picture has changed. The rapid growth of technology, computerisation of production line and manufacturing of different products from same facility are demanding more appropriate method of recovering overhead.

A single overhead rate for entire production department can be considered inappropriate for current production methods. This system of recovery of overhead may result in distorted product costs, thereby leading to wrong calculation of selling price and loosing of customers.

At present, many companies are calculating **separate** overhead rates for different **cost centers** within the production department. Main objective of such subdivision is to achieve more accurate product costing.

For example, in Maruti car factory at Gurgaon, Haryana, India there are different production departments such as machining, assembly, paint shop, etc. Take the case of paint shop. In the paint shop there are different painting machines – one for plain painting, one for metallic painting and one for Teflon coating. All models of car are not using same painting machine. Low cost models are being painted with plain paint and high cost models are being painted with metallic paint (extra cost may vary from ₹ 5,000 to ₹ 10,000 per car). In some top models, Teflon coating are used (again at an extra cost of ₹ 3,000 to ₹ 5,000). Now if we use one single overhead recovery rate for the entire paint shop department, the burden of overhead on low cost models will be more in comparison with high cost models or top models. This may lead to wrong pricing.

To avoid this problem, a separate machine hour rate is calculated for each machine within the department. Each machine is treated as a **cost centre** and common costs of the department are distributed on the basis of some logical base.

For the purpose of control and management of costs, different expenses are classified into two categories:

- (i) Standing charges
- (ii) Running expenses

Standing Charges

Standing charges are fixed in nature and it will not vary in total (generally) with the hours worked. **Examples are:**

(i) Rent, rates and taxes	(vi) Foremen's salary
(ii) Electricity expenses for lighting and airconditioning	(vii) Depreciation on factory building
(iii) Supervision expenses	(viii) Indirect wages
(iv) Insurance premium	(ix) Consumable stores, etc.
(v) Apportioned overheads	

Running Expenses

Running expenses are incurred for running the machine. All these expenses are variable in nature in most of the cases. Examples are:

- (i) Power
- (ii) Repairs and maintenance
- (iii) Operator's salary and wages
- (iv) Depreciation on machinery

There is difference of opinion in respect of **depreciation**. Many authors prefer to include it under running expenses. Others consider it as a standing charge. Truly speaking, depreciation is partly depending on lapse of time and partly depending on the extent of use (e.g., if a machine is used for triple shift, the depreciation will be more than if it is used for single shift). In all **Illustrations**, depreciation has been included under **running expenses** unless it has been specifically asked to include it under standing charges.

Different expenses are allocated and apportioned to different cost centers as follows:

	Expenses	Basis
1.	Rent, Rates and Taxes	Area occupied by each cost center
2.	Lighting	Light points / area occupied
3.	Air conditioning	Cubic area
4.	Insurance premium for assets	Value of the assets of each cost center
5.	Group insurance premium for employees	No of employees in each cost center
6.	Supervision	Time devoted in each cost center
7.	Indirect wages	Direct wages
8.	Power	H.P. of each machine
9.	Depreciation	Value of assets
10.	Operator's salary	Time spent in each machine

Computation of Machine Hour Rate

Generally a separate rate is calculated after taking **all** standing charges into consideration. A separate rate is calculated for **each** item of running expenses. Final machine hour rate is calculated by adding standing charges rate and individual rate of each running expenses.

Types of Machine Hour Rate

Three types of machine hour rate is calculated according to situation:

- (i) Pure machine hour rate
- (ii) Comprehensive machine hour rate
- (iii) Group machine hour rate

Pure Machine Hour Rate: When pure machine hour rate is calculated, only indirect expenses relating to machine running are taken into consideration. No other costs (such as wages of operator, rent of the space occupied by the machine etc.) are taken into consideration. This machine hour rate is not very popular and rarely it is used.

Comprehensive Machine Hour Rate: When comprehensive machine hour rate is calculated, not only indirect expenses relating to machine running are taken into consideration but also all other expenses related to machine are taken into consideration. These are:

- (i) Wages and salaries of operators
- (ii) Rent, rates and taxes of the space occupied by the machine
- (iii) Supervision cost, etc.

Comprehensive machine hour rate is very widely used.

Group Machine Hour Rate : In this case, entire group of machine is treated as a cost center and machine hour rate is calculated by taking all expenses of that group of machines. Generally, comprehensive machine hour rate for a group of machines is calculated.

A format for computation of machine hour rate is given below:

Statement Showing Computation of Machine Hour Rate

Expenses	Per year / Per month	Per hour
(A) Standing Charges:		
(i) Rent, Rates, Taxes	***	
(ii) Lighting	***	
(iii) Supervision	***	
(iv) Insurance Premium	***	
(v) Depreciation on Factory Building	***	***
(B) Running Expenses:		
(i) Power		***
(ii) Repairs and Maintenance		***
(iii) Depreciation on Machinery		***
(iv) Operator's Salary and Wages		***
Machine Rate per Hour = $\frac{\text{Total Overheads}}{\text{Effective Machine Hours}^*}$		

***Calculation of Effective Machine Hours**

Normal Machine Hour per year / per month		***
Less: (i) Normal idle time	***	
(ii) Loss of time due to normal repairs and maintenance	***	
(iii) Setting up time	***	
(iv) Absenteeism Hours	***	***
Effective Hours		***

Illustration 53

From the particulars furnished below, compute the Machine Hour Rate:

	₹
Cost of machine	90,000
Cost of installation	10,000
Scrap value at the end of 10 years	5,000
Indirect wages and materials for the machine	500 per year
Supervision cost for four similar machines	16,000 per year
Insurance premium for the machine	200 per quarter
Rent of the machine shop	400 per month
Electricity cost for the machine shop	100 per month

Power consumption of the machine is 20 units per actual working hour. Power cost is R 4 per unit. The total area of the machine shop is 600 sq.mt. of which this machine occupies only 150 sq.mt.

There are 200 light points in the machine shop of equal wattage of which this machine utilizes only 40 points.

It is estimated that the machine will normally work for 2,700 hours in a year, but it is apprehended that the machine will remain idle for 200 hours.

5.88 Accounting for Overheads

Solution Statement Showing the Computation of Machine Hour Rate

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Insurance (₹ 200 x 4)	800	
Supervision (₹ 16,000 ÷ 4)	4,000	
Rent [(₹ 400 x 12) / 600 x 150]	1,200	
Electricity [(₹ 100 x 12) / 200 x 40]	240	
Total (A)	6,240	
Effective Machine Hours (Note 1) (B)	2,500	
Standing Charges per hour (A ÷ B)		2.50
Running Expenses:		
Power (20 x ₹ 4)		80.00
Depreciation [(₹ 90,000 + 10,000 – 5,000) / 10 / 2,500]		3.80
Indirect Wages and Materials (₹ 500 / 2,500)		0.20
Machine Hour Rate		86.50

Working Note: (1) Calculation of Effective Working Hours

Normal working hours	2,700
Less: Normal idle time	<u>200</u>
Effective working hours	<u>2,500</u>

Illustration 54

A machine was purchased on 1st January, 2018 for ₹ 5 lakhs. The total cost of all machinery inclusive of the new machine was ₹ 75 lakhs. The following further particulars are available:

Expected life of the machine 10 years.

Scrap value at the end of 10 years ₹ 5,000.

Repairs and maintenance for the machine during the year ₹ 2,000.

Expected number of working hours of the machine per year 4,000 hours.

Insurance premium annually for all machines ₹ 4,500.

Power consumption for the machine per hour 25 units @ ₹ 4 per unit.

Area occupied by the machine 100 sq.ft.

Area occupied by other machines 1500 sq.ft.

Rent per month of the department ₹ 800.

Lighting charges for 20 points for the whole department out of which three points are for the new machine ₹ 120 per month. Using the data, calculate machine hour rate for the new machine.

Solution Statement Showing the Computation of Machine Hour Rate

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Insurance Premium [(₹ 4,500 / 75) x 5]	300	
Rent [(₹ 800 x 12) / (1,500 + 100) x 100]	600	
Lighting [(₹ 120 x 12) / 20] x 3]	216	
Total (A)	1,116	
Effective Machine Hours (B)	4,000	
Standing Charges per hour (A ÷ B)		0.279
Running Expenses:		
Depreciation [(₹ 5,00,000 – ₹ 5,000) / 10] / 4,000		12.375
Repairs and Maintenance (₹ 2,000 / 4,000)		0.500
Power (25 x ₹ 4)		100.000
Machine Hour Rate		113.154

Illustration 55

The following information is made available from the costing records of a factory:

(i) The original cost of the machine	₹ 1,00,000
Estimated life	10 years
Residual value	₹ 5,000

Factory operates for 48 hours per week – 52 weeks in a year. Allow 15% towards machine maintenance downtime. 5% may be allowed as setting up time

- (ii) Electricity used by the machine is 10 units per hour at a cost of ₹ 4 per unit.
- (iii) Repairs and maintenance cost is ₹ 500 per month.
- (iv) Two operators attend the machine during operation along with two other machines. Their total wages, including fringe benefits, amount to ₹ 5,000 per month.
- (v) Other overheads attributable to the machine are ₹ 10,431 per year.

Using the above data, calculate machine hour rate.

[B.Com. (Hons.) Delhi – 2000]

Solution

Statement Showing the Computation of Machine Hour Rate

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Attributable Overhead (A)	10,431	
Effective Hours (Note 1) (B)	1,997	
Standing Charges per Hour		5.223
Running Expenses:		
Operators' Wages $[(₹ 5,000 \times 12) / 3] / 1,997$ (Note 2)		10.015
Depreciation $[(₹ 1,00,000 - ₹ 5,000) / 10] / 1,997$		4.757
Repairs and Maintenance $(₹ 500 \times 12) / 1,997$		3.005
Electricity $(10 \times ₹ 4)$		40.000
Machine Hour Rate		63.000

Working Notes:

(1) Calculation of Effective Working Hours

Normal hours per annum (48×52)	2,496	hours
Less: 15% maintenance time	374	
Less: 5% for setting time	125	499
Effective working hours	1,997	hours

- (2) It is to be noted that two operators are looking after 3 (1 + 2) machines in total. Therefore, total wages of operators are to be divided among 3 machines.

Illustration 56

From the following particulars calculate the Machine Hour Rate:

Cost of machine	₹ 2,00,000
Installation charges	₹ 20,000
Rent of the shop per month	₹ 3,000
Insurance premium for the machine per annum	1% of capital cost
Electricity charges for the shop per annum	₹ 300
Repairs and maintenance per month	0.5% of capital cost
Supervisor's salary per month	₹ 1,800
Rate of power charges for 100 units (the machine consumes 16 units of power per hour)	₹ 400

The machine occupies 1/3rd of the shop area. Its life is 10 years and anticipated scrap value is ₹ 10,000. The supervisor devotes 1/4th of his time to the machine. Estimated idle time : 50 hours in a year. Normal working days during a year : 250 days of 8 hours, 50 days of 5 hours.

[C.U.B.Com. (Hons.) – Adapted]

5.90 Accounting for Overheads

Solution Statement Showing the Computation of Machine Hour Rate

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Rent [(₹ 3,000 x 12) / 3]	12,000	
Insurance premium (1% of ₹ 2,20,000)	2,200	
Electricity charges [(₹ 300 x 12) / 3]	1,200	
Supervisor's Salary [(₹ 1,800 x 12) / 4]	5,400	
Total(A)	20,800	
Effective Working Hours (Note 1) (B)	2,200	
Standing Charges per hour (A ÷ B)		9.4545
Running Expenses:		
Power [(₹ 400 / 100) x 16]		64.0000
Repairs and Maintenance [(0.5% x ₹ 2,20,000) x 12] / 2,200]		6.0000
Depreciation [(₹ 2,00,000 + ₹ 20,000 – ₹ 10,000) / 10] / 2,200]		9.5455
Machine Hour Rate		89.0000

Working Note:

(1) Calculation of Effective Working Hours

Normal working hours:	
250 days × 8 hours	2,000
50 days × 5 hours	250
	2,250
Less: Normal idle time	50
Effective working hours	2,200

Illustration 57

Three machines, P, Q and R, which are of different nature, are used in a department of a factory. From the following information, compute machine hour rate of machine R.

- Total cost of machine P, Q and R is ₹ 50,000, out of which cost of machine R is ₹ 10,000. Its estimated scrap value and working life are ₹ 1,000 and 18,000 hours respectively.
- Rent (total area 1,000 sq.ft. and machine R occupies 250 sq.ft.) ₹ 780 p.a.
- Lighting (total light points 12, out of which 2 points used for machine R) ₹ 288 p.a.
- Insurance for all machines ₹ 45 per quarter
- Consumable stores for machine R ₹ 60 per month
- Salary of supervisor (supervisor devotes 1/4th of his time for machine R) ₹ 6,000 p.a.
- Repairs and maintenance for the entire life of machine R ₹ 1,800
- Machine R consumes 5 units of power per hour at a cost of ₹ 16 per 100 units
- Machine R will work 2,000 hours p.a. out of which normal idle time estimated at 8% of total working hours and time for routine maintenance estimated at 40 hours p.a. [C.U.B.Com. (Hons.) – 2001]

Solution Statement Showing the Computation of Machine Hour Rate

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Rent (₹ 780 / 1,000 x 250)	195	
Lighting (₹ 288/12 x 2)	48	
Insurance [(45 x 4) / 50] x 10]	36	
Consumable Stores (₹ 60 x 12)	720	
Supervisor's Salary (₹ 6,000 / 4)	1,500	
Total(A)	2,499	

Effective Machine Hours (Note 1) (B)	1,800	
Standing Charges per hour (A ÷ B)		1.39
Running Expenses:		
Depreciation (₹ 10,000 – ₹ 1,000) / 18,000		0.50
Repairs and Maintenance (₹ 1,800 / 18,000)		0.10
Power (₹ 16 / 100 x 5)		0.80
Machine Hour Rate		2.79

Working Note:

(1) Calculation of Effective Working Hours

Total working hours per annum	2,000	hours
Less: Normal idle time (8% of 2,000 hours)	160	
Less: Routine maintenance	<u>40</u>	<u>200</u> hours
Effective working hours	<u>1,800</u>	hours

Illustration 58

From the following particulars compute a comprehensive machine hour rate :

- Cost of the machine ₹ 1,00,000. Estimated life: 15 years, Residual value: ₹ 10,000.
- Machine running hours: 2,040 hours per machine per annum including idle time of 40 hours due to routine repairs and maintenance and 20 hours due to break-down of machine.
- Power consumption of the machine per hour: 20 units; rate of power per 100 units : ₹ 80.
- There are two operators in the shop and wages, workmen's compensation insurance, etc., of an operator who is in charge of two machines : ₹ 12,000 p.a.
- Rent, rates and taxes of the shop : ₹ 4,800 p.a.
- Insurance premium for the machine : ₹ 400 per quarter.
- General lighting of the shop per month : ₹ 600.
- Repairs and maintenance expenses per month: ₹ 400 per machine.
- Shop Supervisor's salary per month: ₹ 1,500.
- Other factory overhead allocated to the shop : ₹ 6,000 p.a.

There are four identical machines in the machine shop. The supervisor devotes one-fifth of his time for supervising the machine.

[C.U.B.Com. (Hons.) – Adapted]

Solution Statement Showing the Computation of Comprehensive Machine Hour Rate

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Rent, Rates and Taxes (₹ 4,800 / 4)	1,200	
Insurance premium (₹ 400 x 4)	1,600	
General Lighting (₹ 600 x 12) / 4	1,800	
Shop Supervisor's Salary (₹ 1,500 x 12) / 5	3,600	
Other Factory Overhead allocated to Shop (₹ 6,000 / 4)	1,500	
Total(A)	9,700	
Effective Machine Hours (Note 1) (B)	2,000	
Standing Charges per hour (A ÷ B)		4.85
Running Expenses:		
Wages, Workmen Compensation insurance, etc. [(₹ 12,000 / 2) / 2,000]		3.00
Repairs and Maintenance (₹ 400 x 12) / 2,000		2.40
Depreciation [(₹ 1,00,000 – ₹ 10,000) / 15] / 2,000]		3.00
Power (₹ 80 / 100 x 20 units)		16.00
Machine Hour Rate		29.25

5.92 Accounting for Overheads

Working Note:

(1) Calculation of Effective Working Hours

Total working hours per annum	2,040
Less: Idle time for routine repairs and maintenance	<u>40</u>
Effective working hours	<u>2,000</u>

Note: 20 hours lost due to machine break-down will be treated as *abnormal idle time*. Therefore, it is not to be taken into consideration for calculating effective working hours.

Illustration 59

In a machine shop of a company, there are five identical machines operated by three operators. Each machine costs ₹ 1,00,000 and estimated scrap value of each of them is ₹ 10,000 after 10 years. Normal working hours available in the company is 2000 hours in a year.

The following data relate to one such machine as well as to the machine shop:

Rent of the machine shop	₹ 400 per month
Shop supervisor's salary	₹ 2000 per month
Power consumed by the machine	10 units per hour @ ₹ 2 per unit.
Insurance premium for the machine	₹ 500 per quarter
Electricity charges for the machine shop	₹ 200 per month
Repairs and maintenance for the machine	₹ 2,500 p.a.
Works overhead allocated to the machine	₹ 1,500 p.a.
Operator's salary	₹ 1,000 per month per operator

During the year, the machine remained idle for 200 hours due to routine maintenance and also for 150 hours due to shortage of materials.

Determine the comprehensive machine hour rate.

[C.U.B.Com. (Hons.) – 2006]

Solution Statement Showing the Computation of Comprehensive Machine Hour Rate

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Rent of the machine [(₹ 400 x 12) / 5]	960	
Shop Supervisor's Salary [(₹ 2,000 x 12) / 5]	4,800	
Insurance Premium for the machine (₹ 500 x 4)	2,000	
Electricity Charges for the machine [(₹ 200 x 12) / 5]	480	
Works Overhead allocated to the Machine	1,500	
Total(A)	<u>9,740</u>	
Effective Machine Hours (B)	<u>1,650</u>	
Standing Charges per hour (Note 1) (A ÷ B)		5.90
Running Expenses:		
Power (10 units @ ₹ 2 per unit)		20.00
Repairs and Maintenance (₹ 2,500 ÷ 1,650)		1.52
Depreciation (Note 3)		5.45
Operator's Salary (Note 4)		4.36
Comprehensive Machine Hour Rate		<u>37.23</u>

Working Notes:

(1) Calculation of Effective Working Hours per annum

Normal working hours per year	2,000	hours
Less: Idle hours for routine maintenance	<u>200</u>	hours
Less: Hours lost due to shortage of materials (Note 2)	<u>150</u>	hours
Effective hours	<u>1,650</u>	hours

- (2) In this case, it has been assumed that the shortage of materials is a normal phenomena and hours lost due to that is also **normal**. Therefore, it has been deducted for calculating effective hours.

If it is assumed that time lost due to shortage of materials is an abnormal loss, then the effective working hours will be $2,000 - 200 = 1,800$ hours.

(3) Depreciation per hour

	₹
Cost	1,00,000
Less: Scrap value	<u>10,000</u>
Depreciable value	<u>90,000</u>

Depreciation per annum = ₹ 90,000 / 10 = ₹ 9,000. Depreciation per hour = ₹ 9,000 ÷ 1,650 = ₹ **5.45**.

(4) Operator's salary per hour

Salary per annum per machine (₹ 1,000 × 12 × 3) / 5 = ₹ 7,200. Salary per hour = ₹ 7,200 / 1,650 = ₹ **4.36**.

Illustration 60

A machine shop has 6 identical machines manned by 5 operators. The machine cannot be worked without any operator wholly engaged on it. The original cost of all these 6 machines works out to ₹ 6 lakhs.

The following estimates are available for the year 2010:

(a) Normal working hours per month	220	hours
(b) Absenteeism (without pay) per month	20	hours
(c) Leave with pay per month	20	hours
(d) Normal idle time (unavoidable)	20	hours
(e) Average rate of wages per day of 8 hours	₹ 40	
(f) Production bonus	15%	of wages
(g) Cost of power for the period	₹ 20,700	
(h) Supervision and indirect labour cost for the year	₹ 8,100	
(i) Lighting and electricity per annum	₹ 3,070	
(j) Repairs and maintenance of machine	2%	of the value of machines p.a.
(k) Insurance charges	₹ 30,000	p.a.
(l) General management expenses as allocated for the year	₹ 84,000	
(m) Depreciation under straight line method 15% on original cost of machines		

You are required to work out a Comprehensive Machine Hour Rate for the machine shop.

[C.U.B.Com. (Hons.) – Adapted]

Solution Statement Showing the Computation of Comprehensive Machine Hour Rate

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Supervision and Indirect Wages	8,100	
Insurance Charges	30,000	
General Management Expenses	84,000	
Lighting and Electricity	3,070	
Total(A)	<u>1,25,170</u>	
Effective Machine Hours (B)	<u>9,600</u>	
Standing Charges per hour (A ÷ B)		13.03
Running Expenses:		
Wages of 5 Operators (Note 1) (₹ 60,000 / 9,600)		6.25
Production Bonus (Note 3) ₹ (9,000 / 9,600)		0.94
Power Consumed ₹ (20,700 / 9,600)		2.16
Repairs and Maintenance (Note 4) ₹ (12,000 / 9,600)		1.25
Depreciation (Note 5) ₹ (90,000 / 9,600)		9.37
Comprehensive Machine Hour Rate		<u>33.00</u>

5.94 Accounting for Overheads

Working Notes:

(1) Computation of hours, for which 5 operators are available for one year:	Hours
Normal working hours per month available per worker	220
Less: Absenteeism (without pay) per month	20
Leave with pay per month	20
Normal idle time (unavoidable)	20
	<u>60</u>
Utilised hours per month per operator	160
Total utilized hours for 5 operators for the year: 160 hours × 5 × 12 = 9,600 hours.	

It has been given that the machine cannot be worked without any operator engaged on it. Therefore, hours for which 5 operators are available for 12 months are the hours for which machine can be used. Hence, 9,600 hours represents total machine hours.

(2) Computation of Operator's Wages

Average rate of wages per day of 8 hours = ₹ 40.

Average rate of wages per hour = ₹ 40 / 8 = ₹ 5.

Hours per month for which wages is paid = Normal working hours – Absenteeism (without pay)
= 220 – 20 = **200 hours.**

Total wages paid to 5 operators for 12 months :

200 hours × 5 operators × 12 months × ₹ 5 = 200 × 5 × 12 × ₹ 5 = ₹ 60,000.

(3) **Production bonus** = 15% of wages = ₹ 60,000 × 15% = ₹ 9,000.

(4) **Repairs and maintenance** = 2% of the value of machine p.a. = 2% of ₹ 6,00,000 = ₹ 12,000.

(5) **Depreciation** (15% of ₹ 6,00,000) = ₹ 90,000.

Illustration 61

X Ltd. having fifteen different types of automatic machines furnishes information as under for 2009-10:

- Overhead expenses : Factory rent ₹ 96,000 (floor area 80,000 sq.ft.), Heat and gas ₹ 45,000 and Supervision ₹ 1,20,000.
- Wages of the operator are ₹ 48 per day of 8 hours. He attends to one machine when it is under set up and two machines while they are under operation.
In respect of machine B (one of the above machines) the following particulars are furnished:
 - Cost of machine ₹ 45,000. Life of machine 10 years and scrap value at the end of its life ₹ 5,000.
 - Annual expenses on special equipment attached to the machine are estimated at ₹ 3,000.
 - Estimated operation time of the machine is 3,600 hours while set up time is 400 hours per annum.
 - The machine occupies 5,000 sq.ft. of floor area.
 - Power costs ₹ 2 per hour while machine is in operation.

Find out the comprehensive machine hour rate of machine B. Also find out machine costs to be absorbed in respect of use of machine B on the following two work orders:

	Work order 31	Work order 32
Machine set up time (Hours)	10	20
Machine operation time (Hours)	90	180

[C.A. (Inter) – Adapted]

Solution

X Ltd.

Statement Showing the Computation of Fixed Machine Hour Rate of Machine 'B'

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Factory Rent [(₹ 96,000 / 80,000) × 5,000 sq.ft.]	6,000	
Heat and Gas (₹ 45,000 / 15)	3,000	

Supervision (₹ 1,20,000 / 15)
 Depreciation [(₹ 45,000 – ₹ 5,000) / 10]
 Annual Expenses on Special Equipment

Total(A)

Effective Machine Hours (B)

Standing Charges per hour (A ÷ B)

8,000

4,000

3,000

24,000

4,000

6.00

Statement Showing Comprehensive Set-up and Operational Rate per Hour

Particulars	Set-up Rate per hour	Operational Rate per hour
Standing Charges per Hour	6.00	6.00
Power	–	2.00
Wages of Operator	6.00	3.00
Comprehensive Machine Hour Rate	12.00	11.00

Statement Showing “B” Machine Cost to be Absorbed in Two Work Orders

Particulars	Worker Order 31			Work Order 32		
	Hours	Rate (₹)	Amount (₹)	Hours	Rate (₹)	Amount (₹)
Set-up time cost	10	12	120	20	12	240
Operation time cost	90	11	990	180	11	1,980
Total Cost			1,110			2,220

Previous Years’ C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 62

A manufacturing department has three machines. Calculate (i) Machine Hour Rate; (ii) Composite Machine Hour Rate in respect of three machines from the information given below :

	Machine A	Machine B	Machine C
Cost of Machine (₹)	5,00,000	7,00,000	3,00,000
Hours worked	2,000	5,000	2,000
Direct Wages (₹)	4,000	8,000	6,000
Power Units	40,000	20,000	60,000
Space (sq.ft.)	400	300	200
Light Points	2	3	4
No. of Workers	5	3	3

The following are the expenses incurred by the departments : (all figures in ₹)

Repairs to Machinery	4,500	Insurance of Machinery	15,000
Lighting	1,800	Indirect Wages	9,000
Power	600	Other fixed expenses	5,400
Depreciation of Machinery	15,000		

5.96 Accounting for Overheads

Solution

Statement Showing the Distribution of Overheads

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Machine		
				A (₹)	B (₹)	C (₹)
Repairs to Machinery	Cost of machines	5 : 7 : 3	4,500	1,500	2,100	900
Lighting	Light Points	2 : 3 : 4	1,800	400	600	800
Power	Power Unit	2 : 1 : 3	600	200	100	300
Depreciation of Machinery	Cost of machines	5 : 7 : 3	15,000	5,000	7,000	3,000
Insurance of Machinery	Cost of machines	5 : 7 : 3	15,000	5,000	7,000	3,000
Indirect Wages	Direct wages	2 : 4 : 3	9,000	2,000	4,000	3,000
Other Fixed Expenses	Direct wages	2 : 4 : 3	5,400	1,200	2,400	1,800
(A) Total Overhead (Excluding Direct Wages)			51,300	15,300	23,200	12,800
Direct Wages			18,000	4,000	8,000	6,000
(B) Total Overheads (Including Direct Wages)			69,300	19,300	31,200	18,800
(C) Hours Worked				2,000	5,000	2,000
(i) Machine Hour Rate		(A ÷ C)		7.65	4.64	6.40
(ii) Composite Machine Hour Rate		(B ÷ C)		9.65	6.24	9.40

Illustration 63

A department is having three machines. The figures indicate the departmental expenses. Calculate the Machine Hour Rate in respect of these machines :

Depreciation of Machinery	12,000
Depreciation of Building	2,880
Repair to Machinery	4,000
Insurance of Machinery	800
Power	6,000
Lighting	800
Indirect Wages	6,000
Miscellaneous Expenses	4,200

	Machinery		
	I	II	III
Direct Wages (₹)	1,200	2,400	2,400
Power units	30,000	10,000	20,000
No. of Workers	4	8	4
Light Points	8	24	48
Space (sq.ft.)	400	800	800
Cost of Machines (₹)	3,00,000	1,20,000	1,80,000
Hours Worked	200	300	300

[C.U.B.Com. (Hons.) – 2016]

Solution

Statement Showing the Distribution of Overheads

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Machine		
				A (₹)	B (₹)	C (₹)
Depreciation of Machinery	Cost of machines	5 : 2 : 3	12,000	6,000	2,400	3,600
Depreciation of Building	Space (sq.ft.)	2 : 4 : 4	2,880	576	1,152	1,152
Repairs to Machinery	Cost of machines	5 : 2 : 3	4,000	2,000	800	1,200
Insurance of Machinery	Cost of machines	5 : 2 : 3	800	400	160	240

Power	Power Unit	3 : 1 : 2	6,000	3,000	1,000	2,000
Lighting	Light Points	1 : 3 : 6	800	80	240	480
Indirect Wages	Direct Wages	1 : 2 : 2	6,000	1,200	2,400	2,400
Miscellaneous Expenses	Direct Wages	1 : 2 : 2	4,200	840	1,680	1,680
(A) Total Overhead (Excluding Direct Wages)			36,680	14,096	9,832	12,752
(B) Hours Worked				200	300	300
Machine Hour Rate		(A ÷ B)		70.48	32.77	42.51

[For Honours Candidates Only]

Illustration 64

Texus Ltd. has three machine cost centres — Machine A, Machine B and Machine C. The company has pre-determined factory overhead absorption rates for its machine cost centres on the basis of past result and present capacity utilisation.

Such rates applicable for the year 2008 are ₹ 8.30 per hour in Machine A, ₹ 9.50 per hour in Machine B and ₹ 9.00 per hour in Machine C.

The actual expenses incurred for the year 2008 are given below : (all figures in ₹)

Repairs to Machinery	12,000
Lighting	4,000
Indirect Materials	10,000
Depreciation on Machinery	28,000
Power	16,000
Depreciation of Factory Shed	18,000
Indirect Wages	30,000
Canteen Expenses	15,000

Other Information :

	Machine A	Machine B	Machine C
Area occupied (sq.ft.)	800	600	400
Direct Wages (₹)	50,000	40,000	30,000
Direct Materials (₹)	30,000	40,000	30,000
Value of Machinery (₹)	40,000	30,000	30,000
Light Points (Nos.)	18	10	12
Power of Machines (KWH)	200	400	200
No. of Workers	12	8	10
Actual Working Hours	6,000	5,000	4,000

You are required to :

- compute the actual machine hour rate for three machine cost centres.
- determine the over or under absorption of Factory Overhead of the machine cost centres.
- ascertain the price to be charged for a job which requires :

Direct Materials ₹ 900; Direct Wages ₹ 600.

Profit @ 20,% on selling price.

The job requires 2 hours, 4 hours and 4 hours of time in three machines respectively.

5.98 Accounting for Overheads

Solution

Statement Showing the Distribution of Overheads

Items of Overhead	Basis of Apportionment	Ratio	Total (₹)	Machine		
				A (₹)	B (₹)	C (₹)
Repairs to Machinery	Value of machinery	4 : 3 : 3	12,000	4,800	3,600	3,600
Lighting	Light Points	9 : 5 : 6	4,000	1,800	1,000	1,200
Indirect material	Direct Materials	3 : 4 : 3	10,000	3,000	4,000	3,000
Depreciation on Machinery	Value of Machinery	4 : 3 : 3	28,000	11,200	8,400	8,400
Power	KWH	1 : 2 : 1	16,000	4,000	8,000	4,000
Depreciation of Factory Shed	Area Occupied	4 : 3 : 2	18,000	8,000	6,000	4,000
Indirect Wages	Direct Wages	5 : 4 : 3	30,000	12,500	10,000	7,500
Canteen Expenses	No. of Workers	6 : 4 : 5	15,000	6,000	4,000	5,000
(A) Total Overhead			1,33,000	51,300	45,000	36,700
(B) Actual Working Hours				6,000	5,000	4,000
Machine Hour Rate (Actual)		(A ÷ B)		8.55	9.00	9.18

Calculation of Over / Under Absorption of Factory Overheads of Machine Cost Centre

Machine	Overheads		Over / (Under) Absorption ₹
	Incurred ₹	Absorbed ₹	
A	51,300	49,800 (Note 1)	(1,500)
B	45,000	47,500 (Note 1)	2,500
C	36,700	36,000 (Note 1)	(700)
Total	1,33,000	1,33,300	300

Working Notes :

(1) Overhead Absorbed = Pre-determined Overhead Rate × Actual Hours

$$A : ₹ 8.30 \times 6,000 = ₹ 49,800$$

$$B : ₹ 9.50 \times 5,000 = ₹ 47,500$$

$$C : ₹ 9.00 \times 4,000 = ₹ 36,000$$

Cost Sheet

Particulars	(₹)	(₹)
Direct Materials		900.00
Direct Wages		600.00
Prime Cost		1,500.00
Factory overheads :		
A : 2 x 8.55	17.10	
B : 4 x 9.00	36.00	
C : 4 x 9.18	36.72	89.82
Works Cost / Cost of Production		1,589.52
Profit 20% of Sales (or 25% of Cost of Production)		397.48
Price to be charged		1,987.00

Illustration 65

From the following information, calculate the comprehensive machine hour rate of a machine installed in a department :

(i) Cost of the machine	₹ 90,000.
(ii) Customers duty and freight paid for the machine	₹ 10,000.
(iii) Estimated life	15 years
(iv) Residual value	₹ 10,000

- (v) Machine running hours : 2040 hours per annum including idle time of 40 hours due to routine repairs and maintenance and 20 hours due to break-down of machine.
- (vi) Power consumption of the machine per hour is 10 units; rate of power per 100 units is ₹ 60.
- (vii) There are two operators in the shop and wages of an operator who is in charge of two machines is ₹ 12,000 p.a.
- (viii) Rent, rates and taxes of the shop ₹ 400 p.m.
- (ix) Insurance premium for the machine ₹ 400 per quarter.
- (x) General lighting of the shop ₹ 600 p.m.
- (xi) Shop supervisor's salary ₹ 1,500 p.m.
- (xii) Repairs and maintenance expenses per machine ₹ 400 p.m.
- (xiii) Other fixed factory overhead allocated to the shop ₹ 6,000 p.a.

There are four identical machines in the shop. The supervisor devotes one-fifth of his time of supervising the machine.

[C.U.B.Com. (Hons.) – 2010, 2016]

Solution Statement Showing the Computation of Comprehensive Machine Hour Rate		
Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Rent, Rates and Taxes $(400 \times 12) \div 4$	1,200	
Insurance Premium (400×4)	1,600	
General Lighting $(600 \times 12) \div 4$	1,800	
Shop Supervisor's Salary $(1,500 \times 12) \div 5$	3,600	
Other Factory Overheads allocated to Shop $(6,000 \div 4)$	1,500	
Total(A)	9,700	
Effective Machine Hours (B) (Note 1)	2,000	
Standing Charges per hour $(A \div B)$		4.85
Running Expenses:		
Wages of Operator $[(12,000 \div 2) \div 2,000]$		3.00
Repairs and Maintenance $[(400 \times 12) \div 2,000]$		2.40
Depreciation $[(90,000 + 10,000 - 10,000) \div 15] \div 2,000$		3.00
Power $[(160 \div 100) \times 10]$		16.00
Comprehensive Machine Hour Rate		29.25

Working Notes :

(1) Calculation of Effective Working Hours

Total working hours per annum	2,040
Less: Idle time of routine maintenance	40
Effective Working Hours	2,000

Note : 20 hours lost due to machine break-down will be treated as **abnormal idle time**. Therefore, it is not to be taken into consideration for calculating effective working hours.

Illustration 66

From the following particulars, calculate Machine-Hour Rate :

- Cost of machine ₹ 2,00,000.
- Installation charges of machine ₹ 10,000.
- Rent of the shop per month ₹ 6,000.
- Insurance premium for the machine per annum 2% of Capital Cost of Machine.
- Electricity charges for the shop per month ₹ 600.
- Repairs per month 0.5% of Capital Cost.

5.100 Accounting for Overheads

Supervisor's salary per month ₹ 3,600.

Rate of power charges for 100 units ₹ 60.00

(The machine consumes 20 units of power per hour.)

The machine occupies $\frac{1}{4}$ of the shop area.

The life of the machine is 10 years and anticipated scrap value is ₹ 20,000. The supervisor devotes $\frac{1}{4}$ th of his time to the machine.

Estimated idle time : 25 hours a year.

Normal working days during the year : 250 days of 8 hours; 25 days of 5 hours.

[C.U.B.Com. (Hons.) – 2013]

Solution Statement Showing the Computation of Machine Hour Rate

Particulars	Per year (₹)	Per hour (₹)
Standing Charges:		
Rent of the Shop (₹ 6,000 x 12) ÷ 4	18,000	
Insurance Premium [(2% of ₹ 2,10,000) – Note 2]	4,200	
Electricity Charges [(600 x 12) ÷ 4]	1,800	
Supervisor's Salary [(3,600 x 12) ÷ 4]	10,800	
Total(A)	34,800	
Effective Machine Hours (B) (Note 1)	2,100	
Standing Charges per hour (A ÷ B)		16.57
Running Expenses:		
Repairs [(0.5% of ₹ 2,10,000) x 12] ÷ 2,100		6.00
Power [(60 ÷ 100) x 20]		12.00
Depreciation [(₹ 19,000 ÷ 2,100) – Note 4]		9.05
Machine Hour Rate		43.62

Working Notes :

(1) Calculation of Effective Working Hours

Total working hours per annum

250 × 8 hours 2,000

25 × 5 hours 125

2,125

Less: Idle time of routine maintenance 25

Effective Working Hours 2,000

(2) Capital Cost of the Machine

₹

Cost of the Machine 2,00,000

Add : Installation Charges of the Machine 10,000

2,10,000

(3) Electricity charges are fixed in nature. These are incurred for lighting, heating / cooling of the factory, etc.

(4) Depreciation = $\frac{2,00,000 + 10,000 - 20,000}{10} = ₹ 19,000.$

Section 3 : Administrative, Selling and Distribution Overheads

In section 2 of this chapter, the collection, allocation, apportionment and recovery of production / manufacturing overheads have been discussed in detail. Production / Manufacturing overheads are directly related with manufacturing process and constitute an important part of the product cost (materials, labour and production overheads). There are other overheads such as administrative, selling and distribution overheads which are incurred for the management of the entity. These overheads are not unimportant to any organisation. Administration costs relating to production, factory, works or manufacturing is treated as part of the production overheads and included in the cost of the product.

Administrative Overheads

Administrative overheads are incurred for the direction, control and managing the affairs of the organisation as a whole. Administrative overheads do not vary with the production. Most of the administrative overheads are time related. Cost Accounting Standard on Administrative Overheads (CAS-11) defines Administrative Overheads as “*cost of all activities relating to general management and administration of an entity.*”

Administrative overheads include the following *items of costs* :

- (a) Printing and stationery, and other supplies;
- (b) Employees cost - salaries of administrative staff;
- (c) Establishment expenses - office rent and rates, insurance, depreciation of office building and other assets, legal expenses, audit fees, bank charges, etc.

Treatment of Administrative Overheads in Cost Accounts

Administrative overheads are not affected by the number of units produced. However, there are many administrative expenses which are part and parcel of the production process. Examples are - purchasing cost, engineering cost, research cost and franchise fees, etc.

Cost Accounting Standard on ‘Administrative Overheads’ – CAS-11 states that “assignment of administrative overheads to the cost objects shall be based on either of the following *two* principles :

- (i) **Cause and Effect** : Cause is the process or operation or activity and effect is the incurrence of cost.
- (ii) **Benefits received** : Overheads are to be apportioned to various cost objects in proportion to the benefits received by them.”

Administrative overheads relating to production activities are to be apportioned to different cost centres. The apportioned overheads are absorbed to products on the basis of the normal capacity or actual capacity whichever is higher.

In case of under-absorption or over-absorption of administrative overheads relating to production, the same shall also be adjusted in the Costing Profit and Loss Account.

Control of Administrative Overheads

Majority of the administrative expenses are fixed in nature (e.g., rent, rates and taxes, salary of administrative staff) and largely depends upon the policy of the company. For example, the amount of research and development expenses to be incurred. However, for the purpose of exercising proper control, any of the following methods can be employed :

(i) **Use of Budgetary Control System** : Administrative overheads can be controlled by establishing a budget for administrative overhead at the beginning of the year after taking into consideration past data. Periodically the actual data should be compared with the budgeted data. After identifying the deviation, timely action will help to control the administrative overheads.

(ii) **Use of Standard Costing System** : Administrative overheads can be controlled in a better manner by employing sound standard costing system. Variances are calculated and 'adverse' variances are investigated periodically to prevent re-occurrence.

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(iii) **Classification and Analysis of Administrative Overheads** : It is possible to control administrative overheads by classifying it into fixed and variable and by analysing the nature of expenses.

Selling Overheads

Selling overheads are incurred for the 'marketing' and 'selling' the products of the organisation. Chartered Institute of Marketing (CIM) defines marketing as '**the management process responsible for identifying, anticipating and satisfying customer requirements profitably.**'

Selling is a part of marketing. It is concerned with persuading customers at lowest possible cost to buy the products and services of the organisation.

Costing Accounting Standard on "Selling and Distribution Overheads" (CAS-11) states that "**the selling overheads are the expenses related to sale of products or services and include all indirect expenses incurred in selling the products or services.**"

For example :

1. Salaries of sales personnel;
2. Travelling expenses of sales personnel;
3. Commission to sales agents;
4. Sales and brand promotion expenses including advertisement, publicity, sponsorships, endorsements and similar other expenses;
5. Receivable collection costs;
6. After sales service costs;
7. Warranty costs

Distribution Overheads

Costing Accounting Standard on "Selling and Distribution Overheads" (CAS-11) states that "**distribution Overheads, also known as distribution costs, are the costs incurred in handling a product or service from the time it is ready for despatch or delivery until it reaches the ultimate consumer including the units receiving the product or service in an inter-unit transfer.**"

The cost of packing, repacking, labelling, etc., at an intermediate storage location will be part of distribution costs.

For example :

1. Packing, repacking / labelling at an intermediate storage location;
2. Transportation cost;
3. Cost of warehousing (cover depots, godowns, storage yards, stock yards, etc.).

Note : In case of machinery involving technical help in installation, such expenses for installation are part of cost of production and not considered as cost of Selling and Distribution Overheads.

Assignment of Cost

1. Selling and Distribution Overheads directly traceable shall be assigned to the relevant product sold or services rendered.
2. Transportation cost relating to distribution shall be assigned as per CAS-5, where relevant and applicable.
3. Assignment of Selling and Distribution Overheads to the cost objects shall be based on either of the following two principles :
 - (i) **Cause and Effect** - Cause is the process or operation or activity and effect is the incurrence of cost.
 - (ii) **Benefits received** - overheads are to be apportioned to the various cost objects in proportion to the benefits received by them.

Control of Selling and Distribution Overheads

Some of the selling and distribution overheads are variable in nature. *For example*, secondary packing materials will vary with the number of units sold. Again, delivery cost will vary with distance to be covered at the time of delivery.

It is possible to control variable selling and distribution overheads by adopting the following steps :

1. **Use of Budgetary Control System** : Variable selling and distribution overheads can be controlled by establishing a budgetary control system at the beginning of the year based on past data. Periodically, the actual expenses are to be compared with the budgeted expenses to find any deviation. Action in right time will help to control the selling and distribution overheads.
2. **Use of Standard Costing System** : Variable selling and distribution overheads can be controlled in better manner by employing sound standard costing system. After calculating different variances, all adverse variances are to be investigated to prevent the re-occurrence.

Fixed selling and distribution overheads such as advertisement cost, salary of selling staff, depreciation of delivery van, etc., can be controlled by comparing the previous year's data.

Section 4 : Treatment of Different Items in Cost Accounts

1. **Depreciation** : Depreciation is a measure of the wearing out, consumption or other loss of value of a depreciable asset arising from use, effluxion of time or obsolescence through technology and market changes. If the depreciable asset is used for production of goods or services, the depreciation will be included in the production overheads.

If the depreciable asset is used for selling and distribution of finished goods, the depreciation of such asset will be included in the selling and distribution overheads (e.g., depreciation of delivery van).

If the depreciable asset is used for administration, the depreciation of such asset will be included in the administrative overheads. *For example*, depreciation of car used by the managing director or other administrative staff.

2. **Employee Welfare Costs** : It includes those expenses which are incurred by the company voluntarily or as per the provisions of any labour law for the welfare of their employees. Welfare expenses may include hospital, canteen, club running expenses.

Total welfare expenses are distributed among different departments on the basis of number of employees in each department.

Welfare expenses allocated to production department will be treated as production overhead. Similarly, welfare expenses allocated to administrative department or selling and distribution department will be treated as administration overheads and selling distribution overheads respectively.

3. **Fringe Benefits** : It is the benefit(s) provided by the employer to the employee in addition to salaries and allowances. It includes LTA (Leave Travel Assistance), LTC (Leave Travel Concession), housing facility, leave pay and holiday pay, etc.

Total expenditure incurred for fringe benefits are allocated to different departments on the basis of number of employees in each department or on the basis of wages bill of each department. Share of fringe benefits expenditure of factory workers will be treated as production overheads. Similarly, share of fringe benefits expenditure of administrative department and selling and distribution department will be treated as administrative overheads and selling and distribution overheads respectively.

4. **Bad Debts** : Bad debt is an amount that is due from a credit customer but not expected to be received. Bad debt is a loss to the business. It is treated as an operating expense of doing business. On the basis of this, bad debt is treated as selling and distribution overhead. However, many authors treat it as financial losses and exclude it from cost accounts. In my opinion, the first treatment is much more logical.

5.104 Accounting for Overheads

5. **Packing Expenses** : Cost incurred for the packing of the products to make it saleable or to facilitate its transportation etc., is known as Packing Expenses. Expenses incurred for primary packing (e.g., ink-pot, bottles, plastic containers) are treated as direct materials and included in the prime cost.
Expenses incurred for secondary packing (e.g., wooden cases, binding wire, string, etc.) are treated as selling and distribution overheads.
6. **Bonus and Gratuity** : Bonus is paid to workers as per the provision of Bonus Act. The minimum bonus is payable @ 8.33% of wages - irrespective of profit of the organisation. This bonus is a part of direct labour cost and it is included in the prime cost. Production bonus is also paid to individual workers or a group of workers if the target production is achieved. This production bonus is included in the production overhead.
Bonus paid to administrative staff or selling and distribution staff are treated as administrative overheads or selling and distribution overheads, according to situation.
Gratuity is paid to the workers as per Payment of The Gratuity Act. The amount of gratuity paid to productive workers is treated as direct labour cost and it is included in the prime cost.
Gratuity paid to the administrative staff or selling and distribution staff are treated as administrative overheads or selling and distribution overheads, according to situation.
7. **Royalties** : Royalties are paid to the owner of a patent or copyright for an intellectual property, for its use, it is treated as direct expenses and included in the prime cost.
Royalties of an incidental or general nature are treated as selling and distribution overheads.
8. **Drawing Office Costs** : Where drawing office costs are large, draftsmen may be required to book their time to individual jobs. The wages and other expenses of the drawing office is directly charged to the job on the basis of time used.
In many cases drawing office is regarded as providing general services to the organisation as a whole. In this case, all expenses of the drawing office are treated as production overheads and distributed to different production departments on equitable basis.
9. **Setting-up Cost** : Cost incurred for setting-up the machine or equipment by the operator himself is treated as direct labour cost as it is impossible to separate setting-up time and operating time. However, where setting-up is completed by specialist setters, their salary and other related expenses are treated as production overheads.
10. **Remuneration to Apprentices** : Remuneration paid to the apprentices are treated as production overhead because apprentices generally take more time and they are likely to cause more scrap. Alternatively, the remuneration paid to the apprentices may be treated as direct labour cost of the job in which they are engaged.
11. **Training Costs** : Training cost is incurred by the organisation to improve workers' efficiency in operation. Expenses incurred for the training of the factory workers will be treated as production overheads. Total cost of training will be allocated to different production departments on the basis of number of workers. Expenses incurred for training of the sales people will be treated as selling and distribution overheads.
12. **Market Research Expenses** : Market research is undertaken by the organisation to gather information in respect of customer's habit and taste, future trend of demand, potential market, customer's satisfaction about the product, competitor's product(s) etc.
Common expenses for market research are treated as selling and distribution overheads. It is apportioned among the products on the basis of the sale value. If the market research is done for any particular product, it is directly charged to that product as selling and distribution overheads.
13. **After Sales Service Costs** : At the time of sale of goods generally a warranty is given by the manufacturer of the product. For example, if you buy a Sony TV, one year warranty is given. During warranty period if there is any problem with the product, the manufacturer will repair or replace it free of cost.

These costs are treated as after sales service costs. For a big organisation after sales service costs are large amount. It includes salary of the technical staff, rent, rates and taxes of the servicing department, and the cost of free replacement of parts. After sales service costs are treated as selling and distribution overheads. Many organisations treat after sales service costs as production overhead.

14. **Quantity, Trade and Cash Discounts** : Quantity discount is offered for bulk purchases of materials or finished goods. Quantity discount received from the supplier is deducted from the total cost of the materials / finished goods.

Trade discount is offered by the manufacturer to wholeseller and by the wholeseller to retailers. Materials/ finished goods are debited *net of trade discount*. It means, trade discount will reduce the cost of materials/ finished goods. Cash discount is given for payment by debtors, within a stipulated period. It is purely a financial income of the recipient or a financial loss of the seller. Therefore, it is not included in the Cost Account.

15. **Carriage Inwards on Raw Materials** : Expenses incurred for bringing raw materials from vendors / suppliers depo to wear house is called carriage inwards. It is directly allocated to materials and included in the cost of the materials. When carriage is paid for different kinds of materials and it is not possible to allocate the cost logically, it is treated as a production overhead and is charged to cost of production at a predetermined rate.

16. **Carriage Outwards** : Expenses incurred for delivery of the goods to the customer's place is known as carriage outwards. Carriage outwards includes salary of delivery the staff, delivery van running expenses, depreciation of the delivery van, etc. Where delivery is free, all expenses are treated as distribution overheads. It is apportioned among different products on the basis of the sales value / weights. Delivery expenses incurred by any particular product is directly charged to that product.

17. **Storage Losses** : Storage losses can be divided into two categories : (i) Normal storage loss (e.g., loss due to evaporation, shrinkage, breakage, etc.); and (ii) Abnormal storage loss (e.g., loss due to fire, flood, etc.).

(i) Normal storage loss is treated as production overhead. It is apportioned on the basis of value of materials issued, where it is not economical to identify the loss to a particular material. If it is not possible to identify the loss to a particular material, the cost of good units will be inflated to absorb the normal storage loss.

(ii) Abnormal loss after adjusting insurance claim is charged to Costing Profit and Loss Account.

18. **Insurance Costs on Stocks of Materials** : Loss of stock policy is taken for the protection of the loss of materials, finished goods, etc. due to abnormal reasons (e.g., loss by fire, flood, etc.). The premium (insurance costs) paid for the policy can be apportioned over different materials on the basis of their value. The insurance premium may be charged to the cost of materials.

19. **Overtime Premium** : As per the provision of The Factories Act, if a worker works for more than 8 hours a day or 48 hours a week, he is entitled to receive wages at double rate for the overtime hours. For example, if a worker worked for 50 hours in a week. Hourly rate is ₹ 40. The wages payable to him will be :

Regular work hours per weak	48 @ ₹ 40	1,920
Overtime work hours	2 @ ₹ 40	80
Premium	2 @ ₹ 40	80
Total wages		<u>2,080</u>

If there were no overtime, the actual wages should have been 50 hours ₹ 40 = ₹ 2,000.

Here, the main question is the treatment of this extra payment of ₹ 80 as premium. The treatment of this premium (extra amount) will depend upon the reasons for the overtime work.

Overtime work may be necessary in the following situations :

- (i) Overtime is a normal phenomena because the organisation has more orders than it can complete in the regular time. In this situation, premium paid should be treated as production overhead and will be recovered from all the jobs / products.
 - (ii) Overtime is necessary to cover the production loss due to abnormal reasons (e.g., machine breakdown, fire, etc.). In this situation, premium paid is charged to Costing Profit and Loss Account.
 - (iii) Overtime is necessary to meet the deadline and the customer is ready to pay the extra amount. In this situation, overtime premium is directly charged to customer.
 - (iv) Where a job has been taken with full knowledge that it will not be possible to complete the job without overtime and the price for the job is more than the price normally charged. In this situation, the premium is directly charged to the job.
20. **Research and Development Cost** : Research and development are extremely important for any organisation because its survival, to a great extent, depend upon it. Degree of importance will vary according to the nature of the organisation. *For example*, research and development will determine the future of a car company or of an aircraft manufacturing company but for a car repairing company research and development are not of that much importance.
- Now-a-days huge amount is expended for research and development. It will usually include the salaries of the research staff, the costs of providing accommodation to them, cost of equipment, costs of test runs, pilot-schemes, donation to outside research organisations, etc. Generally a definite sum is being specified for research and development by the management as a matter of policy. The cost accountant is faced with the problem of disposing the amount of such costs.
- Treatment in Costs Accounts*
- Treatment of research and development cost will depend upon the nature of research. Generally, research is divided into two categories : (i) Basic Research; and (ii) Applied Research.
- Cost of basic research undertaken by the organisation on regular basis is treated as operating expenses. Cost of applied research undertaken for the development of new product is capitalised if it is a successful production, otherwise, it is debited to Costing Profit and Loss Account.
- Cost of applied research for the improvement of the production process or for the improvement of the quality and features of the products is treated as production overhead. It is apportioned among different products on the basis of sales value or number of units produced.
- Development cost is incurred when results of successful research is implemented. Development cost is treated like research cost.
21. **Erection and Dismantling of Plant and Machinery** : Expenses incurred for the erection of new machinery and equipment will be treated as capital expenditure. It is included in the total cost of the asset and it is taken into consideration for calculating depreciation :
- After erection / installation of the machinery and equipment, sometimes it may be necessary to re-install to achieve more efficiency. Expenses incurred for dismantling and re-erection of the old plant, machinery and equipment should be charged to overheads. If the expenses are large, it should be spread over a number of years.
- When dismantling is necessary to accommodate a new improved, efficient machinery, the entire cost should be charged to the Profit and loss Account. Net loss on such replacement is also to be charged to the Profit and Loss Account.
22. **Interest on Borrowed Capital** : Interest is paid at a fixed rate on borrowed capital / debt capital (e.g., interest paid on debentures, bonds, long-term borrowing from banks, etc.). The treatment of borrowed capital in cost accounts is a matter of debate. There are some accountants who are in favour of including the borrowed capital in the cost of production. But there are some accountants who are against it.

The arguments for inclusion of interest on borrowed capital in costs are given below :

- (a) In majority cases, big projects are financed by 50% equity capital and 50% debt capital. There are few industries such as construction and wine manufacturing, where interest on borrowed capital is a major item of cost. In these industries wages are also a major item of cost. If wages are included in the cost of construction / manufacturing, the interest on borrowed capital should also be included in the cost on the same ground.
- (b) Without inclusion of interest in cost, it is difficult to compare the profitability of different jobs requiring different period of completion.
- (c) In case of some industries like sugar manufacturing, food processing, potato chips manufacturing, large inventories are maintained throughout the year as raw materials are purchased during harvesting period only. For these industries, inclusion of interest on borrowed capital in cost is justified to assess the profitability.

The arguments for non-inclusion of interest on borrowed capital in costs are given below :

- (a) Interest is purely a finance charge. Therefore, it is to be debited to General Profit and Loss Account.
- (b) Inclusion of interest in the cost will inflate the value of W.I.P. and finished goods. AS-2 : 'Inventory' does not support the inclusion of interest in the valuation of inventory.
- (c) It is very difficult to calculate capital employed in inventories as it is a current asset and level of inventories may vary from time to time. It is not possible to calculate interest accurately. The inclusion of interest in costs will complicate the matter. Therefore, it should not be included in the cost of the product.

THEORETICAL QUESTIONS

1. Define overheads as per CAS-3. What are the different components of overhead ? (Page 5.1)
2. Define collection of overheads as per CAS-3. (Page 5.12)
3. What are 'Standing Order Number' and 'Cost Accounting Number' ? (Page 5.13)
4. What do you mean by 'allocation' and 'apportionment' of overhead ? (Page 5.15)
5. What do you mean by "Primary Distribution of Overheads"? What are the methods of secondary distribution of overheads ? (Page 5.14)
6. What do you mean by absorption of overheads? Mention some methods of absorption rates. (Page)
[B.Com. (Madras) – 2008]
7. What process would you follow for the purpose of accounting of under-absorption and over-absorption of overheads ? (Page)
[B.Com. (Madras) – 2008]
[C.U.B.Com. (Hons.) – 2008]
8. What do you understand by under and over absorption of factory overheads? (Page)
[C.U.B.Com. (Hons.) – 2005]
9. Explain the utility of pre-determined overhead absorption rates. (Page)
[C.U.B.Com. (Hons.) – 2004]
10. What are the classification of overheads? (Page 5.2)
[B.Com. (Madras) – 2005]
11. What is 'Blanket Overhead Rate' ? (Page 5.)
12. What is re-apportionment? (Page)
[B.Com. (Madras) – 2007]
13. What is semi-variable overhead? Explain two methods of segregation of semi-variable overhead into fixed element and variable element. (Page 5.5)
14. Indicate the basis of apportionment of the following departmental expenses:
 - (i) Maintenance department
 - (ii) Payroll or time keeping department
 - (iii) Employment or personnel department
 - (iv) Store keeping department
 - (v) Purchase department

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- (vi) Welfare, ambulance, canteen, service, recreation room expenses
(vii) Building service department
(viii) Internal transport service, overhead crane service. *[I.C.W.A. (Inter) – June, 1980]*
15. What do you understand by Departmentalisation of Overheads ? (Page 5.) *[I.C.W.A. (Inter) – Adapted]*
16. What is 'Idle Capacity' ? How this should be treated in cost accounts ? (Page 5.) *[C.A. (Inter) – May, 1997]*

PRACTICAL QUESTIONS

Allocation and Apportionment of Overheads

- 5.1 During the year ended 31st March, 2011 the factory overhead costs of three production departments of an organization are as under :
- | | |
|---|--------|
| | ₹ |
| X | 48,950 |
| Y | 89,200 |
| Z | 64,500 |
- The basis of apportionment of overheads is given below :
- Department : X ₹ 5.00 per machine hour for 10,000 hours
 Y 75% of direct labour cost of ₹ 1,20,000
 Z ₹ 4.00 per piece for 15,000 pieces
- Calculate department-wise under or over absorption of overheads and present the data in a tabular form. *[I.C.W.A. (Inter) – Adapted]*
- 5.2 Morgan Ltd. engaged in executing job orders for the accounting year 2016-17. The factory overhead costs of three production departments are as follows :
- X — ₹ 19,160; Y — ₹ 4,400; Z — ₹ 4,000.
- Overheads have been applied as under :
- Department X : ₹ 1.55 per machine hour for 13,500 hours.
Department Y : ₹ 1.25 per direct labour hour for 2,800 hours.
Department Z : 80% of direct labour cost of ₹ 5,000.
- Find out the amount of under or over absorption of overheads departmental-wise. *[C.U.B.Com. (General) – Adapted]*
- 5.3 A department has three machines. Calculate the machine hour rates in respect of three machines from the information given below :

	Machine I	Machine II	Machine III
Direct Wages	₹ 1,200	₹ 2,400	₹ 3,600
Power units	30,000	10,000	20,000
No. of workers	4	8	8
Light Points	8	24	48
Space (sq.ft.)	400	800	800
Cost of machine	₹ 3,00,000	₹ 1,20,000	₹ 1,80,000
Hours workers	200	300	400
The figures of indirect departmental expenses are :			
Depreciation of machine	12,000		
Repair to machinery	4,000		
Insurance of machinery	600		

Indirect wages	6,000
Power	6,000
Lighting	800
Other expenses	4,200

[C.U.B.Com. (General) – 2001]

- 5.1. The Modern Co. is having four departments: A, B and C are the producing departments and D is a service department. The actual cost for a period are as follows:

	₹
Rent	2,000
Repairs	1,200
Depreciation	900
Lighting	200
Supervision	3,000
Insurance – Stock	1,000
Employee's Insurance – Employer's liability	300
Power	1,800

The following details are also available in respect of four departments:

Particulars	Producing Departments			Service Department
	Dept. A	Dept. B	Dept. C	Dept. D
Area (sq.ft.)	150	110	90	50
Number of workers	24	16	12	8
	₹	₹	₹	₹
Total wages	8,000	6,000	4,000	2,000
Value of assets	24,000	18,000	12,000	6,000
Value of stock	15,000	9,000	6,000	

Apportion the cost to the various departments on the basis of most equitable method.

- 5.2. There are three production departments and one service department in a factory. The costs for the year 2010 are as given below : Rent ₹ 5,200; Light ₹ 480; Power ₹ 1,800; Depreciation on Plant ₹ 3,000; Canteen expenses ₹ 6,300; Supervision charges ₹ 3,150.

With the above noted expenses and particulars as given below, find out the total overhead expenses of each of the production departments. Cost of the service department is apportioned to production departments in the ratio of 2 : 2 : 1.

Particulars	Producing Departments			Service Department
	A	B	C	S
No. of Employees	30	18	9	6
Cost of Plant (₹)	1,50,000	1,00,000	50,000	—
Light Points	9	6	5	4
Horse Power of Machines	10	5	3	—
Wages Paid (₹)	40,000	30,000	20,000	10,000
Area (sq.mt.)	1,500	750	500	500

- 5.3. A manufacturing company has two production departments X and Y and three service departments – time-keeping, stores and maintenance.

Time-keeping department is rendering services to two production departments and two other service departments, stores department is rendering services to maintenance department along with production departments and maintenance department is rendering service to production departments only.

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You are required to prepare a statement showing apportionment of overheads of service departments from the following information:

Production Departments:	₹	Total (₹)
X	16,000	
Y	10,000	26,000
Service Departments:		
Time-keeping	4,000	
Stores	5,000	
Maintenance	3,000	12,000

Other information is:

	X	Y	Time-keeping	Stores	Maintenance
No. of employees	40	30	20	16	10
No. of stores requisition	24	20	—	—	6
No. of machine hours	2,400	1,600	—	—	—

[B.Com. (Hons.) – Delhi, 2003]

- 5.4. A factory is having three production departments A, B and C and two service departments, Boiler-house and Pump-house. The boiler-house has to depend upon the pump room for supply of water and pump room in its turn is dependent on the boiler-house for supply of steam power for driving the pump. The expenses incurred by the production departments during the period are A – ₹ 8,00,000; B – ₹ 7,00,000 and C – ₹ 5,00,000. The expenses for boiler-house is ₹ 2,34,000 and the pump-house is ₹ 3,00,000. The expenses of boiler house and pump room are apportioned to the production departments on the following basis:

	A	B	C	BH	PR
Expenses of boiler-house	20%	40%	30%	—	10%
Expenses of pump- room	40%	20%	20%	20%	—

Show clearly as to how the expenses of boiler-house and pump room would be apportioned to A, B and C departments. Use Simultaneous Equation Method.

[B.Com. (Madras) – Adapted]

- 5.5. In a factory there are two service departments P and Q and three production departments A, B and C. In April 2011 the departmental expenses were :

A – ₹ 6,50,000; B – ₹ 6,00,000; C – ₹ 5,00,000; P – ₹ 1,20,000; Q – ₹ 1,00,000

The service departments expenses are allotted on a percentage basis as follows :

	Production Department			Service Department	
	A	B	C	P	Q
P	30%	40%	15%	—	15%
Q	40%	30%	25%	5%	—

Prepare a statement showing the distribution of the service department costs to the production departments using the Repeated Distribution Method.

[B.Com. (Hons.) (Madras) – Adapted]

- 5.6. A company has three production departments and two service departments. Distribution summary of overhead is as follows:

Production Departments: A – ₹ 13,600; B – ₹ 14,700; C – ₹ 12,800.

Service Departments : X – ₹ 9,000; Y – ₹ 3,000.

The expenses of service departments are charged on a percentage basis which is as follows:

	A	B	C	X	Y
X Department	40%	30%	20%	—	10%
Y Department	30%	30%	20%	20%	

Apportion the cost of service departments by using the Repeated Distribution Method.

[C.A. (Inter) – Adapted]

- 5.7. Budgeted cost of production of a factory for the year ending 30th September, 2010 is given as under:

Production Cost:

	₹	₹
Direct wages	1,00,000	
Direct material	<u>96,000</u>	1,96,000

Indirect Material:

Shop No. 1	6,000	
2	9,000	
3	3,000	
Tool room	1,800	
Stores	2,400	
Clerical Service Dept.	<u>900</u>	23,100

Supervision and Indirect Wages :

Shop No. 1	6,300	
2	8,700	
3	8,100	
Tool room	5,550	
Stores	2,250	
Clerical Service Dept.	<u>3,300</u>	34,200
Rent and rates	15,000	
Insurance	3,000	
Depreciation (15%)	24,000	
Power	13,500	
Lighting and heating	<u>6,000</u>	61,500

Further the following information is also supplied to you:

Department	Area Sq.ft.	Asset Value	Effective H.P.	Productive Capacity		
				Direct Labour Hours	Direct Labour Cost	Machine Hours
Production						
Shop No. 1	8,000	40,000	50	1,50,000	45,000	80,000
2	6,000	72,000	40	1,50,000	30,000	1,20,000
3	12,000	6,000	—	1,00,000	25,000	—
Service						
Tool Room	4,000	24,000	10	—	—	—
Stores	6,000	4,000	—	—	—	—
Clerical Service	4,000	4,000	—	—	—	—
Total	40,000	1,60,000	—	—	—	—

You are required to prepare an Overhead Analysis Sheet for the departments for the year ending 30th September, 2010 showing clearly the basis of apportionment.

[I.C.W.A. (Inter) – Adapted]

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- 5.8. The ABC Company has the following account balances and distribution of direct charges on 31st December, 2010: (figures in ₹)

	Production Dept.			Service Dept.	
	Total	Machine Shop	Packing	General Plant	Stores & Maintenance
Direct Expenditure					
Indirect Labour	14,650	4,000	3,000	2,000	5,650
Maintenance Material	5,020	1,800	700	1,020	1,500
Misc. Supplies	1,750	400	1,000	150	200
Superintendent's Salary	4,000	—	—	4,000	—
Cost and Payroll Salary	10,000	—	—	10,000	—
Indirect Expenditure					
Power	18,000	—	—	—	—
Rent	12,000	—	—	—	—
Fuel and Heat	6,000	—	—	—	—
Insurance	1,000	—	—	—	—
Taxes	2,000	—	—	—	—
Depreciation	1,00,000	—	—	—	—
	1,64,420	6,200	4,700	17,170	7,350

The following data were compiled by means of a factory survey made in the previous year:

	H.P. Hour	Floor Space Sq.ft	Radiator Section	No of Workers	Investment ₹
Machine Shop	3,500	2,000	45	20	6,40,000
Packing	500	800	90	10	2,00,000
General Plant		400	30	3	10,000
Stores and Maintenance	1,000	1,600	60	5	1,50,000
	5,000	4,800	225	38	10,00,000

Expenditure charged to the stores and maintenance department are to be distributed to other departments by the following percentages:

Machine shop 50%; Packing 20%; General Plant 30%

General Plant overhead is distributed on the basis of number of employees.

- (A) Prepare an overhead distribution sheet with supporting schedules to show computations and basis of distribution, including a distribution of service department expenses to the production departments.
- (B) Determine the distribution of the service department's expenses by the method of continued distribution carried through 3 cycles. Show all the calculations to the nearest rupee.

[C.A. (Inter) – Adapted]

- 5.9. E-book is an online book retailer. The company has four departments. The two sales departments are Corporate Sales and Consumer Sales. The two support departments are Administrative (Human Resources Accounting) and Information Systems. Each of the sales departments conducts merchandising and marketing operations independently.

The following data are available for October, 2003 :

Departments	Revenues	No. of Employees	Processing Time used (in minutes)
Corporate Sales	₹ 16,67,750	42	2,400
Consumer Sales	₹ 8,33,875	28	2,000
Administrative		14	400
Information System		21	1,400

Cost incurred in each of four departments for October 2003 are as follows: ₹

Corporate Sales	12,97,751
Consumer Sales	6,36,818
Administrative	94,510
Information Systems	3,04,720

The company uses number of employees as a basis to allocate administrative costs and processing time as a basis to allocate information systems costs.

Required:

- Allocate the support department cost to the sales departments using the **direct method**.
- Rank the support departments based on percentage of their services rendered to the support departments. Use this ranking to allocate support costs based on the step-down allocation method.
- How could you have ranked the support departments differently?
- Allocate the support department costs to two sales departments using the **reciprocal allocation method**.

[C.A. (Inter) – Nov. 2003]

Calculation of Overhead Recovery Rate

- 5.10. A Limited Company has three manufacturing departments A, B and C and one service department S. The following figures are available for one month of 25 working days of 8 hours each. All these departments work for all the days and with full attendance.

Expenditure	Total	Departments			
		S	A	B	C
Power and Lighting	1,100	240	200	300	360
Supervisor's Salary	2,000				
Rent	500				
Welfare Expenses	600				
Other Expenses	1,200	200	200	400	400
	5,400				
Supervisor's Salary		20%	30%	30%	20%
No. of workers		10	30	40	20
Floor area in sq.ft.		500	600	800	600
Services rendered by Service Department			50%	30%	20%

Calculate labour hour rate for each of the Departments A, B and C.

[B.Com. (Hons.), Delhi – Adapted]

5.114 Accounting for Overheads

- 5.11. The following information relates to the activities of a production department for the month of January:

		₹
Materials used		72,000
Direct wages		60,000
Machine hours	20,000	
Labour hours	24,000	
Overhead chargeable to the department.		48,000

On one order to be carried out in the month of February, the relevant data were:

		₹
Materials		4,000
Direct wages		3,300
Machine hours	1,200	
Labour hours	1,650	

Prepare a comparative statement of cost of this order by using the following methods of absorption of overheads: (i) Direct labour hour rate, (ii) Percentage of direct wages; and (iii) Machine hour rate.

[B.Com. (Hons.) – Adapted]

- 5.12. Differentiate between overhead allowance and overhead absorption, where the standard rate is ₹ 26.50 per hour. Calculate the level on which it has been fixed, given the following figures:

Activity level	Overhead Allowance
Hours	₹
5000	1,20,000
8,000	2,40,000
11000	3,63,000

[I.C.W.A. (Inter) – Adapted]

- 5.13. You are supplied with the following information and required to work out the production hour rate of absorption of overheads in departments A, B and C under simultaneous equation method of distributing service departments costs to production department:

Particulars	Total	Production Depts.			Service Depts.	
		A	B	C	P	Q
Total overheads	46,000	11,310	13,050	8,040	7,500	6,100
No. of hours works		5,000	4,000	3,000	—	—
Percentage of service rendered by dept. P		30%	40%	20%	—	10%
Percentage of service rendered by dept. Q		15%	25%	40%	20%	—

[B.Com. (Madras) – Adapted]

- 5.14. Bharat Engineering Works has three production departments A, B and C and one service department S. From undermentioned particulars calculate labour hour rate for each of production departments:

Expenses for the period of 12 months :	₹
Rent	36,000
Power	8,250
Indirect wages	5,200
Depreciation on machinery	22,000
Electricity	5,600
Canteen expenses	6,500

Additional information:

Department	A	B	C	S
Light point (Nos.)	7	7	9	3
Floor space (sq.mts.)	300	250	450	200
Horse power of machines (HP)	65	30	30	40
No. of workers (Nos.)	2	3	6	2
Direct wages (₹)	12,000	14,000	18,000	8,000
Cost of machines (₹)	50,000	60,000	80,000	10,000

Working days : 200 days of 8 hours each. Service rendered by service department S to production departments A, B and C is 30%, 20% and 50% respectively. *[C.U.B.Com. (Hons). – Adapted]*

- 5.15. You are supplied with the following information and required to work out the production hour rate of recovery of overhead in Department A, B and C.

Particulars	Total ₹	Production Depts.			Service Depts.	
		A ₹	B ₹	C ₹	P ₹	Q
Rent	12,000	2,400	4,800	2,000	2,000	800
Electricity	4,000	800	2,000	1,500	400	300
Indirect Labour	6,000	1,200	2,000	1,000	800	1,000
Depreciation	5,000	2,500	1,600	200	500	200
Sundries	4,500	910	2,143	847	300	300
Estimated Working Hours	—	1,000	2,500	1,400	—	—

Expenses of Service Departments P and Q are apportioned as under:

	A	B	C	P	Q
P	30%	40%	20%	—	10%
Q	10%	20%	50%	20%	—

[C.A. (Inter) – Adapted]

- 5.16. Strongman Ltd. has three production departments A, B and C and two service departments X and Y. The following particulars are available for the month of March, 2011 concerning the organisation: ₹

Rent	15,000
Municipal taxes	5,000
Electricity	2,400
Indirect Wages	6,000
Power	6,000
Depreciation on machinery	40,000
Canteen expenses	30,000
Other labour-related costs	10,000

Following further details are also available:

Particulars	Total	A	B	C	X	Y
Floor space (sq.mts.)	5,000	1,000	1,250	1,500	1,000	250
Light points (Nos.)	240	40	60	80	40	20
Direct wages (₹)	40,000	12,000	8,000	12,000	6,000	2,000
Horse power to machines (Nos.)	150	60	30	50	10	—
Cost of machine (₹)	2,00,000	48,000	64,000	80,000	4,000	4,000
Working hours	—	2,335	1,510	1,525	—	—

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The expenses of service departments are to be allocated in the following manner:

	A	B	C	X	Y
X	20%	30%	40%	—	10%
Y	40%	20%	30%	10%	—

You are required to calculate the overhead absorption rate per hour in respect of the three production departments.

[I.C.W.A. (Inter) – Adapted]

Calculation of Cost of Product after Calculating Overheads Recovery Rate

- 5.17. The following figures have been extracted from the books of a manufacturing concern. All jobs pass through the company's two departments:

	Production Dept.	Finishing Dept.
	₹	₹
Materials used	6,000	500
Direct labour	3,000	1,500
Factory overheads	1,800	1,200
Direct labour hours	12,000	5,000
Machine hours	10,000	2,000

The following information pertains to work order No. 111.

	Production Dept.	Finishing Dept.
	₹	₹
Materials used	240	20
Direct labour	130	50
Direct labour hours	530	140
Machine hours	510	50

You are required to prepare a statement showing the different cost results for work order No. 111 under the three commonly used methods.

[B.Com. (Delhi) – Adapted]

- 5.18. XYZ Ltd. has three production departments P1, P2 and P3 and two service departments S1 and S2, the details pertaining to which are as under:

Particulars	P1	P2	P3	S1	S2
Direct wages (₹)	3,000	2,000	3,000	1,500	195
Working hours	3,070	4,475	2,419	—	—
Value of machines (₹)	60,000	80,000	1,00,000	5,000	5,000
HP of machines	60	30	50	10	—
Light points	10	15	20	10	5
Floor space (sq. ft.)	2,000	2,500	3,000	2,000	500

The following figures extracted from the accounting records are relevant: Rent and rates ₹ 5,000; General lighting ₹ 600; Indirect wages ₹ 1,939; Power ₹ 1,500; Depreciation on machine ₹ 10,000; Sundries ₹ 9,695

The expenses of the service departments are distributed as under:

	P1	P2	P3	S1	S2
S1	20%	30%	40%	—	10%
S2	40%	20%	30%	10%	—

Find out the total cost of product LEO which is processed for manufacturing in Dept. P1, P2, P3 for 4, 5 and 3 hours respectively given that its direct material cost is ₹ 50 and direct labour cost is ₹ 30.

[C.U. B.Com. (Hons.) – Adapted]

- 5.19. A company has 3 production departments A, B and C and two service departments X and Y. The following data are extracted from the records of the company for a particular given period:

(A) Expenses:	₹
Rent and rates	25,000
General lighting	3,000
Indirect wages	7,500
Power	7,500
Depreciation on machinery	50,000
Sundries	50,000

(B) **Additional data department-wise:**

	Total	A	Departments			
			B	C	X	Y
Direct wages (₹)	50,000	15,000	10,000	15,000	7,500	2,500
Horse power of machines used	150	60	30	50	10	—
Cost of machinery (₹)	12,50,000	3,00,000	4,00,000	5,00,000	25,000	25,000
Production hours worked	—	6,226	4,028	4,066	—	—
Floor space used (sq.mtr.)	10,000	2,000	2,500	3,000	2,000	500
Lighting points (Nos.)	60	10	15	20	10	5

(C) **Service departments expenses allocation :**

	A	B	C	X	Y
X	20%	30%	40%	—	10%
Y	40%	20%	30%	10%	—

You are required to:

- Compute the overhead rate of production departments using the repeated distribution method; and
- Determine the total cost of a product whose direct material cost and direct labour cost are respectively ₹ 250 and ₹ 150 and which would consume 4 hours, 5 hours and 3 hours in departments A, B and C respectively.

[I.C.W.A. (Stage – I) – Adapted]

- 5.20. From the following particulars, prepare consolidated cost sheet, transfer service department expenditure to production departments on a suitable basis and indicate the final costs of products P, Q and R.

Nature of Expense	Total	Production Depts.		Service Depts.	
		A	B	X	Y
	₹	₹	₹	₹	₹
Direct material	20,000	9,500	10,500	—	—
Direct labour	30,000	13,900	16,100	—	—
Indirect material	4,000	2,000	1,000	700	300
Indirect labour	6,000	850	920	2,730	1,500
Depreciation on Plant	10,000	5,000	3,000	1,500	500
Depreciation on Building	12,000	7,000	2,500	1,000	1,500
Insurance	3,000	1,200	800	300	700
Overtime	3,000	750	250	1,200	800
Other factory expenses	10,500	4,500	2,500	2,300	1,200
Total	98,500	44,700	37,570	9,730	6,500

5.118 Accounting for Overheads

Notes:

- (1) ₹ 2,500 service department charges incurred in Department Y have to be transferred to Service Department X. The balance to be charged to Departments A, B and X at the rate of 45%, 35% and 20% respectively.
- (2) Expenses incurred in Service Department X have to be charged to A and B Departments (3 : 2).
- (3) 4,000 units of product: P are produced through A, the attention to all products being continuous and uniform.
- (4) Department B manufactures 3,000 units of Q and 2,000 units of product R, the direct material consumed being 3 : 2. The work is mainly manual and direct labour hours are :

Product Q	Ordinary hours	12,000	Overtime	40
Product R	"	4,100	"	85

[C.A. (Final) – Adapted]

Calculation of Over / Under Absorption of Overheads

- 5.21. From the following data relating to a production unit work out the over-absorbed or under-absorbed overhead resulted during the month of review.

The unit having a strength of 20 workmen planned for 290 working days of 8 hours each with half-an-hour break. Based on the earlier years' trend, it is forecast that average absenteeism per workman would be 10 days, in addition to the eligibility of 30 days annual leave.

The budgeted overheads related to the unit for the year amounted to ₹ 75,000 and the unit follows a system of recovering overheads on the basis of direct labour hour.

The actual overheads during the year amounted to ₹ 71,200 and the following details regarding actual working of the unit are available:

- (i) The factory worked 3 extra days to meet the production targets, but one additional paid holiday had to be declared.
- (ii) There was a severe breakdown of a major equipment leading to a loss of 350 man hours.
- (iii) Total overtime hours (in addition 3 extra days worked) amounted to 680 hours.
- (iv) The actual average absenteeism per workman was 12 days.

[I.C.W.A. (Inter) – Adapted]

- 5.22. ABC Ltd. uses a historical cost system and applies overheads on the basis of pre-determined rates. The following data are made available by the company for the year ended 31.3.2000:

	₹
Manufacturing overheads	32,72,000
Manufacturing overheads applied	32,00,000
Work-in-progress (closing balance)	5,00,000
Finished goods (closing balance)	15,00,000
Cost of goods sold	2,20,00,000

Apply two methods for disposal of underabsorbed overheads and state the impact of each method on the profit earned by the firm. Also indicate the relevant journal entries.

[I.C.W.A. (Stage – I) – Dec., 2000]

- 5.23. In a manufacturing unit overhead was recovered at a pre-determined rate of ₹ 20 per labour hour. The total factory overhead incurred and the labour hours actually worked were ₹ 45,00,000 and 2,00,000 labour hours respectively. During this period, 30,000 units were sold. At the end of the period 5,000 units were held in stock while there was no opening stock of finished goods. Similarly, though there was no stock of uncompleted units at the beginning of the period, at the end of the period there were 10,000 uncompleted units which may be reckoned at 50% complete.

On analysis of the reasons, it was found that 60% of the unabsorbed overheads were due to defective planning and rest were attributable to increase in overhead costs.

How would unabsorbed overheads be treated in cost accounts ?

- 5.24. Sweat Dreams Ltd. uses a historical cost system and absorbs overheads on the basis of a pre-determined rate. The following data are available for the year ended 31st March, 2011 :

Manufacturing overheads	₹
Amount actually spent	1,70,000
Amount absorbed	1,50,000
Cost of goods sold	3,36,000
Stock of finished goods	96,000
Works-in-progress	48,000

Using two methods of disposal of under-absorbed overheads show the implication on the profits of the company under each method. *[C.A. (Inter) – Adapted]*

- 5.25. A Ltd., a manufacturing company uses pre-determined rates for absorbing overheads based on the budgeted level of activity. A rate of ₹ 22 per labour hour has been calculated for the assembly department for which the following overhead expenditure at various activity levels have been estimated:

No. of labour hours	Total overhead (₹)
14,500	3,38,875
15,500	3,47,625
16,500	3,56,375

You are required to:

- Calculate the variable overhead absorption rate per labour hour.
 - Calculate the estimated total fixed overheads.
 - Calculate the budgeted level of activity in labour hours.
 - Calculate the amount of under/over recovery of overheads if the actual labour hours were 15,850 and actual overheads were ₹ 3,55,050.
- 5.26. In a manufacturing unit, factory overhead was recovered at a pre-determined rate of ₹ 25 per man-day. The total factory overhead expenses incurred and the man-days actually worked were ₹ 41.50 lakhs and 1.5 lakhs man-days respectively. Out of the 40,000 units produced during a period 30,000 were sold. On analysing the reasons, it was found that 60% of the unabsorbed overheads were due to detective planning and the rest were attributable to increase in overhead costs. How would unabsorbed overheads be treated in Cost Accounts ? *[C.A. (Inter) – Adapted]*

Cost Center Machine Hour Rate

- 5.27. Calculate the machine hour rate from the following:

	₹
Cost of machine	8,000
Cost of installation	2,000
Scrap value after 10 years	2,000
Rate and rent for a quarter for the shop	300
General lighting per month	20
Shop supervisor's salary (per quarter)	600
Insurance premium for a machine (per annum)	60
Estimated repair (per annum)	100
Power 2 units per hour @ ₹ 5 per 100 units	
Estimated working hour p.a. 2,000.	

The machine occupies 1/4th of the total area of the shop. The supervisor is expected to devote 1/6th of his time for supervising the machine. General lighting expenses are to be apportioned on the basis of floor area.

[C.U.B.Com. (Hons.) – Adapted]

5.120 Accounting for Overheads

- 5.28. Work out the machine hour rate for the following machine, whose scrap value is nil :

Cost of machine	₹ 90,000
Other charges, e.g., freight and installation	₹ 10,000
Working life	10 years
Working hours	2,000 per year
Repair charges	50% of Depreciation
Power – 10 units per hour @ 10 paise per unit.	
Lubricating oil @ ₹ 2 per day of 8 hours.	
Consumable stores @ ₹ 10 per day of 8 hours.	
Wages of operator @ ₹ 4 per day.	

[B.Com. (Hons), Delhi – Adapted]

- 5.29. Calculate a machine hour rate to recover overhead expenses included below:

	Per hour (₹)	Per year (₹)
Electric power	0.85	
Steam	0.35	
Water	0.15	
Repairs		160
Rent		320
Running hours		2,000
	₹	
Original cost price	4,000	
Book value	400	
Replacement value	3,200	
Depreciation @ 7.5% p.a. on original value		

[I.C.W.A. (Inter) – Adapted]

- 5.30. A machine costing ₹ 2,00,000 is expected to run for 10 years at the end of which its scrap value is estimated to be ₹ 20,000. Installation charges are ₹ 2,000; Repairs for 10 years' life is estimated to be ₹ 18,000 and the machine is expected to run for 2,190 hours in a year. Its power consumption would be 15 units per hour at ₹ 4 per unit. The machine occupies 1/4th of the area of the department and has two points out of total ten for lighting. The foreman has to devote about 1/3rd of his time to this machine. The rent for the department is ₹ 3,000 p.m. and charges for lighting ₹ 800 p.m. The foreman is paid a salary of ₹ 9,600 p.m.

Find out the hourly rate, assuming insurance is @ 1% p.a. and expenses on oil, etc., are ₹ 90 per month.

[B.Com. (Hons), Delhi – Adapted]

- 5.31. From the particulars furnished below, compute a machine hour rate (including shop expenses).

Name of equipment	Mobile 'Crane' No. 47
	5 tonnes – 12 feet sweep
Date of purchase	1-4-2009
Make	Hitachi Corporation, Japan
Cost	₹ 2,50,000
Power	Diesel 10 H.P. engine
Estimated life	10 years
Depreciation	15% p.a. on original cost
Insurance	₹ 1,000 p.a.
Repairs	₹ 6,000 p.a.
Consumable Stores	₹ 3,000 p.a.

Rent	₹ 7,500 p.a.
Superintendent 1/5th for the machine	₹ 13,000 p.a.

Assume that crane can work 200 hours in a month and had actually worked for 80% of the normal working hours.

Cost of diesel oil, etc., per hour is ₹ 15.

[C.U.B.Com. (Hons.) – Adapted]

- 5.32. In a machine shop, the machine hour rate is worked out at the beginning of a year. The following estimates for operating a machine are given:

Total available weekly working hours	48 hours
Setting up time and maintenance time	2 hours for each

Cost details:

	₹
Operator's Wages	6,500 p.m.
Supervisor's Salary (attending three machines)	15,000 p.m.
Rent, rates and taxes	50,000 p.a.
Consumable stores	30,000 p.a.
Repairs and maintenance	36,000 p.a.
W.D.V. of machine	1,80,000

Rate of Depreciation @ 15% p.a.

Power consumed @ 15 units per hour, ₹ 3 per unit. Setting up time is unproductive but electricity is used during setting up.

Calculate the machine hour rate.

[C.U.B.Com. (Hons.) – Adapted]

- 5.33. From the following particulars, calculate the machine hour rate:

- Cost of the machine ₹ 1,00,000. Estimated life 10 years. Scrap value ₹ 10,000.
- Estimated working time – 50 weeks of 44 hours each. It includes 200 hours as time taken up in maintenance and 100 hours as setting up time. However, setting up time is regarded as productive time.
- Power used during production is 16 units per hour @ ₹ 4 per unit. No current is taken during maintenance or setting up time.
- The machine requires a chemical solution which is replaced at the end of each week at a cost of ₹ 20 each time.
- Cost of maintenance is ₹ 1,200 per annum.
- Two attendants control the operation of this machine together with five other identical machines. Their combined weekly wages amount to ₹ 120.
- General works overheads allocated to this machine amount to ₹ 2,000 for the year.

[Delhi, B.Com. – Adapted]

- 5.34. A manufacturing unit has added a new machine to its fleet of five existing machines. The total cost of purchase and installation of the machine is ₹ 7,50,000. The machine has an estimated life of 15 years and is expected to realise ₹ 30,000 as scrap at the end of its working life.

Other relevant data are as follows:

- Budgeted working hours is 2,400 based on 8 hours per day for 300 days. This includes 400 hours for plant maintenance.
- Electricity used by the machine is 15 units per hour at a cost of ₹ 2.00 per unit. No current is drawn during maintenance.
- The machine requires special oil for heating which is replaced once in every month at a cost of ₹ 2,500 on each occasion.
- Estimated cost of maintenance of the machine is ₹ 500 per week of 6 working days.

[I.C.W.A. (Inter) – Adapted]

5.122 Accounting for Overheads

- 5.35. A machine shop has 8 identical drilling machines manned by 6 operators. The machine cannot be worked without an operator wholly engaged on it. The original cost of all these machines works out to ₹ 8 lakhs. These particulars are furnished for a 6 month period:

Normal available hours per month per worker	208
Absenteeism (without pay) hours P.M. per worker	18
Leave (with pay) hours per worker P.M.	20
Normal idle time unavoidable hours per worker P.M.	10
Average rate of wages per worker for 8 hours a day	₹ 20
Average rate of production bonus estimated	15% on wages
Value of power consumed	₹ 8,050
Supervision and indirect labour	₹ 3,300
Lighting and electricity	₹ 1,200

These particulars are for a year:

Repairs and maintenance including consumables	3% of value of machines
Insurance	₹ 40,000
Depreciation	10% of original cost
Other sundry works expenses	₹ 12,000
General management expenses allocated	₹ 54,330

You are required to work out a comprehensive machine hour rate for the machine shop.

[C.A. (Inter) – Adapted]

- 5.36. A machine shop in a factory has five machines of exactly similar type and specification. One operator is employed on each machine at ₹ 20 per hour. The factory works a 40-hour week which includes four hours for set-up time for each machine. The operators are paid fully for 40 hours. Costs are reported for the machine shop on the basis of thirteen four-weekly periods.

The following details applicable to the cost centre / machine are available:

1. Set-up time is unproductive and no power is consumed during the set-up time.
2. Original cost of a machine is ₹ 1,30,000.
3. Depreciation on machine is to be provided at 10% per annum on original cost.
4. Maintenance and repairs per week per machine amounts to ₹ 25.
5. Consumable stores per week per machine amount to ₹ 27.
6. Power consumed is 10 units per hour per machine at 80 paise per unit.
7. Wages paid to the operators are considered as indirect.
8. Overheads apportioned to the cost centre are :

Rent	₹ 3,000 p.a.
Heat and light	₹ 4,000 p.a.
Misc. expenses	₹ 6,000 p.a.

You are required to calculate:

- (i) Cost of running one machine for a four-week period; and
- (ii) The machine hour rate.

[B.Com. (Hons.) – Delhi, 2005]

- 5.37. A machine shop of a factory has 3 cost centres having distinct sets of machines. The following estimates are available for the year 2011:

Particulars	Total for the factory	Centre I ₹	Centre II ₹	Centre III ₹
Direct wages	1,60,000	50,000	50,000	60,000
Share of service expenses	5,000	1,000	1,500	2,500
Power	10,000			
Repairs and maintenance	13,000			
Insurance	8,900			
Rent	3,000			
Lighting	1,800			
Indirect wages	14,400			
Labour welfare expenses	20,000			
Value of machines	3,25,000	1,00,000	75,000	1,50,000
Floor area (sq.ft.)	120	240	360	
Power of Motor (H.P.)	10	10	20	
Machine Hours	5,000	6,000	10,000	
No. of workers	12	10	18	

Machines are depreciated at 10% p.a.

- Compute suitable machine hour rate of overhead absorption for each of the machine centre.
- Job No. 201 passes through all the above three cost centres and the time required in each centre is: Centre I – 4 hours; Centre II – 3 hours; Centre III – 8 hours.
- What price should be company quote for Job No. 201 to yield a profit of 20% on cost if its direct materials and direct labour costs are estimated at ₹ 500 and ₹ 300 respectively and other expenses are 20% on works cost.

[C.U. B.Com. (Hons.) – Adapted]

- 5.38. The following data pertains to the machine shop of an engineering company, relating to the year 2011. The machine shop has 3 cost centres, A, B, C each having 3 distinct set of machines.

	A	B	C	Total
1. No. of workers	400	400	800	1,600
2. No. of machine hours	50,000	50,000	60,000	1,60,000
3. Percentage of HP	40	25	35	100
4. Value of assets (₹ in lakhs)	20	35	30	85.00
5. Direct wages (₹ in lakhs)	16	20	24	60.00
6. Indirect wages (₹ in lakhs)				18.00
7. Supervisory salaries (₹ in lakhs)				7.00
8. Depreciation (₹ in lakhs)				8.50
9. Insurance (₹ in lakhs)				4.25
10. Electricity charges (₹ in lakhs)				12.00
11. Welfare expenses (₹ in lakhs)				9.00
12. Office and other expenses (₹ in lakhs)				16.00

Work out a composite machine hour rate for each of the cost centres, showing the basis of apportionment of expenses amongst the cost centres.

[I.C.W.A. (Stage – I) – Adapted]

5.124 Accounting for Overheads

- 5.39. A machine shop cost centre contains three machines of equal capacities. Three operators are employed on each machine, payable ₹ 20 per hour each. The factory works for forty-eight hours in a week which includes 4 hours set up time. The work is jointly done by operators. The operators are paid fully for the forty-eight hours. In addition they are paid a bonus of 10 per cent of productive time. Costs are reported for this company on the basis of thirteen four-weekly period.

The company for the purpose of computing machine hour rate includes the direct wages of the operator and also recoups the factory overheads allocated to the machines.

The following details of factory overheads applicable to the cost centre are available:

- (a) Depreciation 10% per annum on original cost of the machine. Original cost of the each machine is ₹ 52,000.
- (b) Maintenance and repairs per week per machine is ₹ 60.
- (c) Consumable stores per week per machine are ₹ 75.
- (d) Power: 20 units per hour per machine at the rate of 80 paise per unit.
- (e) Apportionment to the cost centre: Rent per annum ₹ 5,400. Heat and light per annum ₹ 9,720 and foreman's salary per annum ₹ 12,960.

Required:

- (i) Calculate the cost of running one machine of a four-week period.
- (ii) Calculate machine hour rate.

[C.A. (PE – II) – Nov., 2007]

- 5.40. Calculate the machine hour rate of a machine with information given below :

Operating data :

Total number of weeks per quarter	13
Total number of hours per week	48
Stoppage due to maintenance	8 hrs p.m.
Time taken for set-up	2 hrs / week

Cost details :

	₹
Cost of machine	2,00,000
Repair and maintenance	24,000 p.a.
Consumable stores	30,000 p.a.
Rent, rates and taxes	8,000 per quarter
Operator's wages	3,000 p.m.
Supervisor's salary	5,000 p.m.
Cost of power	15 units per hour at ₹ 3 per unit.

Notes :

- (i) Life of the machine is 10 years. Depreciation is provided on straight line basis and is treated as variable cost.
- (ii) Repairs and maintenance and consumable stores are variable costs.
- (iii) Power is consumed for production runs only for set-up maintenance, but cost of power is to be borne by the total time excluding maintenance stoppages.
- (iv) The supervisor is supervising work on five identical machines including the one now considered.
- (b) The company hires out excess capacity in the machine shop for outside jobs. Assuming that hire charges are fixed at variable cost plus 20%. What rate should be quoted by the Company ?

[I.C.W.A. (Stage-1) – June, 1999]

Guide to Answer

Practical Questions

5.1 Overheads allocated and apportioned :

Dept. A – ₹ 4,205; Dept. B – ₹ 2,965; Dept. C – ₹ 2,135; and Dept. D – ₹ 3,095.

Note : Direct wages of Department 'D' will be treated as overhead as it is a service department.

5.2 Overheads after primary distribution : A – ₹ 9,580; B – ₹ 5,520; C – ₹ 3,050; D – ₹ 11,780.

Total overhead after secondary distribution : A – ₹ 14,292; B – ₹ 10,232; C – ₹ 5,406

5.3 Total overhead of production departments : X – ₹ 22,845; Y – ₹ 15,155.

	A	B	C
	₹	₹	₹
(i) Overhead of Boiler-house	60,000	1,20,000	90,000
(ii) Overhead of Pump-room	1,32,000	66,000	66,000

5.5 Total overheads after re-apportionment of service departments' overhead :

Dept. A – ₹ 7,35,335; B – ₹ 6,86,050; C – ₹ 5,48,607.

5.6 Total overheads after re-apportionment of service departments' overhead :

Dept. A – ₹ 18,712; B – ₹ 18,833; C – ₹ 15,555.

5.7 Total overheads : Shop No. 1 – ₹ 41,584; Shop No. 2 – ₹ 53,160; Shop No. 3 – ₹ 22,256.

(It has been assumed that there is no inter-service departmental expenses.)

	Apportioned Expenses (₹)	Total Overhead (₹)	Overhead after Re-distribution (₹)
Machine Shop	77,720	83,920	1,18,399
Packing	25,800	30,500	46,021
General Plant	2,830	20,000	
Stores and maintenance	22,650	30,000	

5.9 (i) After allocation of support department costs (using direct method), the total costs are :

Corporates sales – ₹ 15,20,668; Consumer sales – ₹ 8,13,131.

(ii) Administrative support department provides : *23.77% of its service to information systems support department. (*21/(42 + 28 + 21) × 100)

Information system support provides : *8.33% of its service to administrative support department. *[400 / (2,400 + 2,000 + 400) × 100.]

After allocation of support department costs (using step down allocation method) the total costs are : Corporate sales – ₹ 15,19,478; Consumer sales – ₹ 8,14,321.

(iii) An alternative ranking is based on the rupee amount of services rendered to other service departments, using the rupee figures obtained under requirement (ii).

Overhead of Information system to be allocated **first**.

Overhead of Administrative department to be allocated **next**.

(iv) After allocation of support department costs (using reciprocal allocation method), the total costs are : Corporate sales – ₹ 15,20,639; Consumer sales – ₹ 8,13,161.

5.10 Overheads as per primary distribution : S – ₹ 1,000; A – ₹ 1,300; B – ₹ 1,700; C – ₹ 1,400.

Overheads as per secondary distribution : A – ₹ 1,800; B – ₹ 2,000; C – ₹ 1,600.

Total Labour hours : A – 8,000; B – 8,000; C – 4,000.

Labour Hour Rate : A – ₹ 0.30; B – ₹ 0.25; C – ₹ 0.40.

5.11 (i) Direct labour hour rate = ₹ 2.

(ii) Percentage of direct wages = 80%.

(iii) Machine hour rate = ₹ 2.40.

5.126 Accounting for Overheads

Statement of Cost

Methods of Absorption of Overheads	Direct Labour Hour Rate	Percentage of Direct Wages	Machine Hour Rate
Materials	4,000	4,000	4,000
Direct Wages	3,300	3,300	3,300
Prime Cost	7,300	7,300	7,300
Production Overhead	3,300	2,640	2,880
Total Cost	10,600	9,940	10,180

5.12 Required level of activity = **6,250 hours**.

5.13 Total overhead of : A – ₹ 15,029; B – ₹ 18,355; C – ₹ 12,616.

Absorption Rate : A – ₹ 3; B – ₹ 4.58; C – ₹ 4.20.

5.14 Overheads as per primary distribution summary :

Dept. A – ₹ 21,350; Dept. B – ₹ 19,900; Dept. C – ₹ 30,400; Dept. S – ₹ 19,900.

Total Overheads after re-apportionment of 'S' department's overhead :

Dept. A – ₹ 27,320; B – ₹ 23,880; C – ₹ 40,350.

Labour Hour Rate : A – ₹ 17.07; B – ₹ 14.92; C – ₹ 25.21.

5.15 Total overhead after re-distribution of service department's overhead :

A – ₹ 9,500; B – ₹ 15,000; C – ₹ 7,000.

Recovery rate per hour : A – ₹ 9.50; B – ₹ 6.00; C – ₹ 5.00.

5.16 Overheads as per primary distribution summary :

Dept. A – ₹ 30,200; Dept. B – ₹ 28,800; Dept. C – ₹ 38,600; Dept. X – ₹ 18,500; Dept. Y – ₹ 6,300.

Total overheads after reappportionment of service department's overheads:

Dept. A – ₹ 37,360; Dept. B – ₹ 36,240; Dept. C – ₹ 48,800.

Overhead absorption rate : Dept. A – ₹ 16; Dept. B – ₹ 24; and Dept. C – ₹ 32.

5.17 **Overhead Recovery Rate under Different Methods**

	Direct Wages Rate	Direct Labour Hour Rate	Machine Hour Rate
1. Production Dept.	60%	15 paise per hour	18 paise per hour
2. Finishing Dept.	80%	24 paise per hour	60 paise per hour

Comparative Statement of Work Order 111

	Direct Wages Basis (₹)	Direct Labour Basis (₹)	Machine Hour Basis (₹)
1. Production Dept.	448	449.50	461.80
2. Finishing Dept.	110	103.60	100.00

5.18 Overheads as per primary distribution summary :

Dept. P1 – ₹ 7,700; P2 – ₹ 7,300; P3 – ₹ 9,800; S1 – ₹ 4,700; S2 – ₹ 929.

Total overhead after re-apportionment of service department's overhead :

P1 – ₹ 9,234; P2 – ₹ 9,034; P3 – ₹ 12,160.

Overhead recovery rate : P1 – ₹ 3; P2 – ₹ 2; and P3 – ₹ 5 (approx.). Total Cost = ₹ 117.

5.19 Total overhead of production departments after re-distribution of service departments overhead :

A – ₹ 46,697; B – ₹ 45,304; C – ₹ 60,999. Overhead recovery rate : A – ₹ 7.50; B – ₹ 11.25; C – ₹ 15.00.

Total production cost = 400 + 131.25 = ₹ 531.25.

5.20 Total overhead : Dept. A – ₹ 54,318; B – ₹ 44,182.

Cost per unit of 'P' = ₹ 13.58; Cost per unit of 'Q' = ₹ 10.41; Cost per unit of 'R' = 6.47.

5.21 (i) Anticipated available hours = 37,500 hours. Overhead recovery rate = ₹ 2.00 per direct labour hour.

(ii) Overhead absorbed = ₹ 75,660; Overhead over-absorbed = ₹ 44.

(iii) Total hours worked = 37,830 hours.

5.22 Overhead under-absorbed = ₹ 72,000.

Treatment of under-absorbed overheads :

(a) If it is charged to costing Profit and Loss Account :

Costing Profit and Loss Account	Dr.	72,000	
To Manufacturing Overhead Account			72,000

(b) If it is charged to Production by applying supplementary rate :

W.I.P Account	Dr.	1,500	
Finished Goods Account	Dr.	4,500	
Cost of Goods Sold Account	Dr.	66,000	
To Manufacturing Overhead Account			72,000

5.23 Total unabsorbed overhead = ₹ 5,00,000.

(i) Unabsorbed overheads due to defective planning ₹ 3,00,000 may be charged to Costing Profit and Loss Account.

(ii) Unabsorbed overheads of ₹ 2,00,000 will be charged to Production @ ₹ 5 per unit.

Closing stock of finished goods to be charged = ₹ 25,000.

Work-in-progress to be charged = ₹ 25,000.

5.24 Total unabsorbed overhead = ₹ 20,000.

(i) To be absorbed by cost of goods sold = ₹ 14,000

(ii) To be absorbed by finished goods = ₹ 4,000

(iii) To be absorbed by W.I.P. = ₹ 2,000

₹ 20,000

5.25 (i) Variable overhead rate per hour ₹ 8.75.

(ii) Estimated total fixed overhead ₹ 2,12,000.

(iii) Budgeted level of activity in labour hours 16,000 hours.

Under recovery of overhead : ₹ 6,350 (₹ 3,48,700 – ₹ 3,55,050)

5.26 Total unabsorbed overhead = ₹ 4,00,000.

(i) Unabsorbed overheads due to defective planning ₹ 2,40,000 will be charged to Costing Profit and Loss Accounts.

(ii) Unabsorbed overheads of ₹ 1,60,000 will be charged to Production @ ₹ 4 (1,60,000 / 40,000) per unit.

5.27 (i) Standing charges 0.41

(ii) Machine expenses 0.40

(iii) Repairs 0.05

(iv) Power 0.10

Machine hour rate (₹) 0.96

5.28 (i) Standing charges 2.00 per hour

(ii) Machine expenses 5.00 per hour

(iii) Repairs 2.50 per hour

(iv) Power 1.00 per hour

Machine hour rate (comprehensive) 10.50

5.29 Machine hour rate = ₹ 1.74.

5.30 Standing charges per hour ₹ 23.94

Depreciation per hour 8.32

Repairs per hour 0.83

Power 60.00

Total 93.09

5.128 Accounting for Overheads

5.31	Standing charges per hour	₹ 7.30
	Depreciation per hour	19.50
	Repairs per hour	3.10
	Diesel oil, etc.	<u>15.00</u>
	Total	<u>44.90</u>

5.32 Comprehensive machine hour rate = ₹ 169.86; Effective machine hours = 2,288. Hours for power consumption = 2,392.

5.33	Standing charges	₹ 1.50
	Power	60.80
	Chemical	0.50
	Maintenance	0.60
	Depreciation	<u>4.50</u>
	Total	<u>67.90</u>

5.34 Machine hour rate = ₹ 95.

5.35 Machine hour rate = ₹ 23.87.

5.36 Effective hours = 144. Machine hour rate ₹ 40.

5.37 Machine hour rate : Centre I = ₹ 6.00; Centre II = ₹ 4.417; Centre III = ₹ 4.710.

5.38 Machine hour rate (composite) : Cost Centre A = ₹ 75.20; Cost Centre B = ₹ 86.50; Cost Centre C = ₹ 89.83.

5.39 (i) Cost of running one machine for a four-week period = ₹ **17,368**.

(ii) Machine hour rate = ₹ **98.68**.

5.40 Machine hour rate = ₹ 107.22; (b) Rate to be quoted = ₹ 88.66; Effective working hours = 600; Power consumed ($514 \times 15 \times ₹ 3$) = ₹ 25,830 in a quarter.

Cost Book-Keeping

Introduction

The dynamic nature of business calls for different reports from cost department. This includes reporting of data by product line, by plant-wise, by region-wise and by other significant segregation. The promptness in generation of these reports is most important in enhancing their value to management. A proper cost accounting system can provide meaningful report to the management.

Now-a-days, one of the biggest challenge for an enterprise is management and control of cost. Again there are legal and other requirements for reliable cost data. The cost accounting system should be designed in such a manner that it can provide all necessary data at lowest cost and effort.

Although most accounting systems are computerized, it is nevertheless important to understand the relationship between the various accounts that comprise the cost accounting system.

Now-a-days, cost and management accountants hardly need to make a journal entry or a ledger posting. However, they must know the basic tenets, like the relationship of the data appearing in the Profit and Loss Account and Balance Sheet. Otherwise they cannot provide proper guidance to management. Therefore, it is very important for students to know how cost book-keeping is done.

There are two systems of cost book-keeping in use :

- (1) Integrated (Integral) Accounting System; and
- (2) Non-integral (Interlocking) Accounting System.

In this Chapter, we will discuss the procedures of recording different transactions relating to cost.

Integrated Accounting System

The Chartered Institute of Management Accountants (CIMA) defines integrated accounting as "*a set of accounting records which provides financial and cost accounts using a common input of data for all accounting purposes.*" Under this system, only one set of books of account is maintained. No separate records are maintained by the costing section. All transactions are recorded directly into one general ledger via different day books, e.g., purchases day book, sales day book, cash book, petty cash book and journal proper. All transactions are recorded following the *golden rules* of debit and credit. It is appropriate to recapitulate the rules :

Rule 1 : The Duality Rule

Every transaction has two effects, one of which will be recorded as **debit** in one account and other will be recorded as **credit** in another account. In short, for every debit there should be a credit entry of equal amount.

Rule 2 : Debit and Credit Rule

Traditional Rules of Debit and Credit at a Glance

	Types of Account	Account to be debited	Account to be credited
1.	Personal Account	Receiver	Giver
2.	Real Account	What comes in	What goes out
3.	Nominal Account	Expense and Loss	Income and Gain
4.	Valuation Account	When account to be decreased	When account to be increased

6.2 Cost Book-Keeping

Modern Rules for Debit and Credit

Sl. No.	Types of Account	Account to be debited	Account to be credited
1.	Assets Account	Increase ↑	Decrease ↓
2.	Liabilities Account	Decrease ↓	Increase ↑
3.	Capital Account	Decrease ↓	Increase ↑
4.	Revenue Account	Decrease ↓	Increase ↑
5.	Expense Account	Increase ↑	Decrease ↓
6.	Withdrawal Account	Increase ↑	Decrease ↓

In an integrated accounting system, a minor modification is made at the time of recording any transaction. This modification is necessary to ascertain the cost of the job, process and operations and control of cost.

Illustrative Example – 1

Purchase of raw materials for ₹ 1,00,000 for cash.

In financial accounting, normally it is recorded as :

Purchases Account	Dr.	₹ 1,00,000	
To Cash Account			₹ 1,00,000

In an **integrated accounting system**, Purchases Account will be replaced by Stores Ledger Control Account (Control Account will be discussed in detail within few pages).

The entry will be :

Stores Ledger Control Account	Dr.	₹ 1,00,000	
To Cash Account			₹ 1,00,000

At the time of issue of materials, different accounts (e.g., Work-in-progress Control Account, Production Overhead Control Account, Administrative Overhead Control Account) are debited based on the nature of materials (direct or indirect) and Stores Ledger Control Account is credited.

The entry would be :

Work-in-Progress Control Account	Dr.	[Direct materials]
Production Overhead Control Account	Dr.	[Indirect materials]
Administrative Overhead Control Account	Dr.	[Materials issued for office use]
To Stores Ledger Control Account		

Illustrative Example – 2

Wages paid ₹. 50,000.

In normal financial accounting it is recorded as :

Wages Account	Dr.	₹ 50,000	
To Cash Account			₹ 50,000

In an **integrated accounting system**, the entry would be :

Wages Control Account	Dr.	₹ 50,000	
To Cash Account			₹ 50,000

On the basis of analysis of wages (direct or indirect), different accounts (e.g., Work-in-progress Control Account, Production Overhead Control Account, etc.) are debited and Wages Control Account is credited.

The entry for disposal of wages would be :

Work-in-Progress Control Account	Dr.	[Direct wages]
Production Overhead Control Account	Dr.	[Indirect wages]
To Wages Control Account		

Smooth operation of integrated accounting system requires the following pre-requisites :

1. There should be a suitable coding system in place so that necessary information can be generated for cost ascertainment and cost control.
2. There should be proper co-ordination between cost accounting department and financial accounting department and information must be provided by each department in time and in unambiguous manner.
3. There may be a fully integrated system or partly integrated system. The extent of integration must be determined by the top management.
4. If the accounts are maintained under computerised system, a suitable accounting software must be acquired, taking cost and benefit into consideration. For big companies it is advantageous to have customised software.

Features of Integrated Accounting System

1. In an integrated accounting system, only one ledger is maintained. No separate ledger is maintained for cost accounts.
2. Integrated accounts do not require two separate sets of double entries for many transactions.
3. In an integrated accounting system only one Trial Balance is prepared from which the Financial Accounts and Cost Accounts are prepared.
4. In an integrated accounting system no reconciliation of profit or loss is required.
5. Integrated accounts do not record any notional rent or interest in the books of account.

Advantages of Integrated Accounting System

1. In an integrated accounting system, book-keeping procedures are simple, faster and could reduce the chances of error.
2. In an integrated accounting system, the cost data are available from a single ledger and hence no delay is caused in getting all necessary information.
3. Integrated accounting system discloses only one profit figure. Therefore, the reconciliation of profit or loss is not required. There is no confusion in respect of profit or loss figure.
4. Keeping of one set of ledger and no duplication of entries will save time and money to a great extent.
5. Computerised accounting system can be implemented easily when integrated accounting system is in place.
6. Integrated accounting system reduces the job of the auditor, which could be complicated by the existence of two separate ledgers.
7. The knowledge of cost and financial account can be pooled together to achieve more efficiency.

Disadvantages of Integrated Accounting System

1. In an integrated accounting system more emphasis is given on external reporting. Accounts are prepared to satisfy the legal requirement. The same information may not serve the purpose of the management. **For example**, in an integrated accounting system, stock should be valued as AS-2 : Inventories. But for costing purposes, the more appropriate method of value of stock should be LIFO method (LIFO is, however, not allowed as per AS-2).
2. In an integrated accounting system, notional rent or interest is not recorded. In some cases, the inclusion of these items is necessary to calculate true cost of the product or service. Therefore, decision based on data from integrated accounting system may be misleading.
3. For a multi-product big company, the integrated accounting system may not be suitable for cost control of different products. In this case, a separate cost ledger may serve the purpose of the organisation in a better manner.
4. The friction between financial accounting department and cost accounting department may create a problem for the management if integrated accounting system is in operation. There will be a blame game between two departments for failure or problems.

6.4 Cost Book-Keeping

Control Accounts

Before going into the details of cost book-keeping, it is necessary to explain the nature of **Control Accounts**.

A Control Account represents the total of a number of similar (but individual) items – i.e., a summary account. A large company like Reliance Industries Ltd. (RIL) may have thousands of accounts for raw materials, customers, suppliers, etc. It is not possible to accommodate all the accounts in the general ledger. So, to resolve the practical difficulties and also to assist in the allocation of accounting and book-keeping tasks, separate memorandum ledger is maintained. Individual accounts are maintained in respective ledgers and total of those similar accounts are recorded in the general ledger through Control Accounts.

In the **General Ledger** the following **Control Accounts** are likely to be found :

(i) Stores Ledger Control Account	(vi) Selling and Distribution Control Account
(ii) Wages Control Account	(vii) Finished Goods Control Account
(iii) Work-in-Progress Control Account	(viii) Debtors Ledger Control Account
(iv) Production Overheads Control Account	(ix) Creditors Ledger Control Account
(v) Administration Overheads Control Account	

A simple example will illustrate how Control Accounts operate :

Let us assume that there are four materials – A, B, C, D.

Materials purchased during a period : ₹		Materials issued during the same period : ₹	
Material A	20,000	Material A	18,000
Material B	10,000	Material B	7,000
Material C	<u>30,000</u>	Material C	<u>25,000</u>
	<u>60,000</u>		<u>50,000</u>

Here, the purchase of material A, B, C and D will be recorded in the individual stock account maintained in the Memorandum Stores Ledger. The **total** of all materials purchased will be recorded (posted) in an account within the General Ledger called 'Stores Ledger Control Account'.

Similarly, with issues of materials to the production departments: the individual details will be posted to the respective materials account maintained in the Memorandum Stores Ledger. The total value of all issues will be posted in the Stores Ledger Control Account in the General Ledger. The relationships can be shown with the help of the following diagram :

Memorandum Stores Ledger				General Ledger															
Material 'A' Account				Stores Ledger Control Account <table><tr><td>To Cash</td><td>60,000</td><td>By W.I.P.</td><td>50,000</td></tr><tr><td></td><td></td><td>By Balance</td><td>10,000</td></tr><tr><td></td><td>60,000</td><td></td><td>70,000</td></tr></table>				To Cash	60,000	By W.I.P.	50,000			By Balance	10,000		60,000		70,000
To Cash	60,000	By W.I.P.	50,000																
		By Balance	10,000																
	60,000		70,000																
To Cash	20,000	By W.I.P.	18,000																
		By Balance	2,000																
	20,000		18,000																
Material 'B' Account																			
To Cash	10,000	By W.I.P.	7,000																
		By Balance	3,000																
	10,000		10,000																
Material 'C' Account																			
To Cash	30,000	By W.I.P.	25,000																
		By Balance	5,000																
	30,000		30,000																

[Fig. 7.1]

Advantages of Using Control Accounts

The following are the advantages of Control Accounts in General Ledger :

1. Control Accounts provide a check on the accuracy of entries made in the individual accounts which are maintained in the Memorandum / Subsidiary Ledger.
2. Control Accounts assists in locating the errors. A regular comparison of the balances of the Control Accounts with individual balances will quickly fix up the errors.
3. Control Accounts can assist in speeding up the preparation of accounts.
4. Control Accounts provide an internal check. The staff posting entries to the Control Accounts will act as a check on different staff(s) posting entries in the Memorandum Subsidiary Ledgers.

Journal Entries under Integrated Accounting System

1. ***When materials are purchased in cash***

Stores Ledger Control Account	Dr.
To Cash / Bank Account	

2. ***When materials are purchased on credit***

Stores Ledger Control Account	Dr.
To Creditors Ledger Control Account	
Or	
To Sundry Creditors Account	

Generally there would be numerous suppliers for supply of different types of materials. Almost all organisations maintain separate ledger for suppliers / creditors. In the general ledger one account is maintained, i.e., Creditors Ledger Control Account' to record all transactions relating to suppliers in total.

Therefore, it is more logical to credit Creditors Ledger Control Account than Sundry Creditors Account.

3. ***When materials are returned to suppliers***

Creditors Ledger Control Account	Dr.
Or	
Sundry Creditors Account	Dr.
To Stores Ledger Control Account	

4. ***When direct materials are issued to production***

Work-in-Progress Control Account	Dr.
To Stores Ledger Control Account	

5. ***When indirect materials are issued***

Production / Factory Overhead Control Account	Dr.
To Stores Ledger Control Account	

6. ***When materials are returned to stores***

Stores Ledger Control Account	Dr.
To Work-in-Progress Control Account	
To Production / Factory Overheads Control Account	

7. ***When physical stock is less than stock as per stores ledger***

Stock Discrepancy Account	Dr.
To Stores Ledger Control Account	

8. *When physical stock is more than stock as per stores ledger*

Stores Ledger Control Account Dr.
 To Stock Discrepancy Account

At the end of the accounting period, the balance of 'Stock Discrepancy Account' is transferred to Profit and Loss Account. Alternatively, it could be debited to Production Overheads Control Account.

9. *When wages are paid*

Wages Control Account Dr.
 To Cash / Bank Account

10. *When direct wages are charged to production*

Work-in-Progress Control Account Dr.
To Wages Control Account

- 11.
- When indirect wages are charged*

Production / Factory Overhead Control Account Dr.
To Wages Control Account

12. *When factory / production overheads are incurred*

Production / Factory Overheads Control Account Dr.
To Bank / Cash Account

13. *When factory / production overheads are absorbed*

Work-in-Progress Control Account Dr.
To Production / Factory Overheads Control Account

14. *For under-recovery of production / factory overheads*

Profit and Loss Account Dr.
To Production / Factory Overheads Control Account

15. *For over-recovery of production / factory overheads*

Dr.

Production / Factory Overheads Control Account

To Profit and Loss Account

16. *When cost of finished produced is transferred*

Finished Goods Control Account Dr.
To Work-in-Progress Control Account

17. *When administrative overheads are incurred*

Administrative Overheads Control Account Dr.
To Cash / Bank Account

18. *When administrative overheads are absorbed*

Finished Goods Control Account Dr.
To Administrative Overheads Control Account

19. *When there is under-recovery of administrative overheads*

Profit and Loss Account Dr.
To Administrative Overhead Control Account

20. ***When there is over-recovery of administrative overheads***

Administrative Overheads Control Account	Dr.
To Profit and Loss Account	

21. ***When cost of finished goods are transferred to cost of sales account***

Cost of Sales Account	Dr.
To Finished Goods Control Account	

22. ***When selling and distribution overheads are incurred***

Selling and Distribution Overheads Control Account	Dr.
To Cash / Bank Account	

23. ***When selling and distribution overheads are recovered***

Cost of Sales Account	Dr.
To Selling and Distribution Overheads Control Account	

24. ***When there is under-recovery of selling and distribution overheads***

Profit and Loss Account	Dr.
To Selling and Distribution Overheads Control Account	

25. ***When there is over-recovery of selling and distribution overheads***

Selling and Distribution Overheads Control Account	Dr.
To Profit and Loss Account	

26. ***When goods are sold for cash***

Cash / Bank Account	Dr.
To Sales Account	

27. ***When goods are sold on credit***

Debtors Ledger Control Account	Dr.
Or	
Sundry Debtors Account	Dr.
To Sales Account	

28. ***For closing cost of sales account***

Profit and Loss Account	Dr.
To Cost of Sales Account	

29. ***For closing sales account***

Sales Account	Dr.
To Profit and Loss Account	

It is to be noted that many organisations are closing cost of Sales Account through Sales Account by passing the following entry :

Sales Account	Dr.
To Cost of Sales Account	

The balance of Sales Account is transferred to Profit and Loss Account.

Illustration 1

Shivalika Enterprises operates an integral system of accounting. You are required to pass journal entries for any four of the following transaction that took place for the year ended on 31st March, 2003.

6.8 Cost Book-Keeping

	₹
(i) Raw material purchased (50% on credit)	6,00,000
(ii) Materials issued to Production	4,00,000
(iii) Factory overheads incurred	80,000
(iv) Sales (50% credit)	7,50,000
(v) Receipt from Debtors	2,00,000
(vi) Payment to Creditors	2,00,000

[B.Com. (Hons.), Delhi – Adapted]

Solution

In the books of Shivalika Enterprises

Journal			Dr.	Cr.
Date	Particulars	L.F.	₹	₹
(i)	Stores Ledger Control A/c Dr. To Bank A/c To Creditors Ledger Control A/c (Being the purchase of raw materials for cash and credit equally)		6,00,000	3,00,000 3,00,000
(ii)	Work-in-Progress Control A/c Dr. To Stores Ledger Control A/c (Being issue of materials for production)		4,00,000	4,00,000
(iii)	Factory Overheads Control A/c Dr. To Bank A/c (Being the factory overhead incurred)		80,000	80,000
(iv)	Bank A/c Dr. Debtors Ledger Control A/c Dr. To Sales A/c (Being the sale of goods for cash and credit equally)		3,75,000 3,75,000	7,50,000
(v)	Bank A/c Dr. To Debtors Ledger Control A/c (Being the amount received from different customers)		2,00,000	2,00,000
(vi)	Creditors Ledger Control A/c Dr. To Bank A/c (Being the amount paid to different suppliers)		2,00,000	2,00,000

Illustration 2 (a)

Show the journal entries for the following transactions in the integrated books of accounts :

	₹
(i) Cash purchase	18,000
(ii) Credit purchase	2,45,000
(iii) Materials issued to production	3,25,000
(iv) Wages paid to workers	1,39,612
(v) Finished goods transferred from production	6,29,775
(vi) Administrative overhead allowable to production	78,900
(vii) Works expenses outstanding	2,25,000
(viii) Goods sold during the month	7,65,000

[I.C.W.A. (Inter) – June, 2000]

Solution

In the books of ...

Journal			Dr.	Cr.
Date	Particulars	L.F.	₹	₹
(i)	Stores Ledger Control A/c Dr. To Bank A/c (Being the purchase of materials for cash)		18,000	18,000

(ii)	Stores Ledger Control A/c To Creditors Ledger Control A/c (Being the purchase of materials on credit)	Dr.	2,45,000	2,45,000
(iii)	Work-in-Progress Control A/c To Stores Ledger Control A/c (Being the issue of materials for production)	Dr.	3,25,000	3,25,000
(iv)	Wages Control A/c To Bank A/c (Being the wages paid)	Dr.	1,39,612	1,39,612
(v)	Finished Stock Ledger Control A/c To Work-in-Progress A/c (Being the finished goods transferred from production)	Dr.	6,29,775	6,29,775
(vi)	Work-in-Progress A/c To Administrative Overhead Control A/c (Being the administrative overhead allocated to production)	Dr.	78,900	78,900
(vii)	Production Overhead / Works Expenses Control A/c To Outstanding Works Expenses A/c (Being the adjustment for outstanding works expenses)	Dr.	2,25,000	2,25,000
(viii)	Debtors Ledger Control A/c To Sales A/c (Being the sale of goods on credit to different customers)	Dr.	7,65,000	7,65,000

Illustration 2 (b)

In the course of physical verification of stores as on 31st March, 1991, following differences are revealed in case of AB Ltd.

Balance

Material	Unit	Rate per unit (₹)	Physical	Ledger	Remarks
A	Nos.	7.00	600	680	Wrong counting
B	Litres	12.00	1100	1155	Normal evaporation loss
C	Nos.	6.00	350	400	Material issues not accounted for
D	Kgs.	22.00	900	930	Shortage due to pilferage and theft
E	Nos.	15.00	1475	1325	150 Nos. received but not entered in ledger
F	Metres	10.00	291	291	Obsolete materials. Realised sale value ₹ 1650, awaiting despatch.

Prepare journal entries in the Cost Ledger to give effect to the above adjustments as called for.

[I.C.W.A. (Inter) – June, 1991]

Solution

Material A : Counting was wrong but ledger balance of 680 is correct. Therefore, no entry is required. However, stock sheet should be corrected.

Material B : 55 litres (1155 – 1100) were evaporated which is normal. Cost of 55 litres @ ₹ 12 per litre = ₹ 660 should be adjusted in the accounts through journal entry. The entry will be :

Stores Adjustment Account	Dr.	660
To Stores Ledger Control Account		660

(Being the adjustment of normal evaporation loss of material B)

Note : Stores Adjustment Account will be transferred to Production Overhead Control Account at the end of the period.

Material D : Theft and pilferage of materials should be treated as abnormal loss and it should be charged to

(Being the abnormal loss in the form of materials stolen charged to Costing Profit and Loss Account)

(Being the recording of materials received but not entered in the books of account)

(Being the obsolete item of materials written-off and sale value transferred to Cost Ledger Control Account)

[D.U.B.Com. (Hons.) – 2007]

(iii)	Creditors Ledger Control A/c To Bank A/c (Being the amount to different creditors)	Dr.	3,00,000	3,00,000
(iv)	Work-in-Progress Control A/c To Stores Ledger Control A/c (Being stores issued for production)	Dr.	2,50,000	2,50,000
(v)	Wages Control A/c To Bank A/c (Being the payment of productive wages)	Dr.	2,00,000	2,00,000
(vi)	Wages Control A/c To Bank A/c (Being the payment of unproductive wages)	Dr.	70,000	70,000
(vii)	Production / Works Overhead Control A/c To Bank A/c (Being the works overhead paid)	Dr.	3,60,000	3,60,000
(viii)	Production / Works Overhead Control A/c To Stores Ledger Control A/c (Being the issue of materials for repair)	Dr.	2,000	2,000
(ix)	Selling and Distribution Overheads Control A/c To Bank A/c (Being selling expenses paid)	Dr.	10,000	10,000
(x)	Office and Administrative Overheads Control A/c To Bank / Cash A/c (Being office expenses paid)	Dr.	4,000	4,000
(xi)	Work-in-Progress Control A/c To Production / Works Overhead Control A/c (Being the production overhead absorbed)	Dr.	4,10,000	4,10,000
(xii)	Finished Stock Control A/c To Work-in-Progress Control A/c (Being the transfer of finished goods)	Dr.	8,60,000	8,60,000

Illustration 4

Dutta Enterprises operates an integral system of accounting. You are required to pass the journal entries for the following transactions that took place for the year ended 30.6.2010 (Narrations are not required) :

	₹
Raw materials purchased (50% on credit)	6,00,000
Materials issued to production	4,00,000
Wages paid (50% direct)	2,00,000
Wages charged to production	1,00,000
Factory overheads incurred	80,000
Factory overheads charged to production	1,00,000
Selling and distribution overheads incurred	40,000
Finished goods at cost	5,00,000
Sales (50% credit)	7,50,000
Closing stock	nil
Receipts from debtors	2,00,000
Payments to creditors	2,00,000

6.12 Cost Book-Keeping

Solution

In the books of Dutta Enterprises Journal

		Dr.		Cr.
Date	Particulars	L.F.	₹	₹
	Stores Ledger Control A/c Dr. To Cash or Bank A/c To Creditors Ledger Control A/c		6,00,000	3,00,000 3,00,000
	Work-in-Progress Control A/c Dr. To Stores Ledger Control A/c		4,00,000	4,00,000
	Wages Control A/c (Note 1) Dr. To Cash / Bank A/c		2,00,000	2,00,000
	Work-in-Progress Control A/c Dr. To Wages Control A/c		1,00,000	1,00,000
	Factory Overheads Control A/c Dr. To Wages Control A/c		1,00,000	1,00,000
	Factory Overheads Control A/c Dr. To Cash / Bank A/c		80,000	80,000
	Work-in-Progress Control A/c Dr. To Factory Overheads Control A/c		1,00,000	1,00,000
	Selling and Distribution Overheads Control A/c Dr. To Cash / Bank A/c		40,000	40,000
	Finished Stock Ledger Control A/c Dr. To Work-in-Progress Control A/c		5,00,000	5,00,000
	Cash / Bank A/c Dr. Debtors Ledger Control A/c Dr. To Sales A/c		3,75,000 3,75,000	7,50,000
	Cash / Bank A/c Dr. To Debtors Ledger Control A/c		2,00,000	2,00,000
	Creditors Ledger Control A/c Dr. To Cash / Bank A/c		2,00,000	2,00,000

Working Notes :

- (1) Direct wages or indirect wages are all debited to Wages Control Account. However, direct wages will be transferred to Work-in-Progress Control Account and indirect wages will be transferred to Factory Overheads Control Account.

Illustration 5

In the absence of the Chief Accountant, you have been asked to prepare a month's cost accounts for a company which operates a batch costing system fully integrated with the financial accounts. The following relevant information is provided to you :

Balances at the beginning of the month :

	₹	₹
Stores Ledger Control Account		25,000
Work-in-progress Control Account		20,000
Finished Goods Control Account		35,000
Prepaid Production Overheads brought forward from previous month		3,000

Transactions during the month :

Materials purchased		75,000
Materials issued :		
To Production	30,000	
To Factory Maintenance	<u>4,000</u>	34,000
Materials transferred between batches		2,000

Total wages paid :

To Direct workers	25,000	
To Indirect workers	<u>5,000</u>	30,000
Direct wages charged to batches		20,000
Recorded non-productive time of direct workers		5,000
Selling and distribution overheads incurred		6,000
Other production overheads incurred		12,000
Sales		1,00,000
Cost of finished goods sold		80,000
Cost of goods completed and transferred into finished goods during the month		65,000
Physical value of work-in-progress at the end of the month		40,000
The production overhead absorption rate is 150% of direct wages charged to Work-in-progress.		

Required :

Prepare the following accounts for the month :

(a) Stores Ledger Control Account	(b) Work-in-Progress Control Account
(c) Finished Goods Control Account	(d) Production Overhead Control Account
(e) Profit and Loss Account	

Solution

Dr. Stores Ledger Control Account			Cr.		
Date	Particulars	₹	Date	Particulars	₹
	To Balance b/d	25,000		By WIP Control A/c	30,000
	To Creditors Ledger Control A/c	75,000		By Production Overheads Control A/c	4,000
				By Balance c/d	66,000
		<u>1,00,000</u>			<u>1,00,000</u>

Dr. Work-in-Progress Control Account			Cr.		
Date	Particulars	₹	Date	Particulars	₹
	To Balance b/d	20,000		By Finished Goods Control A/c	65,000
	To Stores Ledger Control A/c	30,000		By Balance c/d	40,000
	To Wages Control A/c	20,000			
	To Production Overheads Control A/c	30,000			
	To Profit and Loss A/c (Note 3) (Stock gains)	5,000			
		<u>1,05,000</u>			<u>1,05,000</u>

Dr. Finished Goods Control Account			Cr.		
Date	Particulars	₹	Date	Particulars	₹
	To Balance b/d	35,000		By Cost of Finished Goods A/c	80,000
	To Work-in-Progress Control A/c	65,000		By Balance c/d	20,000
		<u>1,00,000</u>			<u>1,00,000</u>

Dr. Production Overheads Control Account			Cr.		
Date	Particulars	₹	Date	Particulars	₹
	To Balance b/d (Prepaid)	3,000		By Work-in-Progress Control A/c	30,000
	To Stores Ledger Control A/c	4,000			
	To Wages Control A/c	5,000			
	To Wages Control A/c (Note 2)	5,000			
	To Cash / Bank A/c	12,000			
	To Profit and Loss A/c (Over-absorption)	1,000			
		<u>30,000</u>			<u>30,000</u>

6.14 Cost Book-Keeping

Dr. Wages Control Account			Cr.		
Date	Particulars	₹	Date	Particulars	₹
	To Bank / Cash A/c	30,000		By Work-in-Progress Control A/c	20,000
				By Production Overheads Control A/c	5,000
				By Production Overheads Control A/c (Note 2)	5,000
		30,000			30,000

Dr. Selling and Distribution Overheads Control Account			Cr.		
Date	Particulars	₹	Date	Particulars	₹
	To Bank / Cash A/c	6,000		By Profit and Loss A/c	6,000

Dr.		Profit and Loss Account for the year ended ...		Cr.	
Particulars		₹	Particulars		₹
To Cost of Finished Goods A/c		80,000	By Sales A/c		1,00,000
To Selling and Distribution Overheads Control A/c		6,000	By Work-in-Progress Control A/c (Note 3)		5,000
To Net Profit		20,000	By Production Overhead Control A/c (Over-absorption)		1,000
		1.06.000			1.06.000

Working Notes :

- (1) Materials transferred between batches – ₹ 2,000 will not affect Control Account.
- (2) Wages paid to direct workers ₹ 25,000. But only ₹ 20,000 has been charged to batches. Therefore, balance ₹ 5,000 of direct wages will be debited to Production Overheads Control Account.
- (3) Excess physical stock in Work-in-Progress Control Account will be credited to Profit and Loss Account.
- (4) Production Overhead absorption rate is 150% of direct wages. Therefore, overhead absorbed = 150% of ₹ 20,000 = ₹ 30,000.

Illustration 6

BPR Limited keeps books on integrated accounting system. The following balances appear in the books as on April 1, 2002 :

	Dr. (₹)	Cr. (₹)
Stores Control Account	40,950	—
Work-in-Progress Account	38,675	—
Finished Goods Account	52,325	—
Bank Account	—	22,750
Creditors Account	—	18,200
Fixed Assets Account	1,47,875	—
Debtors Account	27,300	—
Share Capital Account	—	1,82,000
Provision for Depreciation Account	—	11,375
Provision for Doubtful Debts Account	—	3,725
Factory Overheads Outstanding Account	—	6,250
Prepaid Administration Overheads Account	9,975	—
Profit and Loss A/c	—	72,800
	3,17,100	3,17,100

The transactions for the year ended March 31, 2003 were as given below :

	₹	₹
Direct wages	1,97,925	
Indirect wages	<u>11,375</u>	2,09,300
Purchase of materials (on credit)		2,27,500
Materials issued to production		2,50,250
Materials issued for repairs		4,550
Goods finished during the year (at cost)		4,89,125
Credit Sales		6,82,500
Cost of goods sold		5,00,500
Production overheads absorbed		1,09,200
Production overheads paid during the year		91,000
Production overheads outstanding at the end of year		7,775
Administration overheads paid during the year		27,300
Selling overheads acquired		31,850
Payment to Creditors		2,29,775
Payment received from Debtors		6,59,750
Depreciation of Machinery		14,789
Administration overheads outstanding at the end of the year		2,225
Provision for doubtful debts at the end of the year		4,590

Required : Write up accounts in the integrated ledger of BPR Limited and prepare a Trial Balance.

[C.A. (Inter) – November, 2003]

Solution

In the books of BPR Limited

Dr.			Cr.		
Stores Control Account					
Date	Particulars	₹	Date	Particulars	₹
1.4.02	To Balance b/d	40,950	31.3.03	By Work-in-Progress A/c	2,50,250
31.3.03	To Creditors A/c	2,27,500	"	By Production Overhead Control A/c	4,550
			"	By Balance c/d	13,650
		<u>2,68,450</u>			<u>2,68,450</u>

Dr.			Cr.		
Work-in-Progress Account					
Date	Particulars	₹	Date	Particulars	₹
1.4.02	To Balance b/d	38,675	31.3.03	By Finished Goods A/c	4,89,125
31.3.03	To Stores Control A/c	2,50,250	"	By Balance c/d	1,06,925
"	To Wages Control A/c	1,97,925			
"	To Production Overheads A/c	1,09,200			
		<u>5,96,050</u>			<u>5,96,050</u>

Dr.			Cr.		
Finished Goods Account					
Date	Particulars	₹	Date	Particulars	₹
1.4.02	To Balance b/d	52,325	31.3.03	By Cost of Sales A/c	5,00,500
31.3.03	To Work-in-Progress A/c	4,89,125	31.3.03	By Balance c/d	80,450
"	To Administration Overheads	39,500			
		<u>5,80,950</u>			<u>5,80,950</u>

6.16 Cost Book-Keeping

Dr. Cost of Sales Account Cr.					
Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Finished Goods A/c	5,00,500	31.3.03	By Profit and Loss A/c	5,32,350
	To Selling Overheads A/c	31,850			
		5,32,350			5,32,350

Dr. Wages Control Account Cr.					
Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Bank A/c	2,09,300	31.3.03	By Work-in-Progress A/c	1,97,925
				By Production Overheads A/c	11,375
		2,09,300			2,09,300

Dr. Production Overheads Account Cr.					
Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Stores Control A/c	4,550	31.3.03	By Production Overhead Outstanding A/c	6,250
	To Bank A/c	91,000		By WIP A/c	1,09,200
	To Wages Control A/c	11,375		By Profit and Loss A/c	14,039
	To Production Overhead Outstanding A/c	7,775		(Under absorption of overheads)	
	To Depreciation on Machinery A/c	14,789			
		1,29,489			1,29,489

Dr. Administration Overheads Account Cr.					
Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Bank A/c	27,300	31.3.03	By Finished Goods A/c	39,500
	To Pre-paid Administration Overhead A/c	9,975			
	To Outstanding Administration Overhead A/c	2,225			
		39,500			39,500

Dr. Selling Overheads Account Cr.					
Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Bank A/c	31,850	31.3.03	By Cost of Sales A/c	31,850

Dr. Sales Account Cr.					
Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Profit and Loss A/c	6,82,500	31.3.03	By Debtors A/c	6,82,500

Dr. Factory / Production Overhead Outstanding Account Cr.					
Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Production Overheads A/c	6,250	1.4.02	By Balance b/d	6,250
	To Balance c/d	7,775	31.3.03	By Production Overhead A/c	7,775
		14,025			14,025

Dr. Prepaid Administration Overheads Account Cr.					
Date	Particulars	₹	Date	Particulars	₹
1.4.02	To Balance b/d	9,975	31.3.03	By Administration Overheads A/c	9,975

Dr. Provision for Depreciation Account Cr.					
Date	Particulars	₹	Date	Particulars	₹
1.4.02	To Balance b/d	26,164	1.4.02	By Balance b/d	11,375
			31.3.03	By Depreciation on Machinery A/c	14,789
		26,164			26,164

Dr. Administration Overhead Outstanding Account Cr.

Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Balance b/d	2,225	31.3.03	By Administration Overhead A/c	2,225

Dr. Provision for Doubtful Debts Account Cr.

Date	Particulars	₹	Date	Particulars	₹
1.4.02	To Balance b/d	4,590	1.4.02	By Balance b/d	3,725
			31.3.03	By Profit and Loss A/c	865
		4,590			4,590

Dr. Debtors Account Cr.

Date	Particulars	₹	Date	Particulars	₹
1.4.02	To Balance b/d	27,300	1.4.02	By Bank A/c	6,59,750
31.3.03	To Sales A/c	6,82,500	31.3.03	By Balance c/d	50,050
		7,09,800			7,09,800

Dr. Creditors Account Cr.

Date	Particulars	₹	Date	Particulars	₹
1.4.02	To Bank A/c	2,29,775	1.4.02	By Balance b/d	18,200
31.3.03	To Balance c/d	15,925	31.3.03	By By Stores Control A/c	2,27,500
		2,45,700			2,45,700

Dr. Fixed Assets Account Cr.

Date	Particulars	₹	Date	Particulars	₹
1.4.02	To Balance b/d	1,47,875	31.3.03	By Balance c/d	1,47,875

Dr. Share Capital Account Cr.

Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Balance c/d	1,82,000	1.4.02	By Balance b/d	1,82,000

Dr. Bank Account Cr.

Date	Particulars	₹	Date	Particulars	₹
31.3.03	To Debtors	6,59,750	1.4.02	By Balance b/d	22,750
			31.3.03	By Wages Control A/c	2,09,300
				By Production Overhead A/c	91,000
				By Administration Overheads A/c	27,300
				By Selling Overheads A/c	31,850
				By Creditors A/c	2,29,775
				By Balance c/d	47,775
		6,59,750			6,59,750

BPR Limited

Dr. Profit and Loss Account for the year ended 31st March, 2003 Cr.

Particulars	₹	Particulars	₹
To Cost of Sales	5,32,350	By Sales A/c	6,82,500
To Gross Profit c/d	1,50,150		
	6,82,500		6,82,500
To Provision for Doubtful Debts A/c	865	By Gross Profit b/d	1,50,150
To Production Overhead A/c	14,039		
(Under-absorption of overheads)			

6.18 Cost Book-Keeping

To Net Profit c/d	1,35,246		
	1,50,150		1,50,150
To Balance c/d	2,08,046	By Balance b/d	72,800
		By Net Profit b/d	1,35,246
	2,08,046		2,08,046

Trial Balance of BPR Limited as at 31st March, 2003		Dr.	Cr.
Sl.No.	Head of Accounts	₹	₹
1.	Stores Control Account	13,650	
2.	Work-in-Progress Account	1,06,925	
3.	Finished Goods Account	80,450	
4.	Production Overhead Outstanding Account		7,775
5.	Provision for Depreciation Account		26,164
6.	Administration Overhead Outstanding Account		2,225
7.	Debtors Account	50,050	
8.	Creditors Account		15,925
9.	Fixed Assets Account	1,47,875	
10.	Share Capital Account		1,82,000
11.	Bank Account	47,775	
12.	Profit and Loss Account		2,08,046
13.	Provision for Doubtful Debts Account		4,590
	Total	4,46,725	4,46,725

Interlocking (Non-integrated) Accounting System

CIMA defines interlocking accounting system as : "*a system in which the cost accounts are different from the financial accounts, the two sets of accounts being kept continuously in agreement by the use of Control Accounts or reconciled by other means.*"

In an **interlocking** (non-integrated) accounting system, the financial and cost accounts are maintained in separate ledgers.

A separate Cost Ledger will be maintained. The General Ledger (which will be known as Financial Ledger in this system) will continue to record transactions in the usual manner, but in addition a Memorandum Account will be maintained. This account will record items that should be reflected in the Cost Ledger. This memorandum account (in the financial ledger) is called **Financial Ledger Control Account**.

In the cost ledger, a Control Account will be maintained to make that ledger self-balancing. This control account in the cost ledger is called either '**Cost Ledger Control Account**' or '**Financial Ledger Control Account**'. The double entry in the cost ledger itself will be completed through this account.

The cost ledger will record details of cost accumulation.

It is to be noted that the cost ledger do not contain accounts for debtors, creditors, bank, cash and appropriations (e.g., dividends). No separate Balance Sheet is prepared for cost ledger.

Important Ledgers of Interlocking Accounting System

In interlocking accounting system, two sets of ledgers are maintained :

- (1) Financial Accounting Ledgers
- (2) Cost Accounting Ledgers

Financial Accounting Ledgers

Most important financial accounting ledgers are :

- (a) General ledger,
- (b) Debtors Ledger; and
- (c) Creditors Ledger.
- (a) **General Ledger** : General Ledger contains all accounts of the organisation excluding personal accounts of customers and suppliers. However, Control Accounts are maintained for debtors ledger and creditors ledger. Normally, the following types of accounts are maintained in the General Ledger :
 - (i) Accounts of Assets and Liabilities
 - (ii) Accounts of Revenue and Expenses
 - (iii) Accounts of Capital and Withdrawal
 - (iv) Accounts of Appropriation
- (b) **Debtors Ledger** : Debtors ledger contains the accounts of all credit customers for goods / services sold. Entries are made in this ledger mainly from sales day book, cash book, return inward book and bills receivable book.
- (c) **Creditors Ledger** : Creditors ledger contains the accounts of all credit suppliers for goods / services purchased. Entries are made in this ledger mainly from purchases day book, cash book, return outward book and bills payable book.

Cost Accounting Ledgers

Most important cost accounting ledgers are :

- (a) Stores Ledger;
- (b) Work-in-Progress Ledger;
- (c) Finished Goods Ledger; and
- (d) Cost Ledger
- (a) **Stores Ledger** : Stores ledger contains all the stores accounts. An account will be opened for each item in store. (See Chapter 3 : Accounting for Materials for details) Receipts are posted from goods receipts notes and issues from materials requisitions.
- (b) **Work-in-Progress Ledger** : Work-in-progress ledger records production during the period and cost incurred. An account is opened for each job, batch or process in the Work-in-Progress ledger. Individual account is debited with the expenses incurred in respect of those job / batch / process.
- (c) **Finished Goods Ledger** : Finished goods ledger records the completely finished products. An account is opened for each type of finished goods.
- (d) **Cost Ledger** : Cost ledger is the most important ledger amongst the ledgers of the cost department. It is used to maintain all impersonal accounts. In the cost ledger, all Control Accounts in respect of stores (raw materials), wages, WIP, finished goods, overheads, financial accounts are maintained.

Important Control Accounts

The main Control Accounts and their functions are summarised below :

- (1) **Cost Ledger Control Account** : This Control Account is also known as 'Financial Ledger Control Account' / 'General Ledger Adjustment Account'. It is the most important Control Account maintained in the cost ledger. All items of income and expenditure which have been extracted from the financial accounts are recorded / posted in this account. **The double entry is completed in cost ledger through this Control Account.** It should be noted that no entry should be made directly from the financial books to the cost books. All entries (relating to financial books) must be passed through the **Cost Ledger Control Account**. At any point of time, the balance of the **Cost Ledger Control Account** will be equal and opposite of the total of all the balances of the impersonal accounts within the cost ledger.

6.20 Cost Book-Keeping

- (2) **Stores Ledger (or Raw Material) Control Account** : This account records (in total) the purchases and issues of raw materials. The entries are made on the basis of goods received notes and stores requisitions slips. The balance of this Control Account will be equal to the balance of all individual stores accounts.
- (3) **Wages Control Account** : This account records (in total) the wages paid to different employees in the pay roll. It also shows the disposition of gross wages among organisational functions / departments. **For example**, direct wages paid are charged to Work-in-Progress Account and indirect wages are charged to Production Overhead Account. Wages paid are debited and wages charged to different functions / departments are credited.
- (4) **Production Overhead Control Account** : This account records all the manufacturing indirect expenses. This account is debited with the amount of indirect materials, indirect labour and indirect expenses. This account is credited with the amount of overhead **absorbed** in the production. Any balance in this account is transferred to the Overhead Adjustment Account.
- (5) **Work-in-Progress Control Account** : This account records the production activities. This account is debited with the opening balance (in total) of all unfinished jobs, processes and operations. This account is debited with production cost (in total) which includes direct materials consumed, direct wages, direct expenses and production overheads absorbed. It is credited with the cost of completed output. The balance at the end of the period will be equal to the closing balance of all unfinished jobs, processes and operations.
- (6) **Administrative Overhead Control Account** : This account records all the expenses relating to administration. It is debited with the indirect materials issued for office, wages paid to office staff, electricity bills, telephone bills paid for the office. It is credited with the amount of overhead recovered in the finished goods. The balance of Administrative Overhead Control Account is transferred to the Overhead Adjustment Account.
- (7) **Selling and Distribution Overhead Control Account** : This account records all the expenses relating to selling and distribution. It is debited with indirect materials issued (e.g., packing materials, fuel for delivery vans, etc.) for distribution activity, wages and salaries paid to selling staff. It is credited with the amount of overhead recovered per unit sold and transferred to **Cost of Sales Account**.
- (8) **Finished Goods Control Account** : This account is debited with cost of output (all) completed during the period and are debited with the production cost of **goods sold**. The balance will be carried forward to the next period. Generally, a Cost of Sales Account is opened in the cost ledger and it is debited with the amount of production cost of goods sold. This account is closed by transferring to Costing Profit and Loss Account.

Link Between Financial Accounting Ledger and Cost Accounting Ledger

In the financial accounting ledger, a Financial Ledger Control Account is opened. All items of income and expenditure, which affect the cost accounts (e.g., purchases of raw materials, payment of wages to productive workers, payment of factory rent, etc.) are recorded in it.

This account contains the same items as in the corresponding Control Account in the cost ledger (Cost Ledger Control Account). However, they are recorded on the opposite side of that account.

A simple illustration will show how the Financial Ledger Control Account is operated.

Raw materials purchased on credit during the month of November, 2017 was ₹ 5,00,000.

In Financial Accounting it will be recorded as follows :

Purchases Account	Dr.	₹ 5,00,000
Financial Ledger Control Account (Memorandum)	Dr.	5,00,000
To Creditors Ledger Control Account		5,00,000

In the cost ledger it will be recorded as :

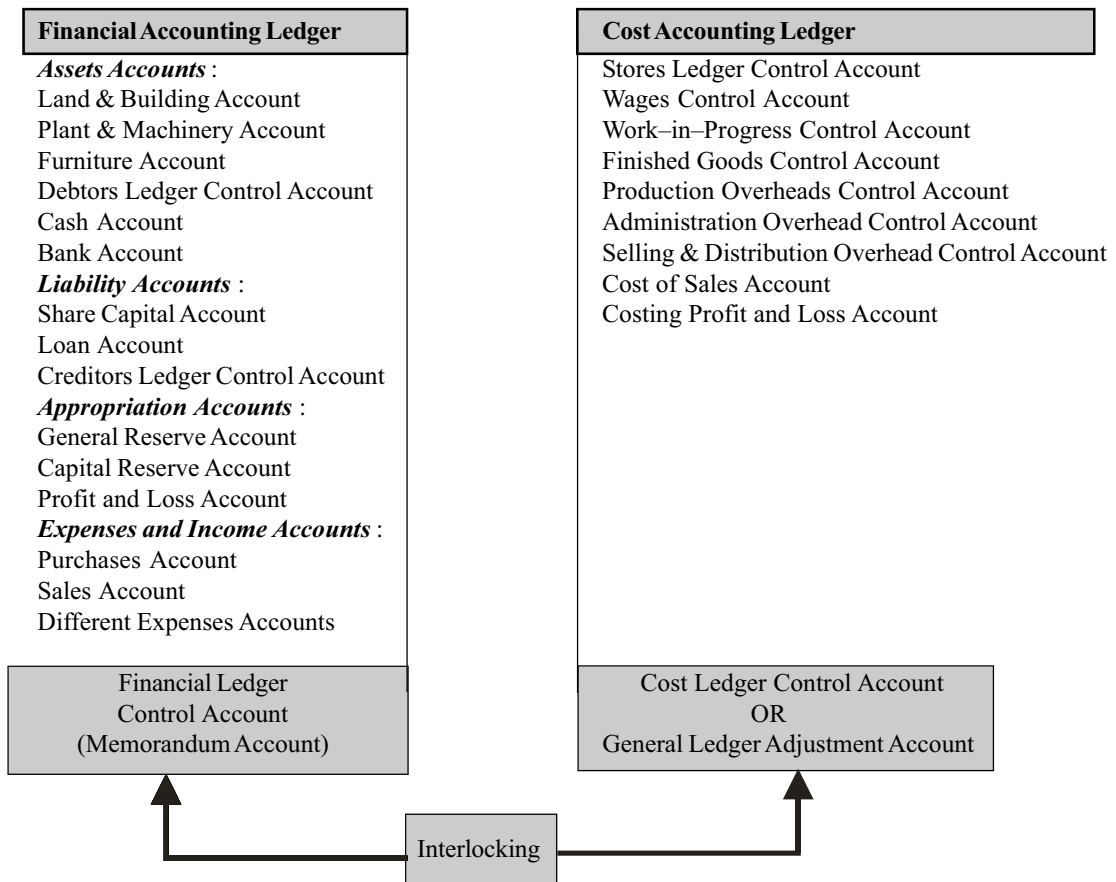
Stores Ledger Control Account	Dr.	5,00,000	
To Cost Ledger Control Account			5,00,000

It is to be noted that Financial Ledger Control Account is not a part of the double entry system in the Financial Accounting Ledger. It is a Memorandum Account – existing merely to link Financial Ledger with Cost Ledger.

In contrast, the Cost Ledger Control Account is a part and parcel of the double entry system of Cost Ledger.

The following diagram will show the overview of an interlocking accounting system :

Overview of an Interlocking Accounting System



Specimen Book—keeping Entries in the Cost Books

1. When materials are purchased for cash / on credit

2. When materials are purchased for cash / on credit for special jobs

3. When materials are returned to suppliers

It is to be noted that the above three entries will affect financial accounts. Therefore, double entry will be completed through General / Cost Ledger Control Account. However, the following entries do not affect the financial accounts. Therefore, they will not appear in the General / Cost Ledger Control Account. They are merely transactions or transfers in the cost ledger itself.

4. When materials are issued for production

Here, it is to be noted that only Control Accounts will be debited and credited. In the Work-in-Progress Ledger, individual Job Account will be debited. Similarly, in the Stores Ledger, individual Stores Account will be credited.

5. When materials are issued for repairs and maintenance of factory

6. When indirect materials are issued for production

7. When materials are issued for office use

8. *When materials are issued for selling and distribution purposes, for example, diesel issued for delivery vans*

Selling and Distribution Overheads Control Account Dr.
To Stores Ledger Control Account

9. *When materials are issued for the manufacturing of capital assets in-house*

Dr.

Capital Assets-in-Progress Account
To Stores Ledger Control Account

10. When materials are returned from production to stores

Stores Ledger Control Account	Dr.
To Work-in-Progress Control Account	

11. When materials are transferred from Job X to Job Y

Job Y Account	Dr.
To Job X Account	

It is to be noted that no entry will be required in Work-in-Progress Control Account and Stores Ledger Control Account.

12. When shortage of material is detected at the time of physical verification

Production Overheads Control Account	Dr.
To Stores Ledger Control Account	

If the shortage is abnormal, the entry will be :

Costing Profit and Loss Account	Dr.
To Stores Ledger Control Account	

B. Accounting Procedures for Labour

1. When wages are paid to direct labour and indirect labour

Wages Control Account	Dr.
To General / Cost Ledger Control Account	

2. When direct wages are charged to production

Work-in-Progress Control Account	Dr.
To Wages Control Account	

3. When indirect wages are allocated to production staff, administrative staff and selling and distribution staff

Production Overheads Control Account	Dr. [Indirect wages of production staff]
Administration Overheads Control Account	Dr. [Indirect wages of administrative staff]
Selling and Distribution Overheads Control Account	Dr. [Indirect wages of selling staff]
To Wages Control Account	

C. Accounting Procedures for Direct Expenses

When direct expenses are incurred

Work-in-Progress Control Account	Dr.
To General / Cost Ledger Control Account	

D. Accounting Procedures for Overhead

1. When indirect expenses are incurred for production, administration, selling and distribution

Production Overheads Control Account	Dr.
Administration Overheads Control Account	Dr.
Selling and Distribution Overheads Control Account	Dr.
To General / Cost Ledger Control Account	

In the cost ledger, Production Overheads Control Account, Administrative Overheads Control Account, Selling and Distribution Overheads Control Account will show the total overheads incurred.

6.24 Cost Book-Keeping

The absorption of different overheads are recorded in the cost ledger as follows :

2. *When production overheads is absorbed*

Work-in-Progress Control Account Dr.

To Production Overhead Control Account

It is very common that production overhead incurred and absorbed are not same. The difference is treated as under-absorption or over-absorption.

Over-absorption occurs when overhead incurred is *less* than overhead absorbed. It is generally transferred to a temporary account called 'Overhead Adjustment Account.

The entry will be :

Production Overheads Control Account Dr.

To Overhead Adjustment Account

Under-absorption occurs, when overhead incurred is *more* than overhead absorbed. It is also transferred to Overhead Adjustment Account. The entry will be :

Overhead Adjustment Account Dr.

To Production Overheads Control Account

It is to be noted that at the end of the accounting period, the balance of the Overhead Adjustment Account is transferred to Costing Profit and Loss Account. The reasons for taking a year-end approach is to smoothen out any fluctuations in overhead absorption which may occur due to variations in actual cost and/or volume of output over the years.

3. *When administrative overhead is absorbed*

Finished Goods Control Account Dr.

To Administrative Overheads Control Account

Any under-absorption or over-absorption of administration overhead is transferred to Overhead Adjustment Account and ultimately to the Costing Profit and Loss Account.

4. *When selling and distribution overhead is absorbed*

Cost of Sales Account Dr.

To Selling and Distribution Overheads Control Account

It is to be noted that the selling and distribution overheads are not apportioned to production but they are recovered from sales.

Any under-absorption or over-absorption of selling and distribution overhead is transferred to Overhead Adjustment Account and ultimately to the Costing Profit and Loss Account.

E. Accounting Procedures for Other Items

1. *When finished goods are transferred from Work-in-Progress Control Account*

Finished Goods Control Account Dr.

To Work-in-Progress Account

The balance of Work-in-Progress Account is transferred to next period.

2. *When cost of goods sold is transferred from Finished Goods Control Account*

Cost of Sales Account Dr.

To Finished Goods Control Account

3. *When goods are sold*

(i) General / Cost Ledger Control Account Dr.

To Sales Account

(ii) Sales Account	Dr.
To Costing Profit and Loss Account	
Or	
General / Cost Ledger Control Account	Dr.
To Costing Profit and Loss Account	

4. For transferring profit

Costing Profit and Loss Account	Dr.
To General / Cost Ledger Control Account	

5. For transferring loss

General / Cost Ledger Control Account	Dr.
To Costing Profit and Loss Account	

Some Important Items

1. Carriage Inwards

Generally carriage inward is added to the purchase price of the materials. This treatment of carriage inward is advocated when it is possible to identify the expenses with the purchase of materials.

It is recorded in the Cost Ledger as follows :

Stores Ledger Control Account	Dr.
To General / Cost Ledger Control Account	

In many cases, it may not be possible to identify the expenses with particular materials. In that case, this expense is recovered on production through production overhead.

Production Overheads Control Account	Dr.
To General / Cost Ledger Control Account	

2. Special Order

In many cases, special orders are taken from the customers for delivery of goods. All expenses incurred are recorded in the usual manner in Work-in-Progress Control Account. When the job is finished, it is not transferred to Finished Goods Control Account. It is directly delivered to customer. The entry will be :

(i) Special Order Account	Dr.
To Work-in-Progress Control Account	
(ii) General / Cost Ledger Control Account	Dr.
To Special Order Account	

3. Capital Order

In many cases, different assets are manufactured in-house. All expenses incurred in this respect must be capitalised. Generally, an account called Capital Work-in-Progress Account is opened in the cost ledger. All expenses (materials, labour and other expenses) are debited to this account. When the asset is completed, it is debited to the Asset Account.

Asset Account	Dr.
To Capital Work-in-Progress Account	

At the end of the accounting period the asset would be transferred from Cost Account to the Financial Account. The entry then will be :

General / Cost Ledger Control Account	Dr.
To Asset Account	

6.26 Cost Book-Keeping

4. Under / Over Absorption of Overheads

It has been explained that under / over absorption of overheads are transferred to the **Overhead Adjustment Account** and the balance is transferred to the Costing Profit and Loss Account at the end of the accounting period.

It is widely accepted that majority of the overheads are **period cost**. Therefore, it must be debited to the Costing Profit and Loss Account of that period.

However, some accountants prefer to carry forward the balance of different overheads account to next period. If this is done, the balance of overhead accounts will appear in the Trial Balance of Cost Accounts and the profit will be different from the previous method.

In the opinion of the majority accountants, under / over absorption of overhead balance should be closed by transferring to the Costing Profit and Loss Account without carrying forward to next period.

Illustration 7

Assuming non-integrated accounting system, pass journal entries in the cost books for the following transactions:

(i)	Issue of materials : Direct	5,00,000
	Indirect	1,00,000
(ii)	Allocation of wages and salaries :	
	Direct labour	1,20,000
	Indirect factory labour	40,000
	Salaries to office staff	90,000
(iii)	Over-absorption of factory overheads	10,000

[C.U.B.Com. (Hons.) – 2006]

Solution

In the Cost Book Journal

		Dr.		Cr.
Date	Particulars	L.F.	₹	₹
(i)	Work-in-Progress Control A/c Dr. To Stores Ledger Control A/c (Being direct materials issued for production)		5,00,000	5,00,000
(i)	Factory / Production Overheads Control A/c Dr. To Stores Ledger Control A/c (Being indirect material issued for consumption in the factory)		1,00,000	1,00,000
(ii)	Work-in-Progress Control A/c Dr. To Wages Control A/c (Being the allocation of direct wages to production)		1,20,000	1,20,000
(ii)	Factory Overheads Control A/c Dr. To Wages Control A/c (Being the allocation of indirect wages for factory)		40,000	40,000
	Administrative Overheads Control A/c Dr. To Wages Control A/c (Being the allocation of indirect wages for office staff)		90,000	90,000
	Factory Overheads Control A/c Dr. To Overhead Adjustment A/c Or To Costing Profit and Loss A/c (Being the adjustment of over-absorption of factory overheads)		10,000	10,000

Illustration 8

Assuming non-integrated accounting system, pass journal entries in the cost books for the following transactions :

- (i) Return to supplier of materials amounting to ₹ 10,000.
- (ii) Purchase of materials on credit ₹ 1,00,000, of which, ₹ 20,000 was purchased for special job.
- (iii) Materials returned from production to stores costing ₹ 5,000.
- (iv) Total wages paid for the period ₹ 10,00,000. The break-up of the wages are :

Direct wages	₹ 8,00,000	
Indirect wages	₹ 2,00,000	₹ 10,00,000

The break-up of the indirect wages of ₹ 2,00,000 are :

Factory	₹ 1,00,000	
Administration	₹ 50,000	
Sales staff	₹ 50,000	₹ 2,00,000
- (v) Production overhead incurred in cash ₹ 50,000 and absorbed ₹ 1,48,000 during the period.
- (vi) Materials of ₹ 1,000 transferred from Job X to Job Y.

[C.U.B.Com. (Hons.) – Adapted]

Solution

In the Cost Book Journal

		Dr.	Cr.
Date	Particulars	L.F.	₹
(i)	Cost Ledger Control A/c Dr. To Stores Ledger Control A/c (Being the return of materials to supplier)		10,000
(ii)	Stores Ledger Control A/c Dr. Work-in-Progress Control A/c (Note 1) Dr. To Cost Ledger Control A/c (Being purchase of materials on credit)		80,000 20,000
(iii)	Stores Ledger Control A/c Dr. To Work-in-Progress Control A/c (Being the return of materials to store from production)		5,000
(iv)	Wages Control A/c Dr. To Cost Ledger Control A/c (Being wages paid in total)		10,00,000
	Work-in-Progress Control A/c Dr. To Wages Control A/c (Being the direct wages charged to Production)		8,00,000
(v)	Production Overheads Control A/c Dr. Administrative Overheads Control A/c Dr. Selling and Distribution Overheads Control A/c Dr. To Wages Control A/c (Being the allocation of indirect wages)		1,00,000 50,000 50,000
(vi)	Production Overheads Control A/c Dr. To Cost Ledger Control A/c (Being the payment of production overhead in cash)		50,000
	Work-in-Progress Control A/c Dr. To Production Overheads Control A/c (Being the production overhead charged to Production)		1,48,000
	Overhead Adjustment A/c Dr. To Production Overheads Control A/c (Note 2) (Being the under-absorption of overhead transferred to Overhead Adjustment Account)		2,000
	Job Y A/c (Note 3) Dr. To Job X A/c (Being the transfer of materials from Job X to Job Y)		1,000

6.28 Cost Book-Keeping

Tutorial Note :

- (1) When materials are purchased for special job, it is directly debited to Work-in-Progress Control Account without entering it in the Stock Ledger Control Account.
- (2) Total production overhead for the period is :

Indirect wages	₹ 1,00,000	
Cash expenses	₹ 50,000	₹ 1,50,000

 Overhead absorbed during the period is ₹ 1,48,000. Therefore, under-absorption of overhead is ₹ 2,000. This amount is transferred to Overhead Adjustment Account or Costing Profit & Loss Account.
- (3) When there is transfer of materials from one job to another, no entry is passed in Stores Ledger Control Account. The job which receives the materials is debited and the job which is releasing the material is credited.

Illustration 9

From the following information, prepare necessary accounts in the cost ledger :

	Opening Balance (₹)	Closing Balance (₹)
Work-in-Progress	3,800	2,500
Materials	22,000	15,000
Finished stock	17,000	32,000

Transactions during the period :

	₹
Materials purchased	58,000
Direct wages	21,000
Electricity charges	20,000
Factory overhead incurred	27,000
Factory overhead applied	26,000
Selling, distribution and administration expenses incurred	28,000
Selling, distribution and administration expenses charged to finished stock sold	29,000
Sales	1,86,000

[C.U.B.Com. (Hons.) – 2007]

Solution

In the Cost Ledger			
Dr.	Cost Ledger Control Account		Cr.
Particulars	₹	Particulars	₹
To Costing Profit and Loss A/c – Sales	1,86,000	By Balance b/d (Note 1)	42,800
To Balance c/d	49,500	By Stores Ledger Control A/c	58,000
		By Work-in-Progress Control A/c (Note 2)	21,000
		By Work-in Progress Control A/c (Note 3)	20,000
		By Factory Overheads Control A/c	27,000
		By Selling, Distribution and Administration Overhead Control A/c	28,000
		By Costing Profit and Loss A/c (Profit)	38,700
	2,35,500		2,35,500
		By Balance b/d	49,500

Dr.	Stores Ledger Control Account		Cr.
Particulars	₹	Particulars	₹
To Balance b/d	22,000	By Work-in-Progress Control A/c (Balancing fig.)	65,000
To Cost Ledger Control A/c – Purchase of materials	58,000	By Balance c/d	15,000
	80,000		80,000
To Balance b/d	15,000		

Dr. Work-in-Progress Control Account		Cr.	
Particulars	₹	Particulars	₹
To Balance b/d	3,800	By Finished Goods Control A/c (Cost of finished goods transferred)	1,33,300
To Stores Ledger Control A/c	65,000		
To Cost Ledger Control A/c – Direct Wages	21,000		
To Cost Ledger Control A/c (Note 3)	20,000		
To Factory Overhead Control A/c	26,000	By Balance c/d	2,500
	1,35,800		1,35,800
To Balance b/d	2,500		

Dr. Finished Goods Control Account		Cr.	
Particulars	₹	Particulars	₹
To Balance b/d	17,000	By Cost of Sales A/c	1,18,300
To Work-in-Progress Control A/c	1,33,300	By Balance c/d	32,000
	1,50,300		1,50,300
To Balance b/d	32,000		

Dr. Factory Overheads Control Account		Cr.	
Particulars	₹	Particulars	₹
To Cost Ledger Control A/c	27,000	By Work-in-Progress Control A/c	26,000
	27,000	By Overhead Adjustment A/c	1,000
			27,000

Dr. Selling, Distribution and Administration Overheads Control Account		Cr.	
Particulars	₹	Particulars	₹
To Cost Ledger Control A/c	28,000	By Cost of Sales A/c	29,000
To Overhead Adjustment A/c	1,000		
	29,000		29,000

Dr. Overhead Adjustment Account		Cr.	
Particulars	₹	Particulars	₹
To Factory Overheads Control A/c (under-absorption)	1,000	By Selling, Distribution and Administration Overheads Control A/c (over-absorption)	1,000

Dr. Cost of Sales Account		Cr.	
Particulars	₹	Particulars	₹
To Finished Goods Control A/c	1,18,300	By Costing Profit and Loss A/c	1,47,300
To Selling, Distribution and Administration Overheads Control A/c	29,000		
	1,47,300		1,47,300

Dr. Costing Profit and Loss Account		Cr.	
Particulars	₹	Particulars	₹
To Cost of Sales A/c	1,47,300	By Cost Ledger Control A/c – Sales	1,86,000
To Cost Ledger Control A/c – Profit	38,700		
	1,86,000		1,86,000

Working Notes :

- (I) Cost Ledger Control Account always shows a credit balance which is equal to the total of different opening balances in respect of materials, work-in-progress and finished stock. Therefore, the balance (Cr.) will be : Materials ₹ 22,000 + Work-in-Progress ₹ 3,800 and finished stock ₹ 17,000 = ₹ 42,800.

Dr.		Work-in-Progress Control Account		Cr.	
Particulars		₹	Particulars		₹
To Balance b/d		60,100	By Finished Goods Control A/c (Balancing fig.)		2,22,000
To Raw Materials Control A/c		1,04,800	By Balance c/d		56,900
To Wages Control A/c (Note 2)		40,000			
To Production Overhead Control A/c		74,000			
		2,78,900			2,78,900

Dr. Finished Goods Control Account Cr.			
Particulars	₹	Particulars	₹
To Balance b/d	1,15,400	By Cost of Sales A/c (Balancing figure)	2,00,000
To Work-in-Progress Control A/c	2,22,000	By Balance c/d	1,37,400
	3,37,400		3,37,400

Dr. Production Overhead Control Account Cr.			
Particulars	₹	Particulars	₹
To Cost Ledger Control A/c	91,600	By Work-in-Progress Control A/c	74,000
	91,600	By Costing Profit and Loss A/c (Note 3)	17,600
			91,600

Dr. Cost of Sales Account Cr.			
Particulars	₹	Particulars	₹
To Cost of Goods Sold A/c	2,00,000	By Costing Profit and Loss A/c	2,30,000
To Selling and Distribution Overhead Control A/c	30,000		
	2,30,000		2,30,000

Dr. Costing Profit and Loss Account Cr.			
Particulars	₹	Particulars	₹
To Cost of Sales A/c	2,30,000	By Sales	3,00,000
To Raw Materials Control A/c (Abnormal loss)	2,400		
To Production Overhead Control A/c	17,600		
To Profit	50,000		
	3,00,000		3,00,000

Working Notes :

- (1) Loss of materials damaged by flood will be debited to Costing Profit and Loss Account.
- (2) Production overhead absorbed ₹ 74,000 which is 185% of direct wages. Therefore, direct wages = $\text{₹ } 74,000 / 185 \times 100 = \text{₹ } 40,000$.
- (3) Production overhead incurred ₹91,600
Less: Production overhead absorbed 74,000
Under-recovery of overheads 17,600
It is to be debited to Profit and Loss Account.

Illustration 11

A company operates separate cost accounting and financial accounting systems. The following is the list of opening balances as on 1.4.2017 in the cost ledger :

	Debit (₹)	Credit (₹)
Stores Ledger Control Account	53,375	—
WIP Control Account	1,04,595	—
Finished Goods Control Account	30,780	—
General ledger Adjustment Account		1,88,750

Transactions for the quarter ended 30.6.2017 are as under :

	₹
Materials purchased	26,700
Materials issued to production	40,000
Materials issued for factory repairs	900
Factory wages paid (including indirect wages ₹ 23,000)	77,500
Production overheads incurred	95,200
Production overheads under-absorbed and written-off	3,200
Sales	2,56,000

6.32 Cost Book-Keeping

The company's gross profit is 25% on factory cost. At the end of the quarter, WIP stocks increased by ₹ 7,500.

Prepare the relevant Control Accounts, Costing Profit and Loss Account and General Ledger Adjustment Account to record the above transactions for the quarter ended 30.6.2010 and also prepare Trial Balance as on that date.

Solution

Solution		In the Cost Ledger		
Dr.	General Ledger Adjustment Account		Cr.	
Particulars		₹	Particulars	₹
To Sales A/c		2,56,000	By Balance b/d	1,88,750
To Balance c/d		1,80,150	By Stores Ledger Control A/c	26,700
			By Production Overheads Control A/c	95,200
			By Wages Control A/c	77,500
			By Costing Profit and Loss A/c	48,000
		4,36,150		4,36,150
			By Balance b/d	1,80,150

Stores Ledger Control Account			
Dr.		Cr.	
Particulars	₹	Particulars	₹
To Balance b/d	53,375	By Work-in-Progress Control A/c	40,000
To General ledger Adjustment A/c	26,700	By Production Overheads Control A/c	900
	80,075	By Balance c/d	39,175
			80,075
To Balance b/d	39,175		

Work-in-Progress Control Account			
Dr.		Cr.	
Particulars	₹	Particulars	₹
To Balance b/d	1,04,595	By Finished Goods Control A/c (Balancing figure)	2,02,900
To Stores Ledger Control A/c	40,000	By Balance c/d	1,12,095
By Wages Control A/c	54,500		
To Production Overheads Control A/c	1,15,900		
	3,14,995		3,14,995
To Balance b/d	1,12,095		

Finished Goods Control Account			
Dr.		Cr.	
Particulars	₹	Particulars	₹
To Balance b/d	30,780	By Cost of Goods Sold A/c (Note 1)	2,04,800
To Work-in-Progress Control A/c	2,02,900	By Balance c/d	28,880
	2,33,680		2,33,680
To Balance b/d	28,880		

Production Overheads Control Account			
Dr.		Cr.	
Particulars	₹	Particulars	₹
To Stores Ledger Control A/c	900	By Work-in-Progress Control A/c (Balancing fig.)	1,15,900
To Wages Control A/c	23,000	By Costing Profit and Loss A/c (written off)	3,200
To General Ledger Adjustment A/c	95,200		
	1,19,100		1,19,100

Dr. Wages Control Account		Cr.	
Particulars	₹	Particulars	₹
To General Ledger Control A/c	77,500	By Work-in-Progress Control A/c	54,500
		By Production Overheads Control A/c	23,000
	77,500		77,500

Dr. Cost of Goods Sold Account		Cr.	
Particulars	₹	Particulars	₹
To Finished Goods Control A/c	2,04,800	By Costing Profit and Loss A/c	2,04,800

Dr. Sales Account		Cr.	
Particulars	₹	Particulars	₹
To Costing Profit and Loss A/c	2,56,000	By General Ledger Adjustment A/c	2,56,000

Dr. Costing Profit and Loss Account		Cr.	
Particulars	₹	Particulars	₹
To Cost of Goods Sold A/c	2,04,800	By Sales	2,56,000
To Production Overhead Control A/c	3,200		
To General Ledger Adjustment A/c (Profit)	48,000		
	2,56,000		2,56,000

Trial Balance as at 30th June, 2017

Heads of Account	Dr. (₹)	Cr. (₹)
Stores Ledger Control Account	39,175	
Work-in-Progress Control Account	1,12,095	
Finished Goods Control Account	28,880	
General Ledger Adjustment Account		1,80,150
	1,80,150	1,80,150

Working Notes :

(1) Gross profit is 25% of factory cost, i.e., 20% of sales.

Hence, cost of goods sold = ₹ 2,56,000 – (20% of ₹ 2,56,000) = ₹ 2,56,000 – ₹ 51,200 = ₹ **2,04,800**.

Illustration 12

On 31st March, 2017 the following balances were extracted from the books of the Supreme Manufacturing Company :

	Dr. (₹)	Cr. (₹)
Stores Ledger Control Account	35,000	—
Work-in-Progress Control Account	38,000	—
Finished Goods Control Account	25,000	—
Cost Ledger Control Account	—	98,000
	<u>98,000</u>	<u>98,000</u>

The following transactions took place in April 2010 :

Raw materials :

Purchased	95,000
Returned to Suppliers	3,000
Issued to Production	98,000
Returned to Stores	3,000

6.34 Cost Book-Keeping

Productive Wages	40,000
Indirect labour	25,000
Factory overhead expenses incurred	50,000
Selling and Administrative expenses	40,000
Cost of finished goods transferred to warehouse	2,13,000
Cost of goods sold	2,10,000
Sales	3,00,000

Factory overheads are applied to production at 150% of direct wages, any under / over absorbed overhead being carried forward for adjustment in the subsequent months. All administrative and selling expenses are treated as period costs and charged off to the Profit and Loss Account of the month in which they are incurred.

Show the following Accounts :

(i) Cost Ledger Control Account	(v) Factory Overhead Control Account
(ii) Stores Ledger Control Account	(vi) Costing Profit and Loss Account
(iii) Work-in-Progress Control Account	(vii) Trial Balance as at 30th April, 2017
(iv) Finished Goods Stock Control Account	

Solution In the Cost Books of Supreme Manufacturing Company

Dr.		Cost Ledger Control Account		Cr.	
Particulars	₹	Particulars	₹		
To Stores Ledger Control A/c (Returned to Suppliers)	3,000	By Balance b/d	98,000		
To Costing Profit and Loss A/c (Sales)	3,00,000	By Stores Ledger Control A/c (Purchases)	95,000		
To Balance c/d	95,000	By Wages Control A/c	65,000		
		By Factory Overheads Control A/c	50,000		
		By Selling and Administrative Overhead A/c	40,000		
		By Costing Profit and Loss A/c	50,000		
	3,98,000		3,98,000		
		By Balance b/d	95,000		

Dr.		Stores Ledger Control Account		Cr.	
Particulars	₹	Particulars	₹		
To Balance b/d	35,000	By Cost Ledger Control A/c (Returned to Suppliers)	3,000		
To Cost Ledger Control A/c (Purchased)	98,000	By To Work-in-Progress Control A/c	98,000		
To Work-in-Progress Control A/c (Returned to Stores)	3,000	By Balance c/d	32,000		
	1,33,000		1,33,000		
To Balance b/d	32,000				

Dr.		Work-in-Progress Control Account		Cr.	
Particulars	₹	Particulars	₹		
To Balance b/d	38,000	By Stores Ledger Control A/c (Returned to Stores)	3,000		
To Stores Ledger Control A/c	98,000	By Finished Goods Control A/c	2,13,000		
To Wages Control A/c (Note 1)	40,000	By Balance c/d	20,000		
To Factory Overhead Control A/c (150% of D.Wages)	60,000		2,36,000		
	2,36,000				
To Balance b/d	20,000				

Dr.		Finished Goods Control Account		Cr.	
Particulars	₹	Particulars	₹		
To Balance b/d	25,000	By Cost of Goods Sold A/c	2,10,000		
To Work-in-Progress Control A/c	2,13,000	By Balance c/d	28,000		
	2,38,000		2,38,000		
To Balance b/d	28,000				

Dr. Factory Overhead Control Account		Cr.	
Particulars	₹	Particulars	₹
To Wages Control A/c (Note 1)	25,000	By Work-in-Progress Control A/c	60,000
To Cost Ledger Control A/c	50,000	By Balance c/d	15,000
	75,000		75,000
To Balance b/d	15,000		

Dr. Costing Profit and Loss Account		Cr.	
Particulars	₹	Particulars	₹
To Cost of Sales A/c (Note 3)	2,50,000	By Cost Ledger Control A/c	3,00,000
To Cost Ledger Control A/c	50,000		
	3,00,000		3,00,000

Trial Balance as at 30th April, 2017

Heads of Account	Dr. (₹)	Cr. (₹)
Cost Ledger Control Account		95,000
Stores Ledger Control Account	32,000	
Work-in-Progress Control Account	20,000	
Finished Goods Control Account	28,000	
Factory Overhead Control Account	15,000	
	95,000	95,000

Working Notes :

Dr. (1) Wages Control Account		Cr.	
Particulars	₹	Particulars	₹
To Cost Ledger Control A/c	65,000	By Work-in-Progress Control A/c	40,000
		By Factory Overhead Control A/c	25,000
	65,000		65,000

Dr. (2) Cost of Goods Sold Account		Cr.	
Particulars	₹	Particulars	₹
To Finished Goods Control A/c	2,10,000	By Cost of Sales A/c	2,10,000

Dr. (3) Cost of Sales Account		Cr.	
Particulars	₹	Particulars	₹
To Cost of Goods Sold A/c	2,10,000	By Costing Profit and Loss A/c	2,50,000
To Selling and Distribution Overhead A/c	40,000		
	2,50,000		2,50,000

Illustration 13

The following balances were extracted from a company's ledger as on 31st December, 2016 :

	₹	₹
Raw Materials Control Account	48,836	—
Work-in-Progress Control Account	14,745	—
Finished Stock Control Account	21,980	—
Normal Ledger Control Account	<u>—</u>	<u>85,561</u>
	<u>85,561</u>	<u>85,561</u>

6.36 Cost Book-Keeping

Further transactions took place during the following quarter as follows :

	₹
Factory overhead – allocated to WIP	11,786
Goods finished – at cost	36,834
Raw materials purchased	22,422
Direct wages – allocated to WIP	18,370
Cost of goods sold	42,000
Raw materials – issued to production	17,000
Raw materials – credited by suppliers	1,000
Inventory audit – raw material losses	1,300
WIP rejected (with no scrap value)	1,800
Customer's returns (at cost) of finished goods	3,000

Prepare the Ledger Accounts in Cost Ledger.

Solution

In the Cost Ledger

Dr. Raw Materials Control Account Cr.

Particulars	₹	Particulars	₹
To Balance b/d	48,836	By Work-in-Progress Control A/c	17,000
To Nominal Ledger Control A/c	22,422	By Nominal Ledger Control A/c	1,000
		By Loss of Stock A/c (Note 4)	1,300
		By Balance c/d	51,958
	71,258		71,258
To Balance b/d	51,958		

Dr. Work-in-Progress Control Account Cr.

Particulars	₹	Particulars	₹
To Balance b/d	14,745	By Finished Stock Control A/c	36,834
To Raw Materials Control A/c	17,000	By WIP Rejection A/c (Note 4)	1,800
To Wages Control A/c	18,370	By Balance c/d	23,267
To Factory Overhead Control A/c	11,786		
	61,901		61,901
To Balance b/d	23,267		

Dr. Finished Stock Control Account Cr.

Particulars	₹	Particulars	₹
To Balance b/d	21,980	By Cost of Sales A/c	42,000
To Work-in-Progress Control A/c	36,834	By Balance c/d	19,814
To Cost of Sales A/c (Returned)	3,000		
	61,814		61,814
To Balance b/d	19,814		

Dr. Nominal Ledger Control Account Cr.

Particulars	₹	Particulars	₹
To Raw Materials Control A/c (Note 3)	1,000	By Balance b/d	85,561
To Balance c/d	1,37,139	By Raw Materials Control A/c	22,422
		By Direct Wages Control A/c	18,370
		By Factory Overhead Control A/c	11,786
	1,38,139		1,38,139
		By Balance b/d	1,37,139

Dr. Factory Overhead Control Account Cr.			
Particulars	₹	Particulars	₹
To Nominal Ledger Control A/c (Note 1)	11,786	By Work-in-Progress Control A/c	11,786
Dr. Direct Wages Control Account Cr.			
Particulars	₹	Particulars	₹
To Nominal Ledger Control A/c (Note 2)	18,730	By Work-in-Progress Control A/c	18,730
Dr. Cost of Sales Account Cr.			
Particulars	₹	Particulars	₹
To Finished Stock Control A/c	42,000	By Finished Stock Control A/c (Returned)	3,000
		By Balance c/d	39,000
	42,000		42,000
To Balance b/d	39,000		
Dr. Loss of Stock Account Cr.			
Particulars	₹	Particulars	₹
To Raw Materials Control A/c	1,300	By Balance c/d	1,300
To Balance b/d	1,300		
Dr. WIP Rejection Account Cr.			
Particulars	₹	Particulars	₹
To WIP Control A/c	1,800	By Balance c/d	1,800
To Balance b/d	1,800		

Working Notes :

- (1) It is assumed that factory overhead absorbed is equal to actual expenditure.
- (2) It is assumed that direct wages allocated to Work-in-Progress is equal to actual wages paid.
- (3) Raw materials cost will be reduced by the amount of credit given by the suppliers. Therefore, the Raw Materials Control Account will be credited and Nominal Ledger Control Account will be debited.
- (4) Loss of stock detected at the time of inventory audit will be credited to Raw Materials Control Account and will be debited to Loss of Stock Account. At the time of preparing Costing Profit and Loss Account, it is to be closed by transferring to Costing Profit and Loss Account.
- (5) WIP rejected (with no scrap value) will be debited to WIP Rejected Account and will be credited to WIP Control Account. At the time of preparing Costing Profit and Loss Account, it is to be closed in transferring to Costing Profit and Loss Account (assuming that it is normal rejection).
- (6) To test the accuracy of posting, it is better to prepare a Trial Balance at the end of the period. Therefore, it has been prepared as follows :

Trial Balance as at 31st March, 2017

Heads of Account	Dr. (₹)	Cr. (₹)
Raw Materials Control Account	51,958	
Work-in-Progress Control Account	23,267	
Finished Stock Control Account	19,814	
Cost of Sales Account	39,000	
Loss of Stock Account	1,300	
WIP Rejection Account	1,800	
Nominal Ledger Control Account		1,37,139
	1,37,139	1,37,139

6.38 Cost Book-Keeping

Illustration 14

A fire destroyed some accounting records of a company. You have been able to collect the following from the spoilt papers / records and as a result of consultation with accounting staff, in respect of January, 2017 :

(i) Incomplete Ledger Entries :

Raw Materials A/c			
Beginning Inventory	₹ 32,000		
Work-in-Progress A/c			
Beginning Inventory	₹ 9,200	Finished Stock	₹ 1,51,000
Creditors A/c			
Closing Balance	₹ 19,200	Opening Balance	₹ 16,400
Manufacturing Overheads A/c			
Amount Spent	₹ 29,600		
Finished Goods A/c			
Opening Inventory	₹ 24,000	Closing Inventory	₹ 30,000

(ii) Additional information :

- (1) The cash book showed that ₹ 89,200 have been paid to creditors for raw material.
- (2) Ending inventory of work-in-progress included material of ₹ 5,000 on which 300 direct labour hours have been booked against wages and overheads.
- (3) The job card showed that workers have worked for 7,000 hours. The wage rate is ₹ 10 per labour hour.
- (4) Overhead recovery rate was ₹ 4 per direct labour hour.

You are required to complete the above accounts in the cost ledger of the company.

Solution

Dr.		Raw Materials Account		Cr.	
Particulars	₹	Particulars	₹		
To Balance b/d (given)	32,000	By Work-in-Progress A/c	53,000		
To General Ledger Adjustment A/c (Purchases)	92,000	By Balance c/d	71,000		
	1,24,000		1,24,000		
Dr.		Work-in-Progress Account		Cr.	
Particulars	₹	Particulars	₹		
To Balance b/d (given)	9,200	By Finished Stock A/c (given)	1,51,000		
To Raw Materials A/c (Balancing figure)	53,000	By Balance c/d (Note 3)	9,200		
To Wages Control A/c (7,000 x ₹ 10)	70,000				
To Manufacturing Overhead A/c (7,000 x ₹ 4)	28,000				
	1,60,200		1,60,200		
Dr.		Creditors Account		Cr.	
Particulars	₹	Particulars	₹		
To Cash / Bank A/c (Note 1)	89,200	By Balance b/d (given)	16,400		
To Balance c/d (given)	19,200	By Purchases A/c (Balancing figure)	92,000		
	1,08,400		1,08,400		

Dr. Manufacturing Overhead Account Cr.			
Particulars	₹	Particulars	₹
To General Ledger Control A/c (Given)	29,600	By Work-in-Progress A/c (7,000 x ₹ 4)	28,000
		By Costing Profit and Loss A/c (under-absorption)	1,600
	29,600		29,600

Dr. Finished Goods Account Cr.			
Particulars	₹	Particulars	₹
To Balance b/d (given)	24,000	By Cost of Sales A/c (Balancing figure)	1,45,000
To Work-in-Progress A/c	1,51,000	By Balance c/d (given)	30,000
	1,75,000		1,75,000

Working Notes :

- (1) Creditors Account is maintained in the financial book. For payment to creditors, the entry will be :

Creditors Account	Dr.	₹ 89,200
To Bank / Cash Account		89,200

- (2) Expenses incurred in respect of manufacturing overhead is recorded in cost ledger as follows :

Manufacturing Overhead Control Account	Dr.
To General Ledger Adjustment Account	

- (3) Valuation of Work-in-Progress :

	₹
Materials	5,000
Direct labour (300 × ₹ 10)	3,000
Manufacturing overhead (300 × 4)	1,200
	<u>9,200</u>

Illustration 15

A company operates on historic job cost accounting system, which is not integrated with financial accounts.

At the beginning of a month, the opening balances in cost ledger were :

₹ in Lakhs

Stores Ledger Control Account	80
Work-in-Progress Control Account	20
Finished Goods Control Account	430
Building Construction Account	10
Cost Ledger Control Account	540

During the month, the following transactions took place :

Material :	Purchased	40
	Issued to Production	50
	Issued to general maintenance	6
	Issued to building construction	4
Wages :	Gross wages paid	150
	Indirect wages	40
	For building construction	10
Works Overheads :	Actual amount incurred (excluding items shown above)	160
	Absorbed in building construction	20
	Under absorbed	8
Royalty paid		5
Selling, distribution and administration expenses		25
Sales		450

At the end of the month, the stock of raw material and work-in-progress was ₹ 55 lakhs and ₹ 25 lakhs respectively. The loss arising in the raw material account is treated as factory overhead. The building under construction was completed during the month. Company's gross profit margin is 20% on sales.

6.40 Cost Book-Keeping

Prepare :

(i) Cost Ledger Control Account	(vii) Wages Control Account
(ii) Stores Ledger Control Account	(viii) Selling, Distribution & Administration Overheads Account
(iii) Work-in-Progress Control Account	(ix) Cost of Goods Sold Account
(iv) Finished Goods Control Account	(x) Cost of Sales Account
(v) Building Construction Account	(xi) Costing Profit and Loss Account
(vi) Works Overheads Control Account	(xii) Trial Balance

sSolution

Dr.		Cost Ledger Control Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs		
To Building Construction A/c	44	By Balance b/d (Note 1)	540		
To Costing Profit and Loss A/c (Sales)	450	By Stores Ledger Control A/c	40		
To Balance c/d	483	By Wages Control A/c	150		
		By Works Overheads Control A/c	160		
		By Royalty A/c	5		
		By Selling, Distribution & Administration Overhead A/c	25		
		By Costing Profit and Loss A/c (Profit)	57		
	977		977		

Dr.		Stores Ledger Control Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs		
To Balance b/d	80	By Work-in-Progress Control A/c	50		
To Cost Ledger Control A/c	40	By Works Overheads Control A/c	6		
		By Building Construction A/c	4		
		By Works Overheads Control A/c (Loss)	5		
		By Balance c/d	55		
	120		120		

Dr.		Work-in-Progress Control Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs		
To Balance b/d	20	By Finished Goods Control A/c (Balancing figure)	333		
To Stores Ledger Control A/c	50	By Balance c/d	25		
To Wages Control A/c	100				
To Royalty A/c	5				
To Works Overheads Control A/c	183				
	358		358		

Dr.		Finished Goods Control Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs		
To Balance b/d	430	By Cost of Goods Sold A/c (Note 2)	360		
To Work-in-Progress Control A/c	333	By Balance c/d	403		
	763		763		

Dr.		Building Construction Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs		
To Balance b/d	10	By Cost Ledger Control A/c	44		
To Stores Ledger Control A/c	4				
To Wages Control A/c	10				
To Works Overheads Control A/c	20				
	44		44		

Dr. Works Overheads Control Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs
To Stores Ledger Control A/c	6	By Building Construction A/c	20
To Wages Control A/c	40	By Work-in-Progress A/c	183
To Cost Ledger Control A/c	160	By Costing Profit and Loss A/c (under-absorption)	8
To Stores Ledger Control A/c (Loss)	5		
	211		211

Dr. Wages Control Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs
To Cost Ledger Control A/c	150	By Works Overheads Control A/c	40
		By Building Construction A/c	10
		By Work-in-Progress Control A/c	100
	150		150

Dr. Selling, Distribution and Administration Overhead Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs
To Cost Ledger Control A/c	25	By Cost of Sales A/c	25

Dr. Cost of Goods Sold Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs
To Finished Goods Control A/c	360	By Cost of Sales A/c	360

Dr. Cost of Sales Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs
To Cost of Goods Sold A/c	360	By Costing Profit and Loss A/c	385
To Selling, Distribution and Administration Overhead A/c	25		
	385		385

Dr. Costing Profit and Loss Account		Cr.	
Particulars	₹ in Lakhs	Particulars	₹ in Lakhs
To Cost of Sales A/c	385	By Cost Ledger Control A/c (Sales)	450
To Works Overheads Control A/c (under-absorption)	8		
To Cost Ledger Control A/c (Profit)	57		
	450		450

Trial Balance as at ...

Heads of Account	Dr. (₹ in Lakhs)	Cr. (₹ in Lakhs)
Stores Ledger Control Account	55	
Work-in-Progress Control Account	25	
Finished Goods Control Account	403	
Cost Ledger Control Account		483
	483	483

Working Notes :

- (1) Cost Ledger Control Account always shows a credit balance. Stores Ledger Control Account, Work-in-Progress Control Account, Finished Goods Control Account and Building Construction Account always show a debit balance.
- (2) When sales is ₹ 100 lakh then cost is ₹ 80 lakh (100 – 20%)
When sales is ₹ 1 lakh then cost is ₹ 80 / 100 lakh
When sales is ₹ 450 lakhs then cost is $80 / 100 \times 450 \text{ lakh} = ₹ 360 \text{ lakhs}$.

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 16

The following are the balances in the Cost Ledger of a manufacturing company on 1st January, 2011 :

	Dr. (₹)	Cr. (₹)
Stores Ledger	9,000	
Work-in-Progress Ledger	8,000	
Finished Goods Ledger	10,000	
Financial Ledger		27,000

Summary of the transactions during the year 2011 :

	₹
Materials purchased	15,000
Materials issued to jobs	16,000
Materials issued for repairs in factory	2,000
Direct wages paid	10,000
Indirect wages paid	2,000
Factory expenses paid	8,000
Administration expenses paid	9,000
Selling expenses paid	5,000
Cost of finished goods produced	40,000
Cost of finished goods sold	55,000
Sales	90,000

Prepare Control Accounts and Costing Profit and Loss Accounts in the Cost Ledger assuming that the overheads recovered and incurred are the same and that administration overheads are charged to finished goods.

[C.U.B.Com. (General) – 2012]

Solution**In the Cost Ledger**

Financial Ledger Control Account			
Dr.			Cr.
Particulars	₹	Particulars	₹
To Costing Profit and Loss A/c (Sales)	90,000	By Balance b/d	27,000
By Balance c/d	16,000	By Stores Ledger Control A/c	15,000
		By Wages Control A/c	12,000
		By Production Overhead Control A/c	8,000
		By Administration Overhead Control A/c	9,000
		By Selling and Distribution Overhead Control A/c	5,000
		By Costing Profit and Loss A/c (Profit)	30,000
	1,06,000		1,06,000

Dr.		Stores Ledger Control Account		Cr.	
Particulars		₹	Particulars		₹
To Balance b/d		9,000	By Work-in-Progress Control A/c (Materials Issued)		16,000
To Financial Ledger Control A/c (Materials Purchased)		15,000	By Production Overhead Control A/c		2,000
			By Balance c/d		6,000
		24,000			24,000

Dr.		Wages Control Account		Cr.		
Particulars		₹		Particulars		₹
To Financial Ledger Control A/c (Direct Wages + Indirect Wages)				By Work-in-Progress Control A/c (Direct Wages)		10,000
		12,000		By Production Overhead Control A/c (Indirect Wages)		2,000
		12 000				12 000

Dr. Work-in-Progress Control Account		Cr.	
Particulars	₹	Particulars	₹
To Balance b/d	8,000	By Finished Goods Control A/c	40,000
To Stores Ledger Control A/c	16,000	By Balance c/d	6,000
To Wages Control A/c	10,000		
To Production Overhead Control A/c	12,000		
	46,000		46,000

Dr. Production Overhead Control Account		Cr.	
Particulars	₹	Particulars	₹
To Stores Ledger Control A/c	2,000	By Work-in-Progress Control A/c	12,000
To Financial Ledger Control A/c	8,000		
To Wages Control A/c	2,000		
	12,000		12,000

Dr. Administration Overheads Control Account		Cr.	
Particulars	₹	Particulars	₹
To Financial Ledger Control A/c	9,000	By Finished Goods Control A/c	9,000

Dr. Finished Goods Control Account		Cr.	
Particulars	₹	Particulars	₹
To Balance b/d	10,000	By Cost of Sales A/c	55,000
To Work-in-Progress Control A/c	40,000	By Balance c/d	4,000
To Administration Overhead Control A/c	9,000		
	59,000		59,000

Dr. Selling Overheads Control Account		Cr.	
Particulars	₹	Particulars	₹
To Financial Ledger Control A/c	5,000	By Cost of Sales A/c	5,000

Dr. Cost of Sales Account			
Particulars	₹	Particulars	₹
To Finished Goods Control A/c	55,000	By Costing Profit and Loss A/c	60,000
To Selling and Distribution Overhead Control A/c	5,000		
	60,000		60,000

Dr. Costing Profit and Loss Account		Cr.	
Particulars	₹	Particulars	₹
To Cost of Sales A/c	60,000	By Financial Ledger Control A/c (Sales)	90,000
To Financial Ledger Control A/c (Profit)	30,000		
	90,000		90,000

Illustration 17

Journalise the following transactions in the Cost Ledger under Cost Control Accounts : (all figures in ₹)

Raw materials purchased	50,000	Direct materials issued to production	30,000
Wages paid (70% Direct)	40,000	Manufacturing expenses incurred	30,000
Manufacturing expenses charged to production	40,000	Selling & distribution expenses incurred	5,000
Selling and distribution expenses recovered	4,000	Sales	1,00,000

6.44 Cost Book-Keeping

Solution

In the Cost Book Journal

		Dr.		Cr.
Date	Particulars	L.F.	₹	₹
	Stores Ledger Control A/c Dr. To Cost Ledger Control A/c (Being the purchase of raw materials)		50,000	50,000
	Work-in-Progress Control A/c Dr. To Stores Ledger Control A/c (Being the materials issued to production)		30,000	30,000
	Wages Control A/c Dr. To Cost Ledger Control A/c (Being wages paid)		40,000	40,000
	Work-in-Progress Control A/c Dr. Production Overheads Control A/c Dr. To Wages Control A/c (Being the direct wages debited to Work-in-Progress Control Account and the balance debited to Production Overhead Control Account)		28,000 12,000	40,000
	Production Overheads Control A/c Dr. To Cost Ledger Control A/c (Being the manufacturing expenses incurred)		30,000	30,000
	Work-in-Progress Control A/c Dr. To Production Overheads Control A/c (Being the production overhead charged to Production)		40,000	40,000
	Selling and Distribution Overhead Control A/c Dr. To Cost Ledger Control A/c (Being the selling and distribution overhead incurred)		5,000	5,000
	Cost of Sales A/c Dr. To Selling and Distribution Overhead Control A/c (Being the selling and distribution overhead recovered)		4,000	4,000
	Cost Ledger Control A/c Dr. To Costing Profit and Loss A/c (Being the sale of goods)		1,00,000	1,00,000

[For Honours Candidates Only]

Illustration 18

Pass journal entries in the cost books (non-integrated system) for the following transactions :

- Materials worth ₹ 25,000 returned to the stores from the job.
- Gross total wages paid ₹ 48,000. Employer's contribution to P.F. and State Insurance amounts to ₹ 2,000. Wages analysis book details : ₹ 20,000 towards direct labour, ₹ 12,000 towards indirect factory labour, ₹ 10,000 towards salaries to office staff and ₹ 8,000 for salaries to selling and distribution staff.

[C.U.B.Com. (Hons.) – 2011]

Solution

In the Cost Book Journal

		Dr.		Cr.
Date	Particulars	L.F.	₹	₹
	Stores Ledger Control A/c Dr. To Work-in-Progress Control A/c (Being the materials returned to stores from the job)		25,000	25,000
	Wages Control A/c (₹ 48,000 + 2,000) Dr. To Cost Ledger Control A/c (Being wages paid along with employer's contribution to P.F. and Insurance)		50,000	50,000

Work-in-Progress Control A/c	Dr.	20,000	
Factory Overhead Control A/c	Dr.	12,000	
Administrative Overhead Control A/c	Dr.	10,000	
Selling and Distribution Overhead Control A/c	Dr.	8,000	
To Wages Control A/c			50,000
(Being allocation of wages)			

Illustration 19

From the following information, prepare the necessary ledger accounts in the Cost Ledger :

	Opening Balance (₹)	Closing Balance (₹)
Stores Ledger Control A/c	20,000	25,000
Work-in-Progress Control A/c	14,000	18,500
Finished Stock Control A/c	16,500	17,500
Following transactions took place during the period :		₹
Materials purchased		47,500
Direct wages paid		25,000
Overhead incurred		12,500
Overhead recovered		17,000
Sales		80,000

[C.U.B.Com. (Hons.) – 2014]

Solution

In the Cost Ledger

Dr.		Cost Ledger Control Account		Cr.	
Particulars	₹	Particulars	₹		
To Costing Profit and Loss A/c (Sales)	80,000	By Balance b/d	50,500		
By Balance c/d	61,000	By Stores Ledger Control A/c	47,500		
		By Work-in-Progress Control A/c (direct wages paid)	25,000		
		By Factory Overhead Control A/c	12,500		
		By Costing Profit and Loss A/c (Profit)	5,500		
	1,41,000		1,41,000		

Dr.		Stores Ledger Control Account		Cr.	
Particulars	₹	Particulars	₹		
To Balance b/d	20,000	By Work-in-Progress Control A/c	42,500		
To Cost Ledger Control A/c	47,500	By Balance c/d	25,000		
	67,500		67,500		

Dr.		Work-in-Progress Control Account		Cr.	
Particulars	₹	Particulars	₹		
To Balance b/d	14,000	By Finished Stock Control A/c	80,000		
To Stores Ledger Control A/c	42,500	By Balance c/d	18,500		
To Cost Ledger Control A/c (direct wages paid)	25,000				
To Factory Overhead Control A/c	17,000				
	98,500		98,500		

Dr.		Finished Stock Control Account		Cr.	
Particulars	₹	Particulars	₹		
To Balance b/d	16,500	By Cost of Sales A/c	79,000		
To Work-in-Progress Control A/c	80,000	By Balance c/d	17,500		
	96,500		96,500		

6.46 Cost Book-Keeping

Dr. Factory Overhead Control Account Cr.			
Particulars	₹	Particulars	₹
To Cost Ledger Control A/c	12,500	By Work-in-Progress Control A/c	17,000
To Costing Profit and Loss A/c	4,500		
	17,000		17,000

Dr. Cost of Sales Account			
Particulars	₹	Particulars	₹
To Finished Stock Control A/c	79,000	By Costing Profit and Loss A/c	79,000

Dr. Costing Profit and Loss Account Cr.			
Particulars	₹	Particulars	₹
To Cost of Sales A/c	79,000	By Cost Ledger Control A/c (Sales)	80,000
To Cost Ledger Control A/c	5,500	By Factory Overhead Control A/c (Over-absorption of factory overhead)	4,500
	84,500		84,500

Illustration 20

Pass necessary journal entries in cost records for the following :

- Materials (direct) amounting to ₹ 42,000 are issued to production.
- Depreciation of factory equipment ₹ 9,000.
- Goods completed and transferred to finished stock ₹ 72,000.
- Factory overhead incurred ₹ 15,000 (of which ₹ 3,000 left unpaid).
- Office overhead recovered ₹ 16,000.

[C.U.B.Com. (Hons.) – 2016]

Solution

In the Cost Book Journal

		Dr.		Cr.
Date	Particulars	L.F.	₹	₹
(a)	Work-in-Progress Control A/c Dr. To Stores Ledger Control A/c (Being the materials issued to production)		42,000	42,000
(b)	Factory Overhead Control A/c Dr. To Cost Ledger Control A/c (Being depreciation on factory equipment)		9,600	9,600
(c)	Finished Stock Control A/c Dr. To Work-in-Progress Control A/c (Being the goods completed and transferred to finished stock)		72,000	72,000
	Factory Overhead Control A/c Dr. To Cost Ledger Control A/c (Being the factory overhead incurred)		15,000	15,000
	Finished Stock Control A/c Dr. To Administrative Overhead Control A/c (Being the office overhead recovered)		16,000	16,000

Reconciliation of Financial Accounts Profit and Cost Accounts Profit

When accounts are maintained under non-integrated (interlocking) system, two profit figures will be there – one in the *cost ledger* and another in the *financial ledger*. While differences (other than errors) arise between financial accounts profit and cost accounts profit, the 'Cost Ledger Control Account' (in the cost ledger) and 'Financial Ledger Control Account' (in the financial ledger) will not 'interlock' in the manner described above (i.e., will not be equal and opposite). The differences between cost accounts profit and financial accounts profit may arise, where *items are appearing only in one set of books* (i.e., either in the financial accounts or in the cost accounts). As there will be two different profit figures, periodic *reconciliation* will be required. Reconciliation can be done either in *Statement* form or in *Memorandum Account* form.

There are **three** reasons, in general, for the differences in profit :

1. Items shown only in the financial accounts.
2. Items shown only in the cost accounts.
3. Same Items Treated Differently in the Financial Accounts and the Cost Accounts

Items Shown Only in the Financial Accounts

There are many items which appear in the financial accounts but not in the cost accounts. These items may be related to expenses or incomes. All the items of expense will reduce the profit of the financial accounts and similarly, all the items of income will increase the profit of the financial accounts. The major items are as follows:

(a) Purely Financial Charges

The following items will fall under this category :

- (i) Loss on sale of fixed assets;
- (ii) Loss on exchange of fixed assets;
- (iii) Loss on sale of investments;
- (iv) Loss on exchange difference (foreign currency);
- (v) Amortisation of fictitious assets (e.g., writing-off of preliminary expenses, discount on issue of shares or debentures, etc.);
- (vi) Amortisation of intangible assets (e.g., writing-off of goodwill, copyrights, licence fees, etc.);
- (vii) Fines and penalties.
- (viii) Interest on bank loans and mortgages.

(b) Purely Financial Incomes

The following items will fall under this category :

- (i) Profit on sale of fixed assets;
- (ii) Profit on exchange of fixed assets;
- (iii) Profit on sale of investments;
- (iv) Profit of exchange difference (foreign currency);
- (v) Income from investment;
- (vi) Dividend received from subsidiaries;
- (vii) Government subsidies;
- (viii) Share transfer fees;
- (ix) Rent received from let-out property.

(c) Abnormal Loss / Income

The following items will fall under this category :

- (i) Loss of stock / assets by fire, flood etc (uninsured);
- (ii) Loss due to theft;
- (iii) Windfall gain (e.g., government incentive for less emission of carbon).

(d) Appropriation of Profit

There are many items which are debited to financial accounts at the time of calculating profit. These are :

- (i) Income tax;
- (ii) Proposed dividends;
- (iii) Transfer to reserves;
- (iv) Donations and charities.

Items Shown Only in the Cost Accounts

There are very few items which appear in the cost accounts but not in the financial accounts. These items are **notional** in nature (i.e., they do not involve payment in cash or kind). An organisation may choose to record it in the cost accounts to reflect 'Loss of benefit'. Common items are :

- (i) Notional rent; and
- (ii) Interest on capital.

Notional rent and interest on capital are sometimes charged to factory overhead to ensure that management take into consideration those expenses which might normally be expected to be included at the time of arriving at the cost of product/service. **For example**, where the factory is owned by the company, no rent is payable. Because of this, the factory overhead will be lower than if rent was payable. The cost of product will lower and the benefit may be transferred to the customer by way of lower price. Many argue that notional rent should be included in the cost of production as it is a factor of production.

There are two methods of recording notional rent in cost books :

Method 1

Factory Overheads Control Account	Dr.
To Notional Rent Provision A/c	

The Notional Rent Provision Account will be carried forward as a reserve account in the cost ledger. As there will be no corresponding entry in the Financial Accounts (as there is no outflow of cash), **notional rent will be an item of reconciliation**.

Method 2

(a) Factory Overheads Control Account	Dr.
To Notional Rent Account	
(b) Notional Rent A/c	Dr.
To Costing Profit and Loss Account	

In this case also there will be no corresponding entry in Financial Accounts.

Here, it should be noted that **notional rent will not become an item of reconciliation** because the credit to Costing Profit and Loss Account cancels out the effect of debit entry in Factory Overheads Control Account.

Same Items Treated Differently in the Financial Accounts and the Cost Accounts

There are many items which are treated differently in the cost accounts and financial accounts. Some of these important items are :

- (a) Stock valuation
- (b) Depreciation
- (c) Absorption of overheads

(a) Stock Valuation

Inventory (raw materials, WIP and finished goods) may be valued differently in the financial accounts and in the cost accounts. **For example**, in the financial accounts inventories are to be valued as per AS-2 where, only FIFO and Weighted Average methods are allowed, however, in the cost account, the management may follow LIFO method for valuation of inventories. Therefore, a difference in profits will arise because of using different methods of valuation.

(b) Depreciation

Depreciation method adapted in the financial accounts may not be same as in the cost accounts. *For example:* In the financial accounts depreciation could be charged on 'straight line' basis but in the cost accounts it is charged on a 'unit of production' basis. This will produce different profit figures in financial accounts and cost accounts.

(c) Absorption of overheads

In the financial accounts actual overhead expenses are debited to Profit and Loss Account. However, in the cost accounts overheads are recovered at a pre-determined rate (see Overhead chapter for details). Overhead incurred and absorbed may be different. This will cause a difference in reported profits (when under / over absorbed overhead is transferred to next period).

Preparation of Profit Reconciliation Statement

Profit Reconciliation Statement is a statement which contains a complete and satisfactory explanation of the differences in profit as per cost accounts and financial accounts. It is just a procedure to prove the profit of other books (cost / financial). It is not a part of the double entry system.

Generally, reconciliation of profit is made in *statement format*. However, some organisations do it through preparation of Memorandum Profit / Loss Account. In the examination, generally, items of reconciliation are given along with the profit as per Cost Accounts or Financial Accounts. In some cases, profit as per both the accounts are given.

We will discuss the procedures for reconciliation of profit under two headings :

- (1) When profit / loss as per cost accounts is given; and
- (2) When profit / loss as per financial accounts is given.

(1) When Profit as per Cost Accounts is Given

If we start reconciliation statement with profit as per Cost Accounts, we are to ascertain the impact of each item (causing a difference) on the profit of financial accounts. In other words, we will have to see whether a particular item increases or decreases the profit as per financial accounts. Now, *add* those items which increase the profit of financial accounts as compared to the profit of cost accounts. For example, '*Purely Financial Incomes*' like :

- (i) Profit on sale of investments;
- (ii) Profit on sale / exchange of fixed assets;
- (iii) Government subsidies;
- (iv) Share transfer fees;
- (v) Dividend received from subsidiaries;
- (vi) Income from investments; and so on

Also *add*, over-absorption of overheads, over-valuation of opening stock as per cost accounts, under valuation of closing stock as per cost accounts.

Deduct those items which decrease the profit of financial accounts. For example, '*Purely Financial Expenses*', like :

- (i) Loss on sale of fixed assets;
- (ii) Loss of sale of investments;
- (iii) Goodwill, preliminary expenses written-off;
- (iv) Fines and penalties;
- (v) Interest on bank loans and mortgage;
- (vi) Loss on exchange difference of foreign currency;
- (vii) Bad debts written-off.

Also *deduct*, under-absorption of overheads, under valuation of opening stock as per cost accounts, over valuation of closing stock as per cost accounts, etc.

6.50 Cost Book-Keeping

Illustration 21

From the following data prepare a Reconciliation Statement to find out profits as per Financial Accounts.

	₹
Profit as per Cost Accounts	2,50,000
Works overhead over-absorbed	20,000
Administrative overhead under-absorbed	45,000
Under-valuation of opening stock in Cost Accounts	15,000
Bad debts written-off during the year	14,000
Preliminary expenses written-off during the year	10,000

[C.U.B.Com. (Hons.) – 2004]

Solution Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Profit as per Cost Accounts		2,50,000
Add: Works overheads over-absorbed		20,000
		2,70,000
Less: Administrative overheads under-absorbed	45,000	
Under-valuation of opening stock in cost accounts	15,000	
Bad debts written-off	14,000	
Preliminary expenses written-off	10,000	84,000
Profit as per Financial Accounts		1,86,000

Illustration 22

From the following information, prepare a reconciliation statement :

	As per financial records ₹	As per cost records ₹
Closing stock	8,160	8,560
Factory expenses	24,260	21,000
Office expenses	10,680	10,000
Selling expenses	14,200	15,000
Depreciation	2,200	1,600
Rent received	5,200	—
Net profit	40,600	39,540

[C.U.B.Com. (Hons.) – 2007]

Solution Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Net Profit as per Cost records		39,540
Add: Selling expenses over-absorbed (₹ 15,000 – ₹ 14,200)	800	
Rent received (not considered in cost accounts)	5,200	6,000
		45,540
Less: Over-valuation of closing stock (₹ 8,560 – ₹ 8,160)	400	
Factory expenses under-absorbed (₹ 24,260 – ₹ 21,000)	3,260	
Office expenses under-absorbed (₹ 10,680 – ₹ 10,000)	680	
Undercharge of depreciation (₹ 2,200 – ₹ 1,600)	600	4,940
Net Profit as per Financial records		40,600

Illustration 23

From the following figures, prepare a Reconciliation Statement :

	Cost Books ₹	Financial Books ₹
Profit	50,000	?
Marketing overheads	8,000	8,000
Provision for bad debts	—	5,000
Factory overheads	8,500	7,000
Director's fees	—	2,000
Income-tax paid	—	15,000
Rent of owned premises	6,000	—
Depreciation	11,250	12,000
Share transfer fee (Cr.)	—	1,000
Administrative overheads	5,000	8,000

[D.U.B.Com. (Hons.) – 2006]

Solution

**Statement Showing the Reconciliation of Profit / Loss
as per Cost and Financial Accounts**

Particulars	₹	₹
Profit as per Cost Books		50,000
Add: Factory overheads over-absorbed	1,500	
Notional rent charged in cost books	6,000	
Share transfer fees credited in financial books only	1,000	8,500
		58,500
Less: Provision for bad debts	5,000	
Director's fees	2,000	
Income-tax paid	15,000	
Depreciation undercharged in the cost book	750	
Administrative overheads under-recovered	3,000	25,750
Profit as per Financial Books		32,750

Illustration 24

From the following information, reconcile the profit as per cost accounts with financial accounts :

	Cost Accounts ₹	Financial Accounts ₹
Profit	86,250	?
Opening Stock :		
Material	10,500	10,300
Work-in-progress	8,500	8,000
Closing Stock :		
Material	14,200	15,000
Work-in-progress	6,000	5,600

Dividend and interest received ₹ 600.

Loss on sale of investments ₹ 1,000.

Interest charged by the bank not considered in Financial Accounts and Cost Accounts ₹ 1,500.

Goodwill written-off during the year ₹ 2,500.

Preliminary expenses written-off ₹ 3,000.

Overhead incurred ₹ 40,000.

Overhead absorbed in Cost Accounts ₹ 38,500.

Find out Profit as per Financial Accounts.

[D.U.B.Com. (Hons.) – 2005]

6.52 Cost Book-Keeping

Solution

Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Profit as per Cost Accounts		86,250
Add: Over-valuation of opening stock as per cost accounts [₹ 19,000 – ₹ 18,300]	700	
Under-valuation of closing stock as per cost accounts [₹ 20,600 – ₹ 20,200]	400	
Dividend and interest credited in financial accounts	600	1,700
		87,950
Less: Loss on sale of investments debited to financial accounts only	1,000	
Goodwill written-off	2,500	
Preliminary expenses written-off	3,000	
Under-absorption of overheads	1,500	8,000
Profit as per Financial Accounts		79,950

Tutorial Note : Bank interest has not been considered in Financial Accounts and Cost Accounts. Therefore, it will not be shown in the reconciliation statement.

(2) When Profit as per Financial Accounts is Given

If we start reconciliation statement with profit as per **Financial Accounts**, we are to ascertain the impact of each item (causing a difference) on the profit of cost accounts. In other words, we will have to see whether a particular item increases or decreases the profit as per cost accounts.

Now, *add* those items which increase the profit of cost accounts as compared to financial accounts. For example, '**Purely Financial Expenses**' (items that have already been discussed), which have been debited to Financial Profit / Loss Account.

Also *add*, under-absorption of overheads, under-valuation of opening stock as per cost accounts, over-valuation of closing stock as per cost accounts, etc.

Deduct those items which increase the profit of financial accounts as compared to cost accounts. For example, '**Purely Financial Incomes**' (items that have already been discussed), which have already been credited to financial accounts.

Also *deduct* over-absorption of overheads, over-valuation of opening stock as per cost accounts, under-valuation of closing stock as per cost accounts.

Illustration 25

From the following data prepare a Reconciliation Statement :

	₹
Profit as per financial accounts	1,44,000
Works overheads under-recovered	9,500
Administrative overheads under-recovered	22,750
Selling overheads over-recovered	19,500
Overvaluation of opening stock in cost accounts	15,000
Overvaluation of closing stock in cost accounts	7,500
Interest earned during the year	3,750
Rent received during the year	27,000
Bad debts written-off during the year	9,000
Preliminary expenses written-off during the year	18,000

[I.C.W.A. (Stage – 1) – Adapted]

Solution

**Statement Showing the Reconciliation of Profit / Loss
as per Cost and Financial Accounts**

Particulars	₹	₹
Profit as per Financial Accounts		1,44,000
Add: Works overheads under-absorbed in the cost accounts	9,500	
Administrative overheads under-recovered in the cost accounts	22,750	
Over-valuation of closing stock in the cost accounts	7,500	
Bad debts written-off	9,000	
Preliminary expenses written-off	18,000	66,750
		2,10,750
Less: Selling overheads over-recovered	19,500	
Overvaluation of opening stock in cost accounts	15,000	
Interest earned	3,750	
Rent received	27,000	65,250
Profit as per Cost Accounts		1,45,500

Preparation of Memorandum Reconciliation Account

As already mentioned, the reconciliation of profit can be done either in Statement format or in Memorandum Account format. Here we will discuss the preparation of Memorandum Reconciliation Account.

The concept is same in both cases, but in Memorandum Reconciliation Account, presentation will be in 'T' Account form. **However, this account is not a part of the double entry system.**

Generally, the following steps are followed for preparation of the Memorandum Reconciliation Account :

Step 1 : Draw a Memorandum Account in a sheet of paper.

Step 2 : Write down profit as per cost accounts on the credit side of the Memorandum Account.

Step 3 : Debit the following items :

- (i) Purely Financial Expenses (already discussed)
- (ii) Under-absorption of overheads as per cost accounts
- (iii) Under-valuation of opening stock as per cost accounts
- (iv) Over-valuation of closing stock as per cost accounts

Step 4 : Find out the balance of the Memorandum Reconciliation Account. If it is a debit balance, it represents profit as per Financial Accounts.

If it is a credit balance, it represents loss as per Financial Accounts.

Illustration 26

The net profit as per financial accounts of a company amounted to ₹ 18,550, while the profits as per cost accounts were ₹ 28,660. On reconciling figure, the following were noted :

	₹	₹
(1) Director's fees not charged in cost accounts	1,050	(3) Bank interest credited 30
(2) A provision for bad and doubtful debts	970	(4) Provision for income-tax 8,300
(5) Over-recovery of overhead to cost accounts	180	

Prepare Reconciliation Statement. Also prepare Memorandum Reconciliation Account.

[D.U.B.Com. (Hons.) – Adapted]

Solution

**Statement Showing the Reconciliation of Profit / Loss
as per Cost and Financial Accounts**

Particulars	₹	₹
Net profit as per Cost Accounts		28,660
Add: (3) Bank interest credited in the financial accounts	30	
(5) Over-recovery of overheads in cost accounts	180	210
		28,870

6.54 Cost Book-Keeping

Less: (1) Director's fees not charged in cost accounts	1,050	
(2) A provision for bad and doubtful debts	970	
(4) Provision for income-tax	8,300	10,320
Net Profit as per financial accounts		18,550

Memorandum Reconciliation Account			
Dr.			Cr.
Particulars	₹	Particulars	₹
To Director's Fees	1,050	By Net Profit as per Cost Accounts	28,660
To Provision for Bad and Doubtful Debts	970	By Bank Interest	30
To Provision for Income-tax	8,300	By Over-recovery of Overheads	180
To Net Profit as per Financial Accounts	18,550		
	28,870		28,870

Illustration 27

A manufacturing company disclosed a net loss of ₹ 3,47,000 as per their cost accounts for the year ended March 31, 2003. The financial accounts, however, disclosed a net loss of ₹ 5,10,000 for the same period. The following information was revealed as a result of scrutiny of the figures of both the sets of accounts :

	₹
(i) Factory overheads under-absorbed	40,000
(ii) Administration overheads over-absorbed	60,000
(iii) Depreciation charged in financial accounts	3,25,000
(iv) Depreciation charged in cost accounts	2,75,000
(v) Interest on investments not included in cost accounts	96,000
(vi) Income-tax provided	54,000
(vii) Interest on loan funds in financial accounts	2,45,000
(viii) Transfer fees (credit in financial books)	24,000
(ix) Stores adjustment (credit in financial books)	14,000
(x) Dividend received	32,000

Prepare a Memorandum Reconciliation Account.

[D.U.B.Com. (Hons) – 2005] [C.A. (PE-II) – May, 2003]

Solution

Memorandum Reconciliation Account			
Dr.			Cr.
Particulars	₹	Particulars	₹
To Net Loss as per Cost Accounts	3,47,000	By Administration Overheads over-absorbed	60,000
To Factory Overhead under-absorbed	40,000	By Interest on Investment	96,000
To Depreciation (under charged)	50,000	By Transfer Fees	24,000
To Income-tax	54,000	By Stores Adjustments	14,000
To Interest on Loan	2,45,000	By Dividend Received	32,000
		By Net Loss as per Financial Accounts	5,10,000
	7,36,000		7,36,000

Illustration 28

A manufacturing company has disclosed a net loss of ₹ 2,13,000 as per their cost accounting records for the year ended March 31, 2009. However, their financial accounting records disclosed a net loss of ₹ 2,58,000 for the same period. A scrutiny of data of both the sets of books of accounts revealed the following information :

	₹
(i) Factory overheads under-absorbed	5,000
(ii) Administration overheads over-absorbed	3,000
(iii) Depreciation charged in financial accounts	70,000
(iv) Depreciation charged in cost accounts	80,000
(v) Interest on investments not included in cost accounts	20,000

- (vi) Income-tax provided in financial accounts 65,000
 (vii) Transfer fees (credit in financial accounts) 2,000
 (viii) Preliminary expenses written-off 3,000
 (ix) Over-valuation of closing stock of finished goods in cost accounts 7,000
 Prepare a Memorandum Reconciliation Account.

Solution

Dr.		Memorandum Reconciliation Account		Cr.
Particulars	₹	Particulars	₹	
To Net Loss as per Cost Accounts	2,13,000	By Administration Overheads over-absorbed	3,000	
To Factory Overheads under-absorbed	5,000	By Depreciation over charged in Cost Accounts	10,000	
To Income-tax Provided in the Financial Accounts	65,000	(₹ 80,000 – ₹ 70,000)		
To Preliminary Expenses written-off	3,000	By Interest on Investment not included in	20,000	
To Over-valuation of Closing Stock in Cost Accounts	7,000	Cost Accounts		
		By Transfer Fees	2,000	
		By Net Loss as per Financial Accounts	2,58,000	
	2,93,000		2,93,000	

Illustration 29

Following is the Trading and Profit and Loss Account of Deep Industries Ltd. for the year ended 31.12.2001 :

	₹		₹
To Materials	45,000	By Sales (4,800 units)	96,000
To Wages	33,000	By Closing Stock (1,200 units)	20,400
To Works expenses	24,000		
To Administrative expenses	6,000		
To Net Profit	8,400		
	1,16,400		1,16,400

The company's cost records show that : (i) Works overhead have been absorbed at ₹ 3 per unit produced; and, (ii) Administrative overheads have been absorbed at ₹ 1.50 per unit produced.

Assuming there is nothing by way of work-in-progress either at the beginning or at the end and there is no opening stock of finished goods, prepare : (i) A statement of cost indicating the net profit; and (ii) A statement reconciling the profit as disclosed by cost accounts and that shown in financial accounts.

[D.U.B.Com. (Hons.) – 2003]

Solution

**Deep Industries Ltd.
Statement of Cost and Profit as per Cost Accounts**

Particulars	₹
Materials	45,000
Wages	33,000
Prime Cost	78,000
Works overhead (6,000 × ₹ 3)	18,000
Factory Cost / Works Cost	96,000
Administrative overheads (6,000 × ₹ 1.50)	9,000
Cost of Production (6,000 units)	1,05,000
Less: Closing Stock (Note 1)	21,000
Cost of Goods Sold	84,000
Selling and Distribution Overheads	Nil
Cost of Sales	84,000
Net Profit (Balancing figure)	12,000
Sales	96,000

6.56 Cost Book-Keeping

Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Net Profit as per Financial Accounts		8,400
Add: Under-absorption of works overheads :		
As per financial accounts	24,000	
As per cost accounts	18,000	6,000
Add: Overvaluation of closing stock as per cost accounts :		
As per cost accounts	21,000	
As per financial accounts	20,400	600
		15,000
Less: Over-absorption of administrative overheads :		
As per cost accounts	9,000	
As per financial accounts	6,000	3,000
Net Profit as per Cost Accounts		12,000

Working Notes :

(1) Valuation of Closing Stock

- Number of units produced = Number of units sold + Number of units unsold
= 4,800 units + 1,200 units = 6,000 units.
- Cost of Production = ₹ 1,05,000
- Number of units unsold = **1,200** units
- Value of closing stock = ₹ 1,05,000 / 6,000 × 1,200 = ₹ **21,000**.

Illustration 30

The following Profit and Loss Account for the year ending 31st March, 1999 has been extracted from the books of A Ltd.

Dr.		Profit and Loss Account for the year ended 31.3.1999		Cr.	
Particulars	₹	Particulars		₹	
To Direct Material	10,000	By Sales		50,000	
To Direct Labour	20,000	By Work-in-Progress in hand		₹	
To Factory Expenses	9,500	Direct Labour	600		
To Administration Expenses	5,200	Direct Material	400		
To Selling and Distribution Expenses	3,800	Factory Expenses	<u>300</u>		1,300
To Interest on Capital	1,000	By Finished Stock in hand			2,700
To Goodwill written-off	1,500				
To Net Profit	3,000				
	<u>54,000</u>				<u>54,000</u>

Cost Accounts manual states that the factory overheads are to be recovered at 50% of direct wages, administration overheads at 10% of work-cost and selling and distribution overheads @ Re 1 per unit sold.

The units of product sold and in hand were 4,000 and 257 respectively.

Prepare :

- Statement of Cost and Profit as per Cost Accounts
- Reconciliation Statement.

[D.U.B.Com. (Hons.) – 2000]

Solution

A Ltd.

Statement of Cost and Profit as per Cost Accounts

Particulars	₹
Direct Material	10,000
Direct Labour	20,000
Prime Cost	30,000
Factory Overhead @ 50% direct labour cost	10,000
	40,000
Less: Closing Work-in-Progress	1,300
Factory Cost / Works Cost	38,700
Administrative Overheads (10% of ₹ 38,700)	3,870
Cost of Production	42,570
Less: Closing Stock of Finished Goods (Note 1)	2,570
Cost of Goods Sold	40,000
Selling and Distribution Overheads (4,000 × ₹ 1)	4,000
Cost of Sales	44,000
Net Profit (Balancing figure)	6,000
Sales	50,000

**Statement Showing the Reconciliation of Profit / Loss
as per Cost and Financial Accounts**

Particulars	₹	₹
Net Profit as per Cost Accounts		6,000
Add: Over-absorption of factory overheads in cost accounts	500	
Over-absorption of selling and distribution overheads in cost accounts	200	
Under-valuation of closing stock in cost accounts	130	830
		6,830
Less: Under-absorption of administration overheads in cost accounts	1,330	
Goodwill written-off has not been taken in cost accounts	1,500	
Interest on capital has not been taken in cost accounts	1,000	3,830
Net Profit as per Financial Accounts		3,000

Working Notes :

(1) Valuation of Closing Stock of Finished Goods

(a) Number of units produced = Number of units sold + Number of units unsold
= 4,000 units + 257 units = **4,257 units**

(b) Cost of production = ₹ 42,570

(c) Value of closing stock = ₹ 42,570 / 4,257 × 257 = ₹ **2,570**.

(2) Value of work-in-progress has been taken as is given in Financial Profit and Loss Account.

Illustration 31

The Profit and Loss Account of Oil India (Pvt.) Ltd. for the year ended 31st March, 2017 is as follows :

	₹		₹
To Direct Materials	4,80,000	By Sales	9,60,000
To Direct Wages	3,60,000	By Work-in-progress :	
To Direct Expenses	2,40,000	Materials	30,000
To Gross Profit	1,20,000	Wages	18,000
		Direct Expenses	<u>12,000</u>
			60,000
		By Closing Stock	1,80,000
	<u>12,00,000</u>		<u>12,00,000</u>

6.58 Cost Book-Keeping

To Administration Expenses	60,000	By Gross Profit	1,20,000
To Net Profit	66,000	By Dividends Received	6,000
	1,26,000		1,26,000

As per the cost records the direct expenses have been estimated at a cost of ₹ 30 per kg. and administration expenses at ₹ 15 per kg. During the year production was 6,000 kg. and sales were 4,800 kg.

Prepare a statement of Closing Profit and Loss Account and reconcile the costing profit with financial profit.

[D.U.B.Com. (Hons.) – Adapted]

Solution

Oil India (Pvt.) Ltd.

Statement of Costing Profit and Loss for the year ended 31st March, 2017

Particulars	₹
Direct Materials (₹ 4,80,000 – ₹ 30,000) (Note 2)	4,50,000
Direct Labour (₹ 3,60,000 – ₹ 18,000) (Note 2)	3,42,000
Direct Expenses (6,000 x ₹ 30)	1,80,000
Prime Cost	9,72,000
Factory overhead	Nil
Works Cost	9,72,000
Administration Overheads (6,000 x ₹ 15)	90,000
Cost of Production	10,62,000
Less: Closing Stock of Finished Goods (Note 1)	2,12,400
Cost of Goods Sold	8,49,600
Net Profit (Balancing figure)	1,10,400
Sales	9,60,000

Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Net Profit as per Cost Accounts		1,10,400
Add: Over-absorption of administrative overheads in cost accounts (₹ 90,000 – ₹ 60,000)	30,000	
Dividend received (not credited to Costing Profit and Loss Account)	6,000	36,000
		1,46,400
Less: Over-valuation of closing stock of finished goods (₹ 2,12,400 – ₹ 1,80,000)	32,400	
Under-charging of direct expenses (₹ 2,40,000 – ₹ 12,000 – ₹ 1,80,000)	48,000	80,400
Net Profit as per Financial Accounts		66,000

Working Notes :

(1) Valuation of Closing Stock of Finished Goods

- Production = 6,000 kg.
- Cost of Production = ₹ 10,62,000
- Closing Stock = 1,200 kg.
- Value of Closing Stock = ₹ 10,62,000 / 6,000 × 1,200 = ₹ 2,12,400.

(2) Direct materials and direct labour have been charged net of work-in-progress.

Illustration 32

The following is the Trading and Profit and Loss Account of Omega Ltd. :

Particulars	₹	Particulars	₹
To Materials Consumed	23,01,000	By Sales (30,000 units)	48,75,000
To Direct Wages	12,05,750	By Finished Goods Stock (1,000 units)	1,30,000
To Production Overheads	6,92,250		
To Administration Overheads	3,10,375		

To Selling and Distribution overheads	3,68,875	By Work-in-progress :		
To Bad Debts written off	22,750	Materials	55,250	
To Goodwill written off	45,500	Wages	26,000	
To Fines	3,250	Production Overheads	16,250	97,500
To Interest on Mortgage	13,000	By Dividends Received		3,90,000
To Loss on Sale of Machine	16,250	By Interest on Bank Deposits		65,000
To Taxation	1,95,000			
To Net Profit	3,83,500			
	55,57,500			55,57,500

The Cost Accounting records of Omega Ltd. which manufactures a standard unit show the following :

- Production overheads have been charged at 20% of Prime Cost.
- Administration overheads have been recovered at ₹ 9.75 per finished unit.
- Selling and distribution overheads have been recovered at ₹ 13 per unit sold.

Required :

- Prepare a Costing Profit and Loss Account, indicating net profit.
- Prepare a Statement reconciling the profit disclosed by cost records with that shown in financial accounts.

[D.U.B.Com. (Hons.) – 2008]

Solution

Omega Ltd.

Dr.		Costing Profit and Loss Account for the year ended ...		Cr.	
Particulars		₹	Particulars		₹
To Direct Materials		23,01,000	By Sales		48,75,000
To Direct Wages		12,05,750			
Prime Cost		35,06,750			
To Production Overheads (Note 1)		7,01,350			
		42,08,100			
Less: Closing WIP (Note 2)		97,500			
Works Cost		41,10,600			
To Administrative Overheads (Note 3)		3,02,250			
Cost of Production		44,12,850			
Less: Closing Stock of Finished Goods (Note 4)		1,42,350			
Cost of Goods Sold		42,70,500			
To Selling and Distribution Overheads (Note 5)		3,90,000			
		46,60,500			
To Net Profit (balancing figure)		2,14,500			
		48,75,000			48,75,000

Solution

Omega Ltd.

Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Profit as per Cost Accounts		2,14,500
Add: Over-absorption of production overheads (₹ 7,01,350 – ₹ 6,92,250)	9,100	
Over-absorption of selling and distribution overheads (₹ 3,90,000 – ₹ 3,68,875)	21,125	
Dividends received (not credited to cost accounts)	3,90,000	
Interest on bank deposits (not credited to Cost Accounts)	65,000	4,85,225
		6,99,725
Less: Under-absorption of administrative overheads (₹ 3,10,375 – 3,02,250)	8,125	
Less : Items not debited to Costing Profit and Loss Account :		
(a) Bad debts written off	22,750	
(b) Goodwill written off	45,500	

6.60 Cost Book-Keeping

(c) Fines	3,250	
(d) Interest on mortgage	13,000	
(e) Loss on sale of machinery	16,250	
(f) Taxation	1,95,000	
Less: Difference in Valuation of Finished Stock (₹ 1,42,350 – ₹ 1,30,000)	12,350	3,16,225
Net Profit as per Financial Accounts		3,83,500

Working Notes :

- (1) Production overhead is recovered in cost accounts @ 20% of prime cost. Prime Cost is ₹ 35,06,750. Hence, production overhead is ₹ 7,01,350.
- (2) Value of closing WIP has been taken as is given in the financial accounts, i.e., ₹ 97,500.
- (3) Administrative overheads have been recovered @ ₹ 9.75 per finished unit. The amount recovered = 31,000 units × ₹ 9.75 = ₹ 3,02,250.
- (4) Valuation of closing stock of finished goods :
 - (a) Cost of production = ₹ 44,12,850
 - (b) Number of units produced = 31,000 units
 - (c) Number of units in closing stock = 1,000 units
 - (d) Value of closing stock = ₹ 44,12,850 / 31,000 × 1,000 = ₹ 1,42,350.
- (5) Selling and distribution overheads have been recovered @ ₹ 13 per unit sold. Selling and distribution overheads recovered = 30,000 units × ₹ 13 = ₹ 3,90,000.

Illustration 33

The following figures are available from financial accounts for the year ended 31st March, 2005 :

	₹
Direct materials consumption	2,50,000
Direct wages	1,00,000
Factory overheads	3,80,000
Administration overheads	2,50,000
Selling and distribution overheads	4,80,000
Bad debts	20,000
Preliminary expenses (written off)	10,000
Legal charges	5,000
Dividend received	50,000
Interest on deposit received	10,000
Sales (1,20,000 units)	7,00,000
Closing Stock :	
Finishing stock (40,000 units)	1,20,000
Work-in-progress	80,000

The Cost Accounts reveal :

Direct materials consumption ₹ 2,80,000.
 Factory overhead recovered at 20% on Prime Cost.
 Administration overhead at ₹ 3 per unit of production.
 Selling and distribution overhead at ₹ 4 per unit sold.

Required to prepare :

- (i) Costing Profit and Loss Account
- (ii) Financial Profit and Loss Account
- (iii) Statement reconciling the profits disclosed by the Costing Profit and Loss Account and Financial Profit and Loss Account.

Solution

Dr.		(i) Costing Profit and Loss Account for the year ended 31st March, 2005		Cr.
Particulars	₹	Particulars	₹	
To Direct Materials	2,80,000	By Sales	7,00,000	
To Direct Wages	1,00,000	By Net Loss (Balancing figure)	4,22,000	
Prime Cost	3,80,000			
To Factory Overheads (Note 1)	76,000			
	4,56,000			
Less: Closing WIP (Note 2)	80,000			
Works Cost	3,76,000			
To Administration Overheads (Note 3)	4,80,000			
Cost of Production	8,56,000			
Less: Closing Stock of Finished Goods (Note 4)	2,14,000			
Cost of Goods sold	6,42,000			
To Selling and Distribution Overheads (Note 5)	4,80,000			
Cost of Sales	11,22,000			11,22,000

Dr.		(ii) Financial Profit and Loss Account for the year ended 31st March, 2005		Cr.
Particulars	₹	Particulars	₹	
To Direct Materials Consumed	2,50,000	By Sales (1,20,000 units)	7,00,000	
To Direct Labour	1,00,000	By Closing Stock :		
To Factory Overheads	3,80,000	Finished Goods	1,20,000	
To Administration Overheads	2,50,000	WIP	80,000	
To Selling and Distribution Overheads	4,80,000	By Dividend Received	50,000	
To Bad Debts	20,000	By Interest on Deposit Received	10,000	
To Preliminary Expenses	10,000	By Net Loss (balancing figure)	5,35,000	
To Legal Charges	5,000			
	14,95,000			14,95,000

**Statement Showing the Reconciliation of Profit / Loss
as per Cost and Financial Accounts**

Particulars	₹	₹
Net Loss as per Cost Accounts		4,22,000
Add: Under-recovery of factory overheads (₹ 3,80,000 – ₹ 76,000)	3,04,000	
Add: Items debited in financial accounts only :		
Bad debts	20,000	
Preliminary expenses	10,000	
Legal charges	<u>5,000</u>	
	35,000	
Add: Over-valuation of closing stock in cost accounts (₹ 2,14,000 – ₹ 1,20,000)	94,000	4,33,000
		8,55,000
Less: Over-valuation of materials consumed (₹ 2,80,000 – ₹ 2,50,000)	30,000	
Over-absorption of administrative overheads (₹ 4,80,000 – ₹ 2,50,000)	2,30,000	
Items credited in financial accounts only :		
Dividend received	50,000	
Interest on deposit	10,000	3,20,000
Net Loss as per Financial Accounts		5,35,000

Working Notes :

- (1) Factory overhead is recovered in cost accounts @ 20% of Prime Cost. Prime Cost is ₹ 3,80,000. Therefore, factory overhead recovered = 20% of ₹ 3,80,000 = ₹ **76,000**.
- (2) Value of closing work-in-progress has been taken as is given in the financial accounts, i.e., ₹ 80,000.
- (3) Administrative overheads is recovered @ ₹ 3 per unit produced. Number of units produced = 1,60,000 (1,20,000 + 40,000). Administrative overhead recovered = 1,60,000 units × ₹ 3 = ₹ **4,80,000**.

6.62 Cost Book-Keeping

- (4) Valuation of Closing Stock of Finished Goods :
- (a) Cost of Production = ₹ 8,56,000
 - (b) Number of units produced = 1,60,000 units
 - (c) Number of units in Closing Stock = 40,000 units
 - (d) Value of Closing Stock = ₹ 8,56,000 / 1,60,000 × 40,000 = ₹ **2,14,000**
- (5) Selling and distribution overhead is recovered @ ₹ 4 per unit sold. Selling and distribution overhead recovered = 1,20,000 units × ₹ 4 = ₹ **4,80,000**.

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 34

Prepare a Reconciliation Statement from the following data :

	₹
Net loss as per Cost Accounts	3,44,800
Works overhead under-recovered in Cost Accounts	6,240
Depreciation over-charged in Cost Accounts	2,600
Administration overheads is under-charged in Financial Accounts	3,400
Interest on Investment	17,500
Goodwill written-off in Financial Accounts	11,400
Income tax paid	80,600

[C.U.B.Com. (General) – 2012]

Solution

Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Net Loss as per Cost Accounts		3,44,800
Add: Works overhead under-recovered in Cost Accounts	6,240	
Goodwill written-off	11,400	
Income tax paid	80,600	98,240
		4,43,040
Less: Depreciation over-charged in Cost Accounts	2,600	
Administration Overheads under-charged in Financial Accounts	3,400	
Interest on Investment	17,500	23,500
Net Loss as per Financial Accounts		4,19,540

Illustration 35

From the following figures, prepare a Reconciliation Statement to determine net profit as per financial books :

	₹
Net Profit as shown in the Cost Books	2,80,000
Depreciation shown excess in Cost Books	4,000
Interest on Investment received	2,000
Provision for Income tax	80,000
Income received from transfer fees	300
Factory Overhead under-recovered in Cost Books	6,000
Office expenses under-recovery in Financial Books	2,000

[C.U.B.Com. (General) – 2015]

Solution

**Statement Showing the Reconciliation of Profit / Loss
as per Cost and Financial Accounts**

Particulars	₹	₹
Net Profit as shown in the Cost Books		2,80,000
Add: Excess Depreciation shown in the Cost Books	4,000	
Interest on Investment received	2,000	
Income received from transfer fees	300	
Office expenses under-recovered in Financial Accounts	2,000	8,300
		2,88,300
Less: Provision for Income Tax	80,000	
Factory Overhead under-recovered in Cash Books	6,000	86,000
Net Profit as per Financial Books		2,02,300

Illustration 36

From the following information, prepare a Reconciliation Statement : (all figures in ₹)

	As per Financial Records	As per Cost Records
Closing Stock	8,610	8,560
Office expenses	10,680	10,000
Factory expenses	24,260	21,000
Depreciation	2,200	1,600
Selling expenses	14,200	15,000
Rent received	5,200	—
Net Profit	40,600	?

[C.U.B.Com. (General) – 2016]

Solution

**Statement Showing the Reconciliation of Profit / Loss
as per Cost and Financial Accounts**

Particulars	₹	₹
Net Profit as shown in the Financial Records		40,600
Add: Office expenses under-recovered in Cost Books (₹ 10,680 – 10,000)	680	
Factory expenses under-recovered in Cost Books (₹ 24,260 – 21,000)	3,260	
Depreciation over-charged in Financial Books	600	4,540
		45,140
Less: Over-valuation of Closing Stock (₹ 8,610 — 8,560)	50	
Selling expenses over-recovered in Cost Books	800	
Rent received	5,200	6,050
Net Profit as per Cost Records		39,090

[For Honours Candidates Only]

Illustration 37

The Trading and profit and Loss Account of ABC Ltd. for the year ended 31.12.2008 were as follows :

Dr.	₹	Cr.	₹
To Purchases	42,000	By Sales	1,43,000
To Direct Wages	20,000	By Closing Stock	2,000
To Manufacturing Overhead	24,000		
To Gross Profit c/d	59,000		
	1,45,000		1,45,000

6.64 Cost Book-Keeping

To Administrative Expenses	10,000	By Gross Profit b/d	59,000
To Selling and Distribution Expenses	16,000		
To Depreciation	2,000		
To Net Profit	31,000		
	59,000		59,000

The following information was available from the Cost Accounts :

- (i) Closing Stock of goods ₹ 4,000
- (ii) Manufacturing overhead was applied @ 150% on direct wages.
- (iii) Administrative, Selling and Distribution expenses were 10% on sales.
- (iv) Depreciation charged ₹ 2,400.

You are required to reconcile the profit of Financial Accounts with that of Cost Accounts.

[C.U.B.Com. (Hons.) – 2009]

Solution

Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Net Profit as per Financial Accounts		31,000
Add: Under-valuation of Closing Stock in Financial Accounts	2,000	
Under-absorption of Administration, Selling and Distribution Overheads in the Cost Accounts (₹ 26,000 – 14,300)	11,700	13,700
		44,700
Less: Over-absorption of manufacturing overheads in Cost Accounts	6,000	
Over-charge of Depreciation in the Cost Accounts	400	6,400
Net Profit as per Cost Accounts		38,300

Illustration 38

From the following figures, prepare a Reconciliation Statement :

	₹
Net Profit as per Cost Accounts	66,760
Net Profit as per Financial Accounts	65,120
Factory Overhead under-recovered in Costing	5,700
Administration Overhead recovered in excess	4,250
Depreciation charged in Financial Accounts	3,660
Depreciation recovered in Costing	3,950
Interest received but not included in Cost Accounts	450
Income Tax provided in Financial Books	230
Stores adjustment (credited in Financial Books)	420
Dividend apportioned in Financial Accounts	860
Loss due to theft provided only in Financial Books	260

[C.U.B.Com. (Hons.) – 2012]

Solution

Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Net Profit as per Financial Accounts		65,120
Add: Factory overhead under-recovered in Cost Accounts	5,700	
Income tax paid provided in Financial Accounts	230	
Dividend apportioned in Financial Accounts	860	
Loss due to theft provided in Financial Accounts only	260	7,050
		72,170

Less: Administration overhead recovered in excess	4,250	
Depreciation over-charged in Cost Accounts (₹ 3,950 – 3,660)	290	
Interest received but not included in Cost Accounts	450	
Stores adjustment (credited in Financial Books)	420	5,410
Net Profit as per Cost Accounts		66,760

Illustration 39

Prepare a Reconciliation Statement from the following information : (all figures in ₹)

	As per financial records	As per cost records
Closing stock	8,160	8,560
Factory expenses	24,260	21,000
Office expenses	10,680	10,000
Selling expenses	14,200	15,000
Depreciation	2,200	1,600
Rent received	5,200	—
Net profit	—	39,540

[C.U.B.Com. (Hons.) – 2013]

Solution

Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Net Profit as per Cost records		39,540
Add: Selling expenses over-absorbed (₹ 15,000 – ₹ 14,200)	800	
Rent received (not considered in cost accounts)	5,200	6,000
		45,540
Less: Over-valuation of closing stock (₹ 8,560 – ₹ 8,160)	400	
Factory expenses under-absorbed (₹ 24,260 – ₹ 21,000)	3,260	
Office expenses under-absorbed (₹ 10,680 – ₹ 10,000)	680	
Undercharge of depreciation (₹ 2,200 – ₹ 1,600)	600	4,940
Net Profit as per Financial records		40,600

Illustration 40

Following is the Trading and Profit and Loss Account of PKB Ltd. for the year ended 31.12.2014 :

Dr. Trading and Profit and Loss Account for the year ended 31.12.2014 Cr.			
Particulars	₹	Particulars	₹
To Materials	90,000	By Sales (4,800 units)	1,92,000
To Wages	66,000	By Closing Stock (1,200 units)	40,800
To Works expenses	48,000		
To Administrative expenses	12,000		
To Net Profit	16,800		
	2,32,800		2,32,800

The company's cost records show that :

- Works overhead have been absorbed at ₹ 7 per unit produced; and,
- Administrative overheads have been absorbed at ₹ 3 per unit produced.

Assuming there is nothing by way of work-in-progress either at the beginning or at the end and there is no opening stock of finished goods, prepare :

- A statement of cost indicating the net profit; and
- A statement reconciling the profit as disclosed by cost accounts and that shown in financial accounts.

[C.U.B.Com. (Hons.) – 2015]

6.66 Cost Book-Keeping

Solution

PKB Ltd. Statement of Cost and Profit as per Cost Accounts

Particulars	₹
Materials	90,000
Wages	66,000
Prime Cost	1,56,000
Works overhead (6,000 × ₹ 7)	42,000
Factory Cost / Works Cost	1,98,000
Administrative overheads (6,000 × ₹ 3)	18,000
Cost of Production (6,000 units)	2,16,000
Less: Closing Stock (Note 1)	43,200
Cost of Goods Sold	1,72,800
Selling and Distribution Overheads	Nil
Cost of Sales	1,72,800
Net Profit (Balancing figure)	19,200
Sales	1,92,000

Working Notes :

(1) Valuation of Closing Stock

- (a) Number of units produced = Number of units sold + Number of units unsold
= 4,800 units + 1,200 units = **6,000 units.**
- (b) Cost of Production = ₹ 2,16,000
- (c) Number of units unsold = **1,200** units
- (d) Value of closing stock = (₹ 2,16,000 ÷ 6,000) × 1,200 = **₹ 43,200.**

Statement Showing the Reconciliation of Profit / Loss as per Cost and Financial Accounts

Particulars	₹	₹
Net Profit as per Financial Accounts		16,800
Add: Under-absorption of works overheads :		
As per financial accounts	48,000	
As per cost accounts	42,000	6,000
Add: Over-valuation of closing stock as per cost accounts :		
As per cost accounts	43,200	
As per financial accounts	40,800	2,400
		25,200
Less: Over-absorption of administrative overheads :		
As per cost accounts	18,000	
As per financial accounts	12,000	6,000
Net Profit as per Cost Accounts		19,200

THEORETICAL QUESTIONS

- What is an integrated accounting system ? (Page 6.1)
- Integrated accounting system are far superior to non-integrated accounting system. Discuss the statement. (Page 6.3)
- What do you mean by non-integrated accounting system ? (Page 6.18)
- What are the benefits of operating control accounts ? (Page 6.5)
- Explain the purpose of the cost ledger control account. (Page 6.19)

[C.U.B.Com (Hons.) – Adapted]

[Delhi University – Adapted]

6. Describe briefly the purpose of the wages control account. (Page 6.20)
7. List the financial expenses which are not included in cost. (Page 6.47)
8. When is the reconciliation statement of cost and financial accounts not required ? (Page 6.1)
[C.A. (PCE) – November, 2009]
9. Indicate the reasons why is it necessary to reconcile cost and financial accounts. What is the accounting procedure to be adopted for their reconciliation ? (Page 6.48)
[C.A. (Inter) – Adapted]
10. What are the reasons for disagreement of profits as per cost accounts and financial accounts ? Discuss. (Page 6.48)
[C.A. (Inter) – May, 2000, 2007]
11. State the essential pre-requisites of integrated accounting system. (Page 6.30)
[C.A. (Inter) – May, 2007]
12. Define integrated accounting system and briefly explain the same highlighting the advantages of the system. (Page 6.1, 6.13)
[I.C.W.A. (Inter) – June, 1995]
13. What do you understand by integrated accounts ? What are the principles on which the system is based? How does computerised environment influence the need for having integrated accounts ? (Page 6.1, 6.12)
[I.C.W.A. (Inter) - June, 2000]
14. State the reasons for the difference between the profits shown in the cost accounts and those shown in the financial accounts of an industrial organisation. (Page 6.48)
[I.C.W.A. (Inter) – June, 1991]
15. Enumerate the principal ledgers that are to be maintained in a system of cost control accounting (briefly mention the contents). (Page 6.19)
[I.C.W.A. (Stage – I) – June, 1998]

PRACTICAL QUESTIONS

Integrated Accounting System

- 6.1 Rex Enterprises operates an integrated system of accounting. You are required to pass the journal entries for the following transactions that took place for the year ended 30th June, 2017.

	₹
Raw materials purchased (50% on credit)	6,00,000
Materials issued to production	4,00,000
Wages paid to workers	2,00,000
Factory overheads incurred	80,000
Factory overheads charged to production	1,00,000
Selling and distribution overheads incurred	40,000
Finished goods at cost	5,00,000
Sale (50% credit)	7,50,000
- 6.2 Journalise the following transactions in the integrated books of accounts :

	₹
(a) Credit purchase	12,00,000
(b) Production wages paid	7,00,000
(c) Stocks issued to production orders	8,00,000
(d) Works expenses charged to production	4,50,000
(e) Finished goods transferred from production orders	18,00,000

6.68 Cost Book-Keeping

(f) Administration expenses charged to production	1,50,000
(g) Works expenses outstanding	1,20,000
(h) Works expenses paid	4,60,000

[C.U.B.Com. (Hons.) – Adapted]

- 6.3 Messers Essbee Ltd. maintains Integrated Account of Cost and Financial Accounts. From the following details write Control Accounts in the General Ledger of the factory and prepare a Trial Balance :

	₹
Share capital	3,00,000
Reserve	2,00,000
Sundry creditors	5,00,000
Plant and machinery	5,75,000
Sundry debtors	2,00,000
Closing Stock	1,50,000
Bank and cash balance	75,000

Transactions during the year were as follows :

Stores purchased	10,00,000
Stores issued to production	10,50,000
Stores in hand	95,000
Direct wages incurred	6,50,000
Direct wages charged to production	6,00,000
Manufacturing expenses incurred	3,00,000
Manufacturing expenses charged to production	2,75,000
Selling and distribution expenses	1,00,000
Finished stock production (at cost)	18,00,000
Sales at selling price	22,00,000
Closing stock	95,000
Payment to Creditors	11,00,000
Receipt from Debtors	21,00,000

[C.U.B.Com. (Hons.) – Adapted]

- 6.4 MHK Ltd. operate an integrated accounting system. At the beginning of the financial period on 1 December, 2016 the following balances are included in the accounts :

	₹
Stock of raw materials	72,000
Work-in-Progress	1,32,000
Finished Goods	82,000

Production overheads are absorbed using pre-determined machine hour rates. Production overheads were budgeted at ₹ 5,00,000 for the period, with machine hours totaling 50,000. MHK Ltd. manufactures a variety of products.

Raw material issues during the six months were as follows :

	₹
From stock to direct production	3,92,000
Other issues from stock to indirect production	15,000
Returns for the same period were :	
From production to stock	4,000
To suppliers as faulty	24,000

Actual sales in the six months were ₹ 18,00,000. Actual machine hours were 44,000 and the following costs were incurred :

Direct labour	4,25,000
Raw materials purchased	4,50,000
Production overheads	4,65,000
General overheads	3,75,000

The following stock valuations have been made at 31 May, 2017

Work-in-Progress	1,80,000
Finished goods	2,52,000

Requirements :

Prepare the following accounts for the six month ended 31 May, 2017 :

- (i) Raw Material Control Account
- (ii) Production Overheads Control Account
- (iii) Work-in-Progress Control Account
- (iv) Finished Goods Control Account
- (v) Profit and Loss Account

6.5 The following incomplete accounts are furnished to you for the month ended 31st October, 2017 :

Stores Control Account

1.10.17 To Balance	54,500

Work-in-Progress Control Account

1.10.17 To Balance	6,000

Finished Goods Control Account

1.10.17 To Balance	75,000

Factory Overheads control Account

Total debits for October, 2017	45,000

Factory Overheads Applied Account

Cost of Goods Sold Account

Creditors for Purchases Account

1.10.17 By Balance	30,000

Additional information :

- (i) The factory overheads are applied by using a budgeted rate based on direct labour hours. The budget for the overheads for 2017 is ₹ 6,75,000 and the budget of direct labour hours is 4,50,000.
- (ii) The balance in the account of creditors for purchases on 31.10.2017 is ₹ 15,000 and the payments made to creditors in October 2017 amount to ₹ 1,05,000.
- (iii) The finished goods inventory as on 31st October, 2017 is ₹ 66,000.
- (iv) The cost of goods sold during the month was ₹ 1,95,000.
- (v) On 31st October, 2017 there was only one unfinished job in the factory. The cost records show that ₹ 3,000 (1,200 direct labour hours) of Direct Labour Cost and ₹ 6,000 of Direct Material Cost had been charged.
- (vi) A total of 28,200 direct labour hours were worked in October 2017. All factory workers earn same rate of pay.
- (vii) All actual factory overheads incurred in October 2017 have been posted.

6.70 Cost Book-Keeping

You are required to find :

- (a) Materials purchased during October 2017.
- (b) Cost of goods completed in October 2017.
- (c) Overheads applied to production in October 2017.
- (d) Balance of work-in-progress on 31st October, 2017.
- (e) Direct materials consumed during October 2017.
- (f) Balance of Stores Control Account on 31st October, 2017.
- (g) Over-absorbed or under-absorbed overheads for October 2017.

Interlocking / Non-integrated Accounting System

- 6.6 Pass journal entries in the cost book (non-integrated system) for the following transactions:
- (i) Materials worth ₹ 25,000 returned to stores from job.
 - (ii) Gross wages paid – ₹ 48,000. Employer's contribution to Provident Fund and ESI amounted to ₹ 2,000.
 - (iii) Wages analysis book detailed : direct labour – ₹ 20,000; indirect labour towards factory – ₹ 12,000; salaries to office staff – ₹ 10,000; salaries to selling and distribution staff – ₹ 8,000.

[D.U.B.Com. (Hons.) – Adapted]

- 6.7 Pass journal entries in the cost books, maintained on non-integrated system for the following :
- (i) Issue of materials : Direct ₹ 5,50,000; Indirect ₹ 1,50,000.
 - (ii) Allocation of wages : Direct ₹ 2,00,000; Indirect ₹ 40,000.
 - (iii) Under / Over absorbed overheads : Factory (over) ₹ 20,000; Administration (under) ₹ 10,000.
- 6.8 How will you transact the following in the material accounts and the stores ledger :
- (a) Material ledger shows 120 units at an average cost of ₹ 10 while the physical count is 110 units, difference due to non-recording of a material requisition note.
 - (b) Physical units show 200 while the ledger balance shows a shortage due to non-receipt of an invoice for 20 units for a total cost of ₹ 100.
 - (c) Ledger balance indicates an excess of 50 units over the physical balance effected by atmospheric changes which are normal. The issue rate is ₹ 3.00 per unit.
 - (d) Physical balance shows a shortage compared to the ledger balance of 10 units traced to have been an effect of excess issue of material to a production job. The issue price is ₹ 2.50 per unit.

[I.C.W.A. (Inter) – Adapted]

- 6.9 After the annual stock taking you come to know of some significant discrepancies between book stock and physical stock. You gather the following information :

Item	Stock Card	Stores Ledger	Physical Check	Cost / Unit
	Units	Units	Units	₹
A	600	600	560	60
B	380	380	385	40
C	750	780	720	10

- (a) What action should be taken to record the information shown above ?
- (b) Suggest reasons for the shortage and discrepancies disclosed above and recommend a possible course of action by management to prevent future losses.

(Your answer should be in points and you need not elaborate.)

[C.A. (Inter) – May, 1991]

- 6.10 The following information for the year ended 31st December, 2016 is obtained from the books and records of a factory :

	Completed Jobs (₹)	WIP (₹)
Raw material supplied from stores	88,000	32,000
Wages	1,00,000	40,000
Chargeable expenses	10,000	4,000
Materials returned to stores	1,000	—

Factory overheads are 80% of wages. Office overheads are 25% of factory cost and selling distribution overheads are 10% of cost of production.

The completed jobs realised ₹ 4,10,000.

Write up :

- (i) Work-in-progress Ledger Control Account;
- (ii) Completed Job Ledger Control Account;
- (iii) Cost of Sales Account.

[D.U.B.Com. (Hons.) – Adapted]

- 6.11 WYZ Limited has separate accounting system for the cost and financial ledgers which are interlocked by means of control accounts in two ledgers. The following information was available for the period :

	₹
Cost of goods sold	13,10,750
Cost of finished goods produced	12,41,500
Direct wages	1,73,400
Direct material issues	5,98,050
Direct material purchases	6,17,300
Production overheads (actual expenditure as per the financial accounts)	3,92,525

At the beginning of the period, the various account balances in the Cost Ledger were :

Account	₹
Work-in-Progress Control	1,25,750
Finished Goods Control	94,500
Direct Material Stores Control	48,250

In the Cost Accounts, additional production depreciation of ₹ 35,000 is charged, and production overheads were over-absorbed by ₹ 63,775 for the period.

Requirements :

Prepare the following Control Accounts in the Cost Ledger showing clearly the double entries between the accounts and the closing balances :

- (i) Work-in-Progress Control Account
- (ii) Direct Material Stores Control Account
- (iii) Finished Goods Control Account
- (iv) Production Overhead Control Account

- 6.12 As of 31st March, 2008, the following balances existed in the firm's cost ledger which maintained separately on double entry basis :

	Debit ₹	Credit ₹
Stores Ledger Control Account	3,00,000	—
Work-in-Progress Control Account	1,50,000	—
Finished Goods Control Account	2,50,000	—
Manufacturing Overhead Control Account	—	15,000
Cost Ledger Control Account	—	6,85,000
	7,00,000	7,00,000

During the next quarter, the following items arose :

	₹
Finished products (at cost)	2,25,000
Manufacturing overhead incurred	85,000
Raw material purchased	1,25,000
Factory wages	40,000
Indirect labour	20,000
Cost of sales	1,75,000

6.72 Cost Book-Keeping

Materials issued to production	1,35,000
Sales returned (at cost)	9,000
Materials returned to suppliers	13,000
Manufacturing overhead charged to production	85,000
You are required to prepare the Cost Ledger Control Account, Stores Ledger Control Account, Work-in-Progress Control Account, Finished Stock Ledger Control Account, Manufacturing Overhead Control Account, Wages Control Account, Cost of Sales Account and the Trial Balance at the end of the quarter.	

[C.A. (PCE) – May, 2008]

- 6.13 ACME Manufacturing Co. Ltd. opens the costing records with the balances as on 1st July, 2017 :

	₹	₹
Material Control Account	1,24,000	—
Work-in-Progress Account	62,500	—
Finished Goods Account	1,24,000	—
Production Overhead Account	8,400	—
Administration Overhead Account	—	12,000
Selling and Distribution Overhead Account	6,250	—
General Ledger Control Account	—	3,13,150
	<u>3,25,150</u>	<u>3,25,150</u>

The following are the transactions for the quarter ended 30th September, 2017 :

	₹
Materials purchased	4,80,100
Materials issued to jobs	4,77,400
Materials to works maintenance	41,200
Materials to administration office	3,400
Materials to selling department	7,200
Wages – direct	1,49,300
Wages – indirect	65,000
Transportation for incoming materials	8,400
Production overheads	2,42,250
Absorbed overheads production	3,59,100
Administration overheads	74,000
Administration allocation to production	52,900
Administration allocation to sales	14,800
Sales overheads	64,200
Sales overheads absorbed	82,000
Finished goods produced	9,58,400
Finished goods sold	9,77,300
Sales realisation	14,43,000

Prepare the various accounts as you envisage in the Cost Ledger and prepare a Trial Balance as at 30th September, 2017.

- 6.14 NLA Limited operates on a non-integrated accounting system. At the end of April, the financial accountant has produced the final accounts, shown below. Based on these accounts and data supplied by the cost accountant, a reconciliation statement has been prepared, also as shown below :

You are required to prepare the following accounts as they would appear in the cost ledger :

(i) Raw material stores; (ii) Work-in-progress; (iii) Finished goods; and (iv) Cost of sales.

Assume that administration, selling and distribution expenses are charged to costs at actuals.

Dr. Manufacturing, Trading and Profit and Loss Account for the month of April, 2016				Cr.	
Particulars	₹	₹	Particulars	₹	
To Raw Materials :			By Cost of Goods manufactured c/d	6,02,000	
Opening Stock	60,500				
Purchases	3,20,000				
	3,80,500				
Closing Stock	65,000	3,15,500			
To Direct Wages		1,25,000			
To Production Overhead		1,60,000			
To Work-in-Progress :					
Opening Stock	36,700				
Closing Stock	35,200	1,500			
		6,02,000			6,02,000
To Finished Goods :			By Sales		10,00,000
Opening Stock	45,600				
Goods manufactured	6,02,000				
	6,47,600				
Closing Stock	47,600	6,00,000			
To Gross Profit c/d		4,00,000			
		10,00,000			10,00,000
To Administration Expenses		1,10,000	By Gross Profit b/d		4,00,000
To Selling and Distribution Expenses		1,50,000	By Discount Received		30,000
To Discount Allowed		50,000			
To Debenture Interest		20,000			
To Net Profit		1,00,000			
		4,30,000			4,30,000

Statement reconciling the profit as per Financial and Cost Accounts :

Particulars	₹	₹	₹
Profit as per Financial Accounts			1,00,000
Difference in stock valuation :			
Add: Raw materials closing stock	750		
Work-in-progress opening stock	900		
Finished goods opening stock	1,300		
closing stock	500	3,450	
Less: Raw materials opening stock	1,100		
Work-in-progress closing stock	500	1,600	1,850
Other items :			
Add: Discount allowed	50,000		
Debenture interest	20,000	70,000	
Less: Discount received		30,000	40,000
Production overhead, over-absorbed			1,41,850
			2,000
Profit as per Cost Accounts			1,39,850

6.74 Cost Book-Keeping

Reconciliation of Profit

- 6.15 In reconciliation between cost and financial accounts one of the areas of differences is different method of stock valuation. State in each of the following circumstances, whether costing profit will be higher or lower than the financial profit.

Items of Stock	Cost Valuation	Financial Valuation
(i) Raw materials (opening)	₹ 50,000	₹ 60,000
(ii) Work-in-progress (closing)	₹ 60,000	₹ 50,000
(iii) Finished stock (closing)	₹ 50,000	₹ 60,000

[D.U.B.Com. (Hons.) – Adapted]

- 6.16 From the following figures prepare a statement reconciling the profits as per the cost accounts and the profits as per the financial accounts.

Net profit as per the financial account	₹ 1,28,755
Net profit as per the cost accounts	1,72,400
Works overheads under-recovered	3,120
Administrative overheads over-recovered	1,700
Depreciation charged in the financial accounts	11,200
Depreciation charged in the cost accounts	12,500
Interest received but not included in the cost accounts	8,000
Loss due to obsolescence charged in the financial accounts	5,700
Income-tax provided in the financial accounts	40,300
Stores adjustment credited in the financial accounts	475
Depreciation of stock charged in the financial accounts	6,750
Bank interest credited in the financial accounts	750

[I.C.W.A. (Inter) – Adapted]

- 6.17 M/s. Rana Traders maintains separate cost books which disclosed a profit of ₹ 60,228 for the year ending March 31, 2004. The net profits disclosed by financial accounts amounted to ₹ 39,520. Upon enquiry, it is found that :

- The company made a provision of ₹ 1,200 for bad debts.
- Overheads charged to production in cost book were ₹ 15,000, whereas actual overhead expenses amounted to ₹ 13,864.
- Directors were paid fee amounting to ₹ 1,500.
- Installations of a new plant involved an expenditure of ₹ 24,000 but it had not got into production as yet. Depreciation @ 5% was provided on the cost of the plant.
- The company received interest on bank deposits amounting to ₹ 56.
- It paid income tax ₹ 18,000.

Prepare a Reconciliation Statement, explaining the difference between the profits revealed by the cost and financial books.

[D.U.B.Com. (Hons.) – 2007]

- 6.18 From the following figures prepare a Memorandum Reconciliation Account :

Net loss as per costing records	₹ 1,72,400
Works overhead under recovered in costing	3,120
Administrative overhead recovered in excess	1,700
Depreciation charged in financial records	11,200
Depreciation recovered in costing	12,500
Interest received not included in costing	8,000
Obsolescence charged (loss) in financial records	5,700
Income-tax provided in financial books	40,300

[C.S. (Inter) – Adapted]

6.19 Prepare Cost Sheet from the following provided by M/s. R.S. Ltd. for the year ending 31st March, 2017:

Office overheads are 20% of Works Cost.
Also prepare a Reconciliation Statement, if factory, office and selling expenses are ₹ 5,000, ₹ 5,000 and ₹ 10,000 respectively, while Closing Stock is valued at ₹ 2,500 in financial books.

6.20 The financial records of Modern Manufacturers Ltd. reveal the following for the year ended 30.6.2017 :

In the costing records, factory overhead is charged at 100% of wages, administration overhead 10% of factory cost and selling and distribution overhead at the rate of ₹ 16 per unit sold. Prepare a statement reconciling the profit as per cost records with the profit as per financial records of the company.

- (i) Sales ₹ 10,00,000 (50,000 units)
- (ii) There was no opening and closing stock of finished units.
- (iii) Direct materials and direct wages cost were ₹ 5,00,000 and ₹ 2,50,000 respectively.
- (iv) Actual factory expenses were ₹ 1,50,000 of which 60% are fixed.
- (v) Actual administrative expenses were ₹ 45,000 which are completely fixed.
- (vi) Actual selling and distribution expenses were ₹ 30,000 of which 40% are fixed.
- (vii) Interest and dividends received ₹ 15,000.

- Find out profit as per financial books for the year ended 31st March, 2017.
- Prepare the cost sheet and ascertain the profit as per cost accounts for the year ended 31st March, 2010 assuming that the indirect expenses are absorbed on the basis of normal production capacity; and
- Prepare a statement reconciling profits shown by financial and cost books.

6.76 Cost Book-Keeping

- 6.22 The following figures have been extracted from the financial accounts of a manufacturing firm for the first year of its operation :

	₹
Direct material consumption	50,00,000
Direct wages	30,00,000
Factory overheads	16,00,000
Administrative overheads	7,00,000
Selling and distribution overheads	9,60,000
Bad debts	80,000
Preliminary expenses written-off	40,000
Legal charges	10,000
Dividends received	1,00,000
Interest received on deposits	20,000
Sales (1,20,000 units)	1,20,00,000
Closing stocks :	
Finished goods (4,000 units)	3,20,000
Work-in-progress	2,40,000

The cost accounts for the same period reveal that the direct material consumption was ₹ 56,00,000. Factory overhead is recovered at 20% on prime cost. Administration overhead is recovered at ₹ 6 per unit of production. Selling and distribution overheads are recovered at ₹ 8 per unit sold.

Prepare the Profit and Loss Accounts both as per financial records and as per cost records. Reconcile the profits as per the two records.

- 6.23 Given below is the Trading and Profit and Loss Account of a company for the year ended 31st March, 2017 :

Particulars	₹	Particulars	₹	₹
To Materials	27,40,000	By Sales (60,000 units)		60,00,000
To Wages	15,10,000	By Stock (2,000 units)		1,60,000
To Factory Expenses	8,30,000	By Work-in-progress :		
To Admn. Expenses	3,82,400	Materials	64,000	
To Selling Expenses	4,50,000	Wages	36,000	
To Preliminary Expenses		Factory expenses	<u>20,000</u>	1,20,000
Written-off	60,000	By Dividend received		18,000
To Net Profit	3,25,600			
	<u>62,98,000</u>			<u>62,98,000</u>

The company manufactures standard units.

In the cost accounts :

- Factory expenses have been allocated to production at 20% of prime cost.
- Administrative expenses at ₹ 6 per unit produced; and
- Selling expenses at ₹ 8 per unit sold.

Prepare the Closing Profit and Loss Account of the company and reconcile the same with the profit disclosed by the financial accounts.

- 6.24 The following figures have been extracted from the cost records of a manufacturing unit :

	₹
Stores : Opening balance	32,000
Purchases of material	1,58,000
Transfer from work-in-progress	80,000

Issues to work-in-progress	1,60,000
Issues to repair and maintenance	20,000
Deficiencies found in stock taking	6,000
Work-in-progress : Opening balance	60,000
Direct wages applied	65,000
Overheads applied	2,40,000
Closing balance of WIP	45,000

Finish products: Entire output is sold at a profit of 10% on actual cost from work-in-progress. Wages incurred ₹ 70,000, overhead incurred ₹ 2,50,000.

Items not included in cost records : Income from investment ₹ 10,000; loss on sale of capital assets ₹ 20,000.

Draw up Stores Control Account, Work-in-progress Control Account, Costing Profit and Loss Account, Profit and Loss Account and Reconciliation Statement.

6.25 From the following information prepare :

(a) Profit and Loss Account

(b) Cost Sheet

(c) Reconciliation Statement

	₹	Units
Sales	2,50,000	20,000
Material	1,00,000	
Wages	50,000	
Factory overheads	45,000	
Administrative overheads	26,000	
Selling and distribution overheads	18,000	
Closing stock : finished goods	15,000	1,230
Work-in-progress :		
Materials	3,000	
Wages	2,000	
Factory overheads	2,000	
Goodwill written-off	20,000	
Interest on capital	2,000	

In costing books, factory overheads is charged at 100% on wages, administrative overheads at 10% of factory cost and selling and distribution overheads at the rate of ₹ 1 per unit sold.

[D.U.B.Com. (Hons.) – Adapted]

6.26 The summarized Profit and Loss Account of a company for the year ended 31.3.2002 are given below :

Particulars	₹	Particulars	₹
To Material consumed	44,00,000	By Sales (2,00,000 units)	1,00,00,000
To Wages	24,00,000	By Finished stock C.B. (12,000 units)	5,00,000
To Factory overheads	14,00,000	By Work-in-progress : C.B.	
To Admn. overheads	5,20,000	Materials	1,20,000
To Selling and distri. overheads	4,80,000	Labour	80,000
To Bad debts written off	40,000	Factory overheads	<u>40,000</u>
To Preliminary exp. written off	60,000	By Agricultural Income	32,000
To Net Profit	16,00,000	By Miscellaneous receipts	1,28,000
	<u>1,09,00,000</u>		<u>1,09,00,000</u>

6.78 Cost Book-Keeping

The following additional information is also furnished :

- (i) In cost accounts, factory overheads have been absorbed at 22% of prime cost.
 - (ii) In cost accounts, administration overheads have been absorbed at a flat rate of ₹ 3 per unit.
 - (iii) In cost accounts, selling and distribution overheads have been absorbed at ₹ 2.50 per unit.
 - (iv) Closing WIP valued by the cost department has been incorporated in financial accounts.
 - (v) Valuation of finished goods (CB) has been independently made by the financial accounts branch.
- You are required to prepare the Cost Profit and Loss Account and reconcile the profit as per Cost Profit and Loss Account with profit as per Financial Accounts.

[I.C.W.A. (Stage – I) – June, 2002]

Guide to Answers

Practical Questions

- 6.3. Total of trial balance : ₹ 12,15,000.
- | | | |
|-------------|----------------------------------|----------|
| Balance of: | Stores Control Account | ₹ 95,000 |
| | Finished Goods Control Account | 95,000 |
| | Work-in-Progress Control Account | 1,25,000 |
| | Share Capital Account | 3,00,000 |
| | Reserve Account | 5,15,000 |
| | Sundry Creditors Account | 4,00,000 |
| | Plant and Machinery Account | 5,75,000 |
| | Sundry Debtors Account | 3,00,000 |
- 6.4. Balance of:
- | | |
|----------------------------------|----------|
| Raw Materials Control Account | ₹ 95,000 |
| Work-in-Progress Control Account | 1,80,000 |
| Finished Goods Control Account | 2,52,000 |
| Net Profit | 3,50,000 |
- (Unabsorbed production overhead charged to Profit & Loss Account ₹ 40,000)
- 6.5. (a) Materials purchased during October, 2010 ₹ 90,000;
(b) Cost of goods completed during the month ₹ 1,86,000;
(c) Overhead applied to production ₹ 42,300;
(d) Balance of WIP ₹ 10,800;
(e) Direct materials consumed ₹ 78,000;
(f) Balance of Stores Control Account ₹ 66,000;
(g) Factory overhead under-absorbed ₹ 2,700.
- 6.11. Balance of:
- | | |
|---|------------|
| Work-in-Progress Control Account | ₹ 1,47,000 |
| Direct Materials Stores Control Account | 67,500 |
| Finished Goods Control Account | 25,250 |
- [Note : Production overhead transferred to Work-in-Progress Control Account ₹ 4,91,300 (₹ 3,92,525 + 35,000 + 63,775)]
- 6.12. Balance of:
- | | |
|---------------------------------------|------------------|
| Cost Ledger Control Account | (Cr.) ₹ 9,42,000 |
| Stores Ledger Control Account | (Dr.) 2,77,000 |
| WIP Control Account | (Dr.) 1,85,000 |
| Finished Stock Ledger Control Account | (Dr.) 3,09,000 |
| Cost of Sales | (Dr.) 1,66,000 |
| Overhead Adjustment Account | (Dr.) 5,000 |
- Total of Trial Balance ₹ 9,42,000.

6.13. Balance of :	Materials Control Account	(Dr.)	74,900
	Production Overhead Account	(Dr.)	6,150
	Administration Overhead Account	(Cr.)	2,300
	Selling and Distribution Overhead Account	(Cr.)	4,350
	Work-in-Progress Account	(Dr.)	1,42,800
	Finished Goods Account	(Dr.)	1,05,100
	General Ledger Adjustment Account	(Cr.)	3,22,300
	Total of Trial Balance ₹ 3,28,950.		
6.14. Balance of :	(i) Raw Material Stores Account	(Dr.)	65,750
	(ii) Work-in-Progress Control Account	(Dr.)	34,700
	(iii) Finished Goods Account	(Dr.)	48,100
	(iv) Cost of Sales ₹ 8,60,150.		
6.15. (i)	Costing Profit will be more by ₹ 10,000. The costing profit will be more because Costing Profit and Loss Account was debited less for opening stock of raw materials than financial accounts.		
(ii)	Costing Profit will be more by ₹ 10,000. The costing profit will be more because the Costing Profit and Loss Account was credited more for closing stock of WIP than financial accounts.		
(iii)	Costing Profit will be less by ₹ 10,000. The costing profit will be less because the Costing Profit and Loss Account was credited less for closing stock of finished stock than financial accounts.		
6.16. Taking profit as per Cost Accounts			1,72,400
Add: ₹ 1,700 + ₹ 1,300 + ₹ 8,000 + ₹ 475 + ₹ 750			<u>12,225</u>
			1,84,625
Less: ₹ 3,120 + ₹ 5,700 + ₹ 40,300 + ₹ 6,750			<u>55,870</u>
Profit as per Financial Accounts			<u>1,28,755</u>
6.17. Taking Profit as per Cost Book			60,228
Add: ₹ 1,136 (₹ 15,000 – ₹ 13,864) + ₹ 56			<u>1,192</u>
			61,420
Less: ₹ 1,200 + ₹ 2,500 + ₹ 1,200 + ₹ 18,000			<u>21,900</u>
Profit as per Financial Accounts			<u>39,520</u>
6.18. Net Loss as per Financial Accounts ₹ 2,08,045.			
Debit : ₹ 3,120, ₹ 40,300, ₹ 800, ₹ 150, ₹ 1,400, ₹ 2,400, ₹ 5,700.			
Credit : ₹ 1,700, ₹ 1,300; ₹ 8,000, ₹ 750, ₹ 475, ₹ 6,000.			
6.19. Prime Cost ₹ 24,000; Works Cost ₹ 28,500; Cost of Production ₹ 34,200; Cost of Goods Sold ₹ 32,000;			
Profit as per Cost Accounts ₹ 24,000.			
Profit as per Financial Accounts ₹ 22,500.			₹
6.20. Profit as per Financial Accounts			1,76,000
Profit as per Cost Accounts			4,80,000
Taking Cost Accounts Profit			4,80,000
Add: ₹ 80,000 + ₹ 32,000 + ₹ 43,200			<u>1,55,200</u>
			6,35,200
Less: ₹ 1,07,200 + ₹ 3,20,000 + ₹ 32,000			<u>4,59,200</u>
Profit as per Financial Accounts			<u>1,76,000</u>
6.21. Profit as per Financial Accounts ₹ 40,000. Profit as per Cost Accounts ₹ 49,500.			
Prime Cost ₹ 7,50,000. Works' Cost ₹ 8,85,000. Cost of Production ₹ 9,22,500.			
Cost of Sales ₹ 9,50,000.			

6.80 Cost Book-Keeping

Reconciliation :		₹
Taking Profit as per Cost Accounts		49,500
Add: Interest & Dividend		<u>15,000</u>
		64,500
Less: ₹ 15,000 + ₹ 7,500 + ₹ 2,000		<u>24,500</u>
Profit as per Cost Accounts		<u>40,000</u>
6.22. Profit as per Cost Accounts ₹ 5,65,160; Prime Cost ₹ 86,00,000; Works Cost ₹ 1,00,80,000; Cost of Production ₹ 1,08,24,000; Cost of Sales ₹ 1,14,34,840. Profit as per Financial Accounts ₹ 12,90,000.		
Reconciliation :		₹
Taking Profit as per Cost Account		5,65,160
Add: ₹ 6,00,000 + ₹ 1,20,000 + ₹ 44,000 + ₹ 1,00,000 + ₹ 20,000		<u>8,84,000</u>
		14,49,160
Less: ₹ 80,000 + ₹ 40,000 + ₹ 10,000 + ₹ 29,160		<u>1,59,160</u>
Profit as per Financial Accounts		<u>12,90,000</u>
6.23. Profit as per Cost Accounts ₹ 3,40,646.		
Reconciliation:		₹
Taking Profit as per Financial Accounts		3,25,600
Add: ₹ 60,000 + ₹ 10,400 + ₹ 12,646		<u>83,046</u>
		4,08,646
Less: ₹ 18,000 + ₹ 20,000 + ₹ 30,000		<u>68,000</u>
Profit as per Cost Accounts		<u>3,40,646</u>
6.24. Profit as per Cost Accounts ₹ 4,000. Loss as per Financial Accounts ₹ 11,000.		
Reconciliation:		₹
Taking Profit as per Cost Accounts		4,000
Add: Income from investment		<u>10,000</u>
		14,000
Less: ₹ 5,000 + ₹ 20,000		<u>25,000</u>
Loss as per Financial Accounts		<u>11,000</u>
6.25. Net Profit as per Financial Accounts ₹ 11,000. Net Profit as per Cost Accounts ₹ 30,000. (Prime Cost ₹ 1,50,000; Works Cost ₹ 1,93,000; Cost of Production ₹ 2,12,300; Cost of Sales ₹ 2,20,000)		
Reconciliation:		
Taking Profit as per Cost Accounts		30,000
Add: ₹ 5,000 + ₹ 2,000 + ₹ 2,700		<u>9,700</u>
		39,700
Less: ₹ 6,700 + ₹ 20,000 + ₹ 2,000		<u>28,700</u>
Profit as per Financial Accounts		<u>11,000</u>
Closing Stock of Work-in-Progress ₹ 7,000. Value of Closing Stock of Finished Goods ₹ 12,300.		
6.26. Net Profit as per Cost Accounts ₹ 13,00,000. Value of Closing Stock of Finished Goods ₹ 4,92,000.		
Reconciliation:		₹
Taking Profit as per Cost Accounts		13,00,000
Add: ₹ 32,000 + ₹ 1,28,000 + ₹ 96,000 + ₹ 1,16,000 + ₹ 20,000 + ₹ 8,000		<u>4,00,000</u>
		17,00,000
Less: ₹ 40,000 + ₹ 60,000		<u>1,00,000</u>
Profit as per Financial Accounts		<u>16,00,000</u>

Job Costing and Batch Costing

Introduction

Some manufacturing companies produce one or more standardized products for sale or stocking. The product specification and production procedures are same. For example, 'SONY' manufactures different models of TV using standardized parts and components for their stock. These TVs are sold in the market as per the demand of the customers.

There are many organisations which are producing products or providing services as per the requirement of the customers. They engage in production only when they *receive an order from a customer* with specifications. **For example**, BHEL (Bharat Heavy Electrical Ltd.) supplies stream turbines, generators, boilers and matching auxiliaries as per the requirements of the power generating companies like NTPC, CESC, etc. Generally, no two orders are same, nor do all orders follow same production procedures. However, in many cases customers give repeat orders for the same product. For the purpose of calculation of cost and control of cost, cost information is accumulated for each job / order separately. The costing system which provides information in this way is called **Job Costing System**. Job costing is used where the cost of separate job is wanted. The important condition for use of job costing is that individual job be separately identified in operating departments.

Meaning of Job Costing

Job costing is a method of costing that accumulate costs and assigns them to specific job. The different jobs consume different resources (material, labour, expenses) of the organisation in different quantity, the best way to determine the cost of a product or service is to accumulate costs for a job or batch. Cost per unit is calculated by dividing total job costs by the number of units produced in that batch or order. In this connection, it should be noted that an unit, a lot or a batch, an order for a product may be taken as a cost unit.

Kohler defines 'job order costing' as follows :

"... a method of cost accounting whereby cost is compiled for a specific quantity of product, equipment, repairs or other services that moves through the production process as a continuously identifiable unit, applicable material, direct labour, direct expenses and usually a calculated portion of overhead being charged to a job order; distinguished from process costing."

CIMA (U.K.) has defined 'job costing' as "The category of basic costing methods which is applicable where the work consists of separate contracts, jobs or batches, each of which is authorised by specific order or contract."

Features of Job Costing

The following are the main features of job costing :

1. Cost information is accumulated for each job / order separately.
2. No two jobs are same, nor do all jobs follow the same production procedures.
3. Production is started after receiving order(s) from the customers.
4. The job is executed as per the specification of the customer and according to their schedule.
5. Most of the costs are direct in nature. However, production overhead is charged to job as per the policy of the company.
6. Each job / order is treated as a cost unit.

7.2 Job Costing and Batch Costing

7. Profit / loss is calculated for each job separately after completion.
8. Cost data are used in future for the purpose of quotation for new job(s).
9. Raw materials, parts and components are purchased on the basis of the job undertaken.
10. Proportion of labour cost as compared to total cost, is higher as jobs are not standardised and automatic machines cannot be used in majority cases.

Advantages of Job Costing

The following are the advantages of job costing :

1. Calculation of cost and determination of profit and loss for each job is easier because most of the costs are direct in nature.
2. Materials are purchased as per the requirement of the job. Therefore, the chance of obsolescence of materials is very less.
3. Proper job costing system facilitates to estimate the cost of similar job(s) in future.
4. Requirement for materials is calculated after in depth study of the drawings and design sheet. Therefore, the chance of wastage of material is very less.
5. The comparison of estimated cost with the actual cost of the job will help to identify the grey areas, which in turn will help the organisation to improve the profitability.
6. Availability of periodic cost data helps the organisation to monitor the cost of the job on regular basis.
7. Cost data of the previously executed jobs will help the organisation to quote right price for winning the bid.
8. Job costing is suitable for determining price in case of cost-plus contract / job.

Limitations of Job Costing

The following are the limitations of job costing :

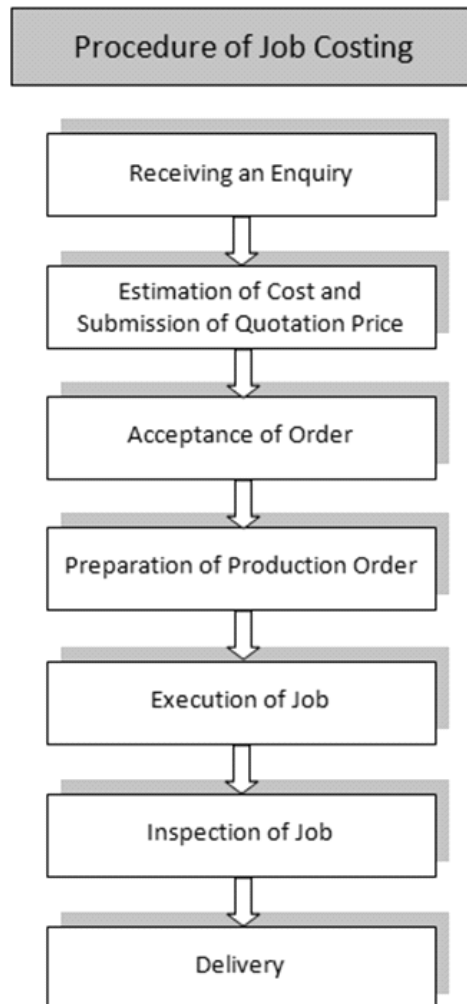
1. Under inflationary situation, cost comparison may not be fruitful.
2. Each and every job is separate. Therefore, standardisation is not possible. It also affects the efficiency of the workers.
3. Job costing is expensive and it is not suitable for small organisations.
4. Change in production technique and technology may lead to obsolescence of costly equipments and machinery.
5. Under dynamic market conditions, previous cost data may not be useful for quoting any similar job(s).

The terms 'job costing', 'batch costing', 'specific order costing', 'job lot costing' are often used as synonyms for job order costing. Anthony (Management Accounting) make the distinctions : A pure job costing system is one in which the costs are collected for each individual job worked on. A 'job' may mean one unit of product (e.g., a turbine or a house), or it may mean many units of identical or similar products covered by a single production order, e.g., books or shirts. When the job consists of more than one unit of product, the system is often called 'Job lot costing' or simply 'Lot costing'.

Users of Job / Batch Costing

The following industries use job / batch costing for calculating cost of output :

1. Printing press;
2. Film producing companies;
3. Accounting firms and Law firms;
4. Toys manufacturing companies;
5. Advertising agencies;
6. Consulting firms;
7. Medical clinics;
8. Ship building companies; e.g., Garden Reach Shipbuilding Co. Ltd.;
9. Custom-made equipment manufacturing company, e.g., BHEL;



[Fig. 8.1]

Job Order Number

As soon as an order is accepted, the production planning department assigns a number to each job, which is called the **Job Order Number**. All expenses (such as material, labour and overhead) for that job are booked on the basis of this number, e.g., when materials are issued for the job, 'job number' is placed on each material requisition.

Job Order Sheet

The cost of each job is recorded in a summary sheet called a **Job Order Cost Sheet** or simply a **Cost Sheet**. This cost sheet is designed to collect the cost of materials, labour and production overhead consumed in completing the job. There is no standard format for Cost Sheet. Cost Sheet differs in form, contents and arrangement. It is designed according to the need of the organisation.

7.4 Job Costing and Batch Costing

A *standard format* is given below :

Cost Sheet for the year ...

Direct materials consumed	***
Direct labour	***
Direct expenses	***
Prime Cost	***
Factory overhead (say, 20% of the prime cost)	***
Factory Cost / Works Cost	***
Add: Opening stock of W.I.P.	***
Less: Closing stock of W.I.P.	***
Works Cost of Finished Goods	***
Administrative overhead (say 10% of works cost)	***
Cost of Production	***
Add: Opening stock of finished goods	***
Less: Closing stock of finished goods	***
Cost of Goods Sold	***
Selling and Distribution overhead (say Rs 5 per unit sold)	***
Cost of Sales	***
Profit	***
Sales	***

Students should remember the following points :

(1) Production Equation (in units) for Finished Goods :

Opening stock + Production = Sales + Closing stock

In an examination question, one of the figures may be missing.

(2) Factory and administrative overheads are based on number of units produced, whereas selling and distribution overheads are based on number of units sold.

Elements of Cost

In the preparation of a Cost Sheet, it is necessary to identify all the costs of manufacturing goods. The costs of manufacturing a product consist of three major elements :

(a) Materials; (b) Labour; and (c) Expenses.

(a) Materials : Materials are classified as Direct Materials and Indirect Materials.

Direct Materials are those which can be identified with the product, i.e., these are directly traceable to an article being manufactured. **For examples**, wood, screws etc. in a furniture factory.

Indirect Materials are those which do not form a part of the finished product but necessary for production. For examples, sandpaper used in furniture factory for smoothing surfaces.

Here, we discuss the nature of few materials. These are (i) Raw materials; (ii) Packing materials; (iii) Consumable materials; and (vi) Maintenance materials.

(i) Raw Materials : The term, raw material, is referred to a material that has to be further worked upon for converting into a finished product. The raw materials used in production are treated as Direct Materials.

(ii) Packing Materials : Primary packing materials are treated as *Direct Materials* whereas secondary packing materials are treated as *Indirect Materials*. Examples of primary packing materials are — bottles and plastic containers, tins, product labels, etc. **Examples** of secondary packing materials are — wooden cases, binding wire, string, etc.

(iii) Consumable Materials : These are treated as *Indirect Materials*. **Examples** will include cotton waste, grease, lubricating oil, etc.

(iv) Maintenance Materials : These are required for keeping plant and machinery in working condition. **Examples** will include gears, bushes and bearings etc. These are treated as *Indirect Materials*.

(b) Labour : Labour is also classified as Direct Labour and Indirect Labour.

Direct Labour is the remuneration paid to production workers who are directly associated with the manufacturing of particular articles.

Indirect Labour is the remuneration paid to those workers who are not involved in the actual manufacturing of the product. **Examples** will include the remuneration of supervisors, works manager; security staff, etc.

(c) Expenses : Expenses are also classified as Direct Expenses and Indirect Expenses.

Direct Expenses are those which can be directly identified with a particular product other than direct materials and direct labour. **Examples** are hire charges of special plant; royalties paid on production, etc.

Indirect Expenses are those which cannot be identified with the product such as rent, rates and taxes, etc.

In cost accounting, the aggregate of direct materials, direct labour and direct expenses are called **prime cost**.

$$\text{Prime Cost} = \text{Direct Material} + \text{Direct Labour} + \text{Direct Expenses}$$

The aggregate of indirect materials, indirect labour and indirect expenses are known as **overhead**.

$$\text{Overhead} = \text{Indirect Materials} + \text{Indirect Labour} + \text{Indirect Expenses}$$

Therefore, overhead is the cost of the facilities surrounding production, which do not, however, directly become part of the product.

From the above, we can conclude: **Total Cost = Prime Cost + Overhead.**

Cost Accounting Procedures

The details of cost accounting procedures have been discussed in Chapter 7 : 'Cost Book-keeping'. We will be discussing some of the accounting entries here.

Recording of Purchase of Materials

Accounting entries for purchases of materials will vary to some extent from those studied in 'Financial Accounting'.

In this case, 'Materials Control Account' is debited in place of 'Purchase Account' and credit is made to Accounts Payable / Bank (in case of cash purchases).

It is to be noted that each material purchased is also entered in the individual materials ledger card of the 'Stores Ledger'. A separate card is used for each material.

Journal Entries (Materials)

(i) When materials are purchased on credit / cash

Materials Control Account	Dr.	[Total Amount]
To Accounts Payable Account		[Credit Purchase]
To Cash / Bank Account		[Cash Purchase]

(ii) When materials are returned to suppliers

Accounts Payable Account	Dr.
To Materials Control Account	

(iii) When 'direct materials' are issued for production

Work-in-Progress Account	Dr.
To Materials Control Account	

(iv) When 'indirect materials' are issued

Factory Overhead Control Account	Dr.
To Materials Control Account	

7.6 Job Costing and Batch Costing

Journal Entries (Labour)

Accounting for labour may be divided into two :

- (a) Collection of payroll data, computation of earnings of each worker and payment of wages.
- (b) Distribution and allocation of labour cost to jobs and departments, etc.

A full explanation of labour costing and payroll accounting has been discussed in Chapter 4 : 'Accounting for Labour'.

(a) When wages are paid

Wages Control Account	Dr.	[Total amount]
To Bank / Cash Account		[Net amount paid]
To Tax Deducted at Source Account		[TDS]

(b) When direct wages are charged to Jobs

Work-in-Progress Account	Dr.	[Direct wages]
To Wages Control Account		

(c) When indirect wages are allocated

Factory Overhead Control Account	Dr.	
To Wages Control Account		

Journal Entries (Factory overhead)

(a) When factory overhead is recovered / charged to Jobs

Work-in-Progress Account	Dr.	
To Factory Overhead Control Account		

(b) Under / Over-absorbed factory overhead is transferred to Costing Profit and Loss Account

Journal Entries (Jobs completed)

When jobs are completed, cost sheets are closed. Completion of a job results in finished goods. The entry will be:

Finished Goods Account	Dr.	
To Work-in-Progress Account		

Journal Entries (Jobs Delivered)

When finished goods are delivered to customers, sales invoices are prepared and the following entry is passed:

Customers Account	Dr.	
To Sales Account		

Each delivery requires a debit to Cost of Goods Sold Account and credited to Finished Goods Account.

Illustration 1

Prepare cost sheet from the following particulars of Aruna Industries Ltd. for the year ending 31st March, 2005:

Raw materials	₹ 15,000
Direct labour	₹ 9,000
Machine hours	900
Machine hour rate	₹ 5
Production	17,100 units
Sales	16,000 units
Selling price per unit	₹ 4
Selling overhead per unit	50 paise
Office overhead are 20% of works cost.	

[D.U.B.Com. (Hons.) – 2007]

Solution

Aruna Industries Ltd.
Cost Sheet for the year ending 31st March, 2005

[Production : 17,100 units]

Particulars	Note	Total (₹)	Per unit (₹)
Direct materials		15,000	
Direct labour		9,000	
Prime Cost		24,000	1.40
Factory overhead	(1)	4,500	0.27
Factory Cost / Works Cost		28,500	1.67
Office overhead (20% of works cost)		5,700	0.33
Cost of Production		34,200	2.00
Less: Closing stock of finished goods (11,000 units × ₹ 2)		(2,200)	
Cost of Goods Sold		32,000	2.00
Selling and Distribution overhead (16,000 units × 0.50)		8,000	0.50
Cost of Sales		40,000	2.50
Profit (Balancing figure)		24,000	1.50
Sales	(2)	64,000	4.00

Working Notes :(1) Factory overhead = Machine hours × machine hour rate = 900 × ₹ 5 = ₹ **4,500**(2) Total Sales = 16,000 units × ₹ 4 = ₹ **64,000****Illustration 2**

Tirupati Electronics Ltd. produces a standard product and provides you the following information for the year ending 31st March, 2017 :

₹

Raw materials :

Opening stock 10,000

Purchases 85,000

Closing stock 4,000

Direct wages 20,000

Other direct expenses 10,000

Factory overheads 10% of direct wages

Office overheads 10% of works cost

Selling expenses ₹ 2 per unit sold

Finished goods :

Opening stock 1,000 units (₹ 16,000)

Produced during the year 10,000 units

Closing stock 2,000 units

Prepare cost sheet for the year ending 31st March, 2017. Also ascertain the selling price per unit so as to yield a profit of 20% on the selling price.

[D.U.B.Com. (Hons.) – Adapted]

Solution

Tirupati Electronics Ltd
Cost Sheet for the year ending 31st March, 2017

[Production : 10,000 units]

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	91,000	
Direct wages		20,000	
Other direct expenses		10,000	
Prime Cost		1,21,000	12.10

7.8 Job Costing and Batch Costing

Factory overheads (100% of direct wages)		20,000	2.00
	Factory Cost / Works Cost	1,41,000	14.10
Office overheads (10% of works cost)		14,100	1.41
	Cost of Production	1,55,100	15.51
Add: Opening Stock of finished goods (1,000 units)		16,000	
Less: Closing Stock of finished goods (2,000 units × ₹ 15.51)	(2)	(31,020)	
	Cost of Goods Sold	1,40,080	15.56
Selling Expenses (9,000 units × ₹ 2)		18,000	2.00
	Cost of Sales	1,58,080	17.56
	Profit	39,520	4.39
	Sales	1,97,600	21.95

Working Notes :

- (1) **Raw materials consumed,** ₹
- | | |
|--------------------------------|---------------|
| Opening stock of raw materials | 10,000 |
| Add: Purchases | <u>85,000</u> |
| | 95,000 |
| Less: Closing stock | <u>4,000</u> |
| | <u>91,000</u> |
- (2) Number of units sold = Opening balance + Production – Closing balance
= 1,000 units + 10,000 units – 2,000 units = 9,000 units
Cost of goods sold = 1,40,080 ÷ 9,000 units = ₹ 15.5644
Cost of Production per unit = ₹ 1,55,100 ÷ 10,000 units = ₹ 15.51
- (3) Profit = 20% of selling price or 25% of cost of sales = 25% of ₹ 1,58,080 = ₹ 39,520.

Illustration 3

From the following information, prepare cost sheet and find out the amount of profit :

	₹
Raw materials purchased	24,000
Direct labour	6,000
Works overhead	14,000
Stock on 1st January, 2017 :	
Raw materials	4,000
Finished goods (800 quintals)	3,200
Work-in-Progress :	
1st January, 2017	960
31st January, 2017	3,200
Office and administrative overheads	1,600
Sales (finished goods)	60,000

Advertising, discount allowed and selling cost is ₹ 0.40 per quintal. During the month, 12,800 quintals of the commodity were produced.

[D.U.B.Com. (Hons.) – Adapted]

Solution	Cost Sheet for the month of January, 2017	[Production : 12,800 quintals]	
Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	28,000	
Direct labour		6,000	
Prime Cost		34,000	2.66

Works overheads		14,000	1.09
	Factory Cost / Works Cost	48,000	3.75
Add: Opening Stock of W.I.P.		960	
Less: Closing Stock of W.I.P.		(3,200)	
	Works Cost of Finished Goods	45,760	3.575
Office and administrative overheads		1,600	0.125
	Cost of Production	47,360	3.70
Add: Opening Stock of finished goods		3,200	
Less: Closing stock of finished goods		Nil	
	Cost of Goods Sold	50,560	3.72
Selling and Distribution Overhead (13,600 quintals × 0.40)		5,440	0.40
	Cost of Sales	56,000	4.12
	Profit (Balancing figure)	4,000	.29
	Sales (given)	60,000	4.41

Working Notes :

(1) Raw materials consumed

	₹
Opening stock of raw materials	4,000
Add: Purchases	<u>24,000</u>
	<u>28,000</u>

- (2) Total Sales = Opening Quantity + Production – Closing Quantity**
= 800 quintals + 12,800 quintals – Nil = 13,600 quintals
Cost of goods sold per quintal = ₹ 50,560 ÷ 13,600 = ₹ **3.7176**

Illustration 4

A company manufactures to customer order and operates a job costing system. Job X–3 remained incomplete at the end of April with the following production costs incurred :

Prime Costs :	₹ 4,360
Overheads :	₹ 2,890

The company worked on two jobs in May, Prime Cost incurred were :	Job X–3	Job X–4
	(₹)	(₹)
Direct materials issued from stores	1,660	8,240
Direct materials returned to stores	Nil	(470)
Direct materials transferred between two jobs	(180)	180
Direct labour	720	3,690

Direct labour is paid at a rate of ₹ 9.00 per hour. Production overheads are absorbed at a rate of ₹ 17.50 per direct labour hour. 10% of the total production cost of each job is added in order to recover general administration costs. Job X–3 was completed in May and the customer paid the agreed sum of ₹ 13,400.

You are required to :

- Prepare a Profit Statement for Job X–3
- Calculate the value of work-in-progress for Job X–4 at the end of May.

Solution

(i) Profit Statement – Job X–3

Particulars	(₹)	(₹)
Sales Revenue		13,400
Less: Production Costs :		
Prime Costs (Note 1)	6,560	
Overheads (Note 2)	4,290	10,850
Gross Profit		2,550
Less: General administration costs (10% of ₹ 10,850)		1,085
Net Profit		1,465

7.10 Job Costing and Batch Costing

(ii) Work-in-Progress Valuation of Job X-4

Particulars	(₹)
Prime Costs (Note 3)	11,640
Production Overheads (Note 4)	7,175
	<u>18,815</u>

Working Notes :

(1) Calculation of total prime cost of Job X-3

	₹
Prime costs incurred in April	4,360
Add: Direct materials issued in May	1,660
Add: Direct labour paid in May	<u>720</u>
	6,740
Less: Materials transferred to Job X-4	<u>(180)</u>
	<u>6,560</u>

(2) Calculation of Total Production Overheads Absorbed

	₹
Production overheads absorbed in April	2,890
Add: Production overheads absorbed in May $[(₹ 720 / 9) \times ₹ 17.50]$	<u>1,400</u>
	<u>4,290</u>

(3) Calculation of Prime Costs of Job X-4

	₹
Direct materials issued from stores	8,240
Add: Direct materials transferred from Job X-3	<u>180</u>
	8,420
Less: Direct materials returned to stores	<u>(470)</u>
	7,950
Add: Direct labour	<u>3,690</u>
	<u>11,640</u>

(4) Production overheads absorbed in Job X-4 = $(3,690 / 9) \times ₹ 17.50 = ₹ 7,175$.

Illustration 5

A printing and publishing company has been asked to provide an estimate for the production of 1,00,000 catalogues, of 64 pages (32 sheets of paper) each, for a potential customer.

Four operations are involved :

(i) Photography; (ii) Set-up; (iii) Printing; and (iv) Binding.

Each page of the catalogue requires a separate session. Each session costs ₹ 3,000. Set-up would require a plate to be made for each page of the catalogue. Each plate requires four hours of labour at ₹ 140 per hour and ₹ 700 of materials. Overheads are absorbed on the basis of labour hours at an hourly rate of ₹ 190.

In printing, paper costs ₹ 240 per thousand sheets. Materials loss are expected to be 2% of input. Other printing materials will cost ₹ 140 per 500 catalogues.

1,000 catalogues are printed per hour of machine time. Labour and overhead costs incurred in printing are absorbed at a rate of ₹ 1,240 per machine hour.

Binding costs are recovered at a rate per machine hour. The rate is ₹ 860 per hour and 2,500 catalogues are bound per hour of machine time.

A profit margin of 10% of selling price is required.

You are required to :

- Determine the total amount that should be quoted for the catalogue job by the company;
- Calculate the additional costs that would be charged to the job if the labour efficiency ratio achieved versus estimate in set-up is 90%.

Solution (a) Statement Showing the Quotation for 1,00,000 Catalogues

Particulars	(₹)	(₹)
1. Photography (64 pages @ ₹ 3,000 per page)		1,92,000
2. Set-up costs :		
Labour (64 plates × 4 hour per plate × ₹ 140 per hour)	35,840	
Materials (64 plates @ ₹ 700 per plate)	44,800	
Overheads (256 labour hours @ ₹ 190)	48,640	1,29,280
3. Printing :		
Materials (Note 1)	8,11,674	
Labour & Overheads (1,00,000 / 1,000 machine hours @ ₹ 1,240)	1,24,000	9,35,674
4. Binding :		
Labour and Overheads (1,00,000 / 2,500 machine hours @ ₹ 860 per hour)		34,400
Total Cost		12,91,354
Profit (10% of selling price or 1/9 of cost)		1,43,484
Selling Price		14,34,838

- (b) Estimated hours : 256
 Actual hours : $256 \div 0.9 = 284.44$ hours
 Additional cost = $(284.44 - 256) \times ₹ (140 + 190) = ₹ 9,387$ (approx.)

Working Note :

(1) Calculation of material cost for printing

	₹
Paper [1,00,000 catalogues × 32 sheets × (240 ÷ 1,000)] ÷ 0.98	7,83,674
Other materials (1,00,000 / 500) × ₹ 140	28,000
	<u>8,11,674</u>

Illustration 6

Honesty Engineering Works has a machine shop in which it manufactures two auto parts P1 and P2 out of forgings F1 and F2.

For the quarter ending December, 2017 following cost data are available :

Consumption of Raw Materials :

	₹
F1	1,50,000
F2	2,00,000
Wages and Salaries	1,53,000
Stores and Spares	12,000
Repairs and Maintenance	15,000
Power	16,000
Insurance	8,000
Depreciation	50,000
Factory Overheads	68,000
Administrative Overheads	64,400
Distribution Overheads	75,000
Total Cost	<u>8,11,400</u>

You are given following further information :

- (i) Production and Sale of P1 and P2 were as under :
- | | P1 | P2 |
|--------------------------|----------|----------|
| Production (pieces) | 6,000 | 4,000 |
| Sale of above pieces (₹) | 4,80,000 | 5,20,000 |
- (ii) Direct wages paid were ₹ 36,000 in case of P1 and ₹ 32,000 for P2. This basis is used for apportioning wages and salaries and factory overheads.
- (iii) Machine hours were utilised in production of these products : P1 = 550; P2 = 450.
- (iv) Stores and spares, repairs and maintenance, power, insurance and depreciation are charged to cost of both the products on the basis of machine hours used.

7.12 Job Costing and Batch Costing

- (v) Administrative overheads are apportioned on the basis of respective conversion costs while distribution overheads on the basis of their sales realisations.

(vi) All the production was sold out.

Required : Prepare cost sheets of both the production and work out profit earned on each of them.

[I.C.W.A. (Inter) – Adapted]

Solution

Honesty Engineering Works

Cost Sheet for Products – P1 and P2 for the quarter ending 2017

Particulars	Basis of Apportionment	Total (₹)	P1 (₹)	P2 (₹)
Raw materials consumed	Direct	3,50,000	1,50,000	2,00,000
Wages and salaries (Note 1a)	Direct Wages	1,53,000	81,000	72,000
Stores and spares (Note 2a)	Machine hour	12,000	6,600	5,400
Repairs and maintenance (Note 2b)	"	15,000	8,250	6,750
Power (Note 2c)	"	16,000	8,800	7,200
Insurance (Note 2d)	"	8,000	4,400	3,600
Depreciation (Note 2e)	"	50,000	27,500	22,500
Factory overheads (Note 1b)	Direct Wages	68,000	36,000	32,000
Administrative overheads (Note 3c)	Conversion Cost	64,400	34,510	29,890
Distribution overheads	Sale Value	75,000	36,000	39,000
Total Cost of Sales	(A)	8,11,400	3,93,060	4,18,340
Sales Revenue	(B)	10,00,000	4,80,000	5,20,000
Profits (B – A)		1,88,600	86,940	1,01,660

Note : For lack of information 'Cost Sheet' could not be presented in the usual format.

Working Notes :

- Wages and salaries as well as factory overheads are to be apportioned in the ratio of direct wages, i.e., ₹ 36,000 : ₹ 32,000 or 9 : 8.
 - Wages and Salaries will be apportioned as follows :**
 $P1 = ₹ 1,53,000 / 17 \times 9 = ₹ 81,000$
 $P2 = ₹ 1,53,000 / 17 \times 8 = ₹ 72,000$
 - Factory overheads will be apportioned as follows :**
 $P1 : ₹ 68,000 / 17 \times 9 = ₹ 36,000$
 $P2 : ₹ 68,000 / 17 \times 8 = ₹ 32,000$
- Ratio of machine hours used by P1 and P2 = 550 : 450 = 11 : 9
 - Stores and spares will be apportioned as follows :**
 $P1 : ₹ 12,000 / 20 \times 11 = ₹ 6,600$
 $P2 : ₹ 12,000 / 20 \times 9 = ₹ 5,400$
 - Repairs and maintenance will be apportioned as follows :**
 $P1 : ₹ 15,000 / 20 \times 11 = ₹ 8,250$
 $P2 : ₹ 15,000 / 20 \times 9 = ₹ 6,750$
 - Power will be apportioned as follows :**
 $P1 : ₹ 16,000 / 20 \times 11 = ₹ 8,800$
 $P2 = ₹ 16,000 / 20 \times 9 = ₹ 7,200$
 - Insurance will be apportioned as follows :**
 $P1 : ₹ 8,000 / 20 \times 11 = ₹ 4,400$
 $P2 : ₹ 8,000 / 20 \times 9 = ₹ 3,600$
 - Depreciation will be apportioned as follows :**
 $P1 : ₹ 50,000 / 20 \times 11 = ₹ 27,500$
 $P2 : ₹ 50,000 / 20 \times 9 = ₹ 22,500$

- (3) Total Conversion Cost = ₹ (1,53,000 + 12,000 + 15,000 + 16,000 + 8,000 + 50,000 + 68,000) = ₹ **3,22,000**
 (a) **Conversion Cost of P1** = ₹ (81,000 + 6,600 + 8,200 + 8,800 + 4,400 + 27,500 + 36,000) = ₹ **1,72,550**
 (b) **Conversion Cost of P2** = ₹ (72,000 + 5,400 + 6,750 + 7,200 + 3,600 + 22,500 + 32,000) = ₹ **1,49,450**
 (c) **Apportionment of administrative overheads:**
 P1 = ₹ 64,400 / 3,22,000 × 1,72,550 = ₹ 34,510
 P2 = ₹ 64,400 / 3,22,000 × 1,49,450 = ₹ 29,890
 Total 64,400
 (4) Distribution overheads will be apportioned in the ratio of sales, i.e., 4,80,000 : 5,20,000 or 12 : 13
 P1 = ₹ 75,000 / 25 × 12 = ₹ 36,000
 P2 = ₹ 75,000 / 25 × 13 = ₹ 39,000

Illustration 7

A manufacturing concern produces standardised electric meters in one of its departments. From the following particulars relating to a job of 50 meters, you are required to determine the value of the work-in-progress and the finished goods.

- (a) Costs incurred as per job card :
- | | |
|------------------|-------|
| | ₹ |
| Direct materials | 7,500 |
| Direct labour | 2,000 |
| Overheads | 6,000 |
- (b) Selling price per meter 450
 (c) Selling and distribution expenses 30% of the sale value
 (d) 25 meters are completed and transferred to the stock of finished goods
 (e) Completion stage of work-in-progress :
- | | |
|------------------|------|
| Direct materials | 100% |
| Direct labour | 60% |
| Overheads | 60% |

[I.C.W.A. (Inter) – Adapted]

Solution

Statement of Equivalent Production

Particulars	Total Units	Equivalent Units			
		Materials		Labour & Overhead	
		%	Units	%	Units
Transferred to finished stock	25	100%	25	100%	25
Work-in-Progress	25	100%	25	60%	15
	50		50		40

Statement of Cost

Elements of Cost	Total Cost (₹)	Equivalent Units	Cost per Unit (₹)
1. Direct material	7,500	50	150
2. Direct labour	2,000	40	50
3. Overhead	6,000	40	150
Total Cost of each Equivalent Unit			350

- (a) **Value of Work-in-Progress** ₹
- | | |
|-------------------------------|--------------|
| Direct materials : 25 × ₹ 150 | 3,750 |
| Direct labour : 15 × ₹ 50 | 750 |
| Overhead : 15 × ₹ 150 | <u>2,250</u> |
| | <u>6,750</u> |

7.14 Job Costing and Batch Costing

(b) Finished goods should be valued at cost or Net Realisable Value (NRV) whichever is lower. In this case:

- (i) Cost per unit of equivalent product ₹ 350
- (ii) NRV:
- | | |
|--|-----------|
| Selling price | 450 |
| Less: 30% Selling expenses | 135 ₹ 315 |
| Therefore, value of finished meters = 25 × ₹ 315 = | ₹ 7,875 |

Illustration 8

From the understated particulars, you are required to prepare a monthly cost sheet of Soap Manufacturers Ltd., showing therein :

(i) Prime Cost; (ii) Works Cost; (iii) Cost of Production; (iv) Cost of Sales; and (v) Profit per unit

Opening Inventory (1-1-2004) :	₹
Raw materials	6,000
Work-in-progress	9,620
Finished goods (1,000 units)	13,680
Closing inventory (31-1-2004) :	
Raw materials	7,000
Work-in-Progress	8,020
Finished goods (use FIFO method)	?
Donations to home for destitute	2,100
Raw materials purchased	72,000
Import duty on raw materials purchased	14,400
Productive wages	18,000
Machine hours worked	21,600 hours
Machine hour rate	₹ 1.50
Chargeable expenses	₹ 2,000
Office and administration expenses	₹ 1 per unit
Selling expenses	₹ 0.90 per unit
Units sold	8,000 units
Units produced	8,200 units
Profit on sale	10%

[D.U.B.Com. (Hons.) – 2005]

Solution

Soap Manufacturers Ltd. Cost Sheet

[Production : 8,200 units]

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	85,400	
Productive wages		18,000	
Chargeable expenses		2,000	
Prime Cost		1,05,400	12.85
Factory overheads	(2)	32,400	
Factory Cost / Works Cost		1,37,800	
Add: Opening stock of W.I.P.		9,620	
Less: Closing stock of W.I.P.		(8,020)	
Works Cost of Finished Goods		1,39,400	17.00
Office and administration expenses (₹ 1 × 8,200 units)		8,200	1.00
Cost of Production		1,47,600	18.00
Add: Opening stock of finished goods		13,680	
Less: Closing stock of finished goods	(3)	(21,600)	

Selling and Distribution overheads (₹ 0.90 × 8,000 units)	Cost of Goods Sold		1,39,680	17.46
			7,200	0.90
	Cost of Sales		1,46,880	18.36
	Profit	(4)	16,320	2.04
	Sales		1,63,200	20.40

Working Notes :

(1) Direct materials consumed

	₹
Opening stock of raw materials	6,000
Add: Purchases	72,000
Add: Import duty on raw materials purchased	14,400
	92,400
Less: Closing stock of raw materials	7,000
	85,400

(2) Factory Overhead = Machine Hours Worked × Machine Hour Rate = 21,600 × ₹ 1.50 = ₹ 32,400

(3) Value of closing stock of finished goods

Closing stock = Opening Stock + Production – Sales = 1,000 units + 8,200 units – 8,000 units = **1,200 units**
 Value of closing stock = Cost of Production × No. of Units in Closing Stock
 = ₹ 18 × 1,200 = ₹ 21,600

(4) Profit = 10% of sales or 1/9 of cost of sales = 1/9 × ₹ 1,46,880 = ₹ 16,320

Illustration 9

ARB Ltd. furnished the following information for the year 2006–07 :

	₹
Stock of raw materials on 1.4.2006	1,00,000
Stock of finished goods on 1.4.2006 (500 tonnes)	8,00,000
Freight paid	2,00,000
Prime cost	44,50,000
Stock of raw materials on 31.3.2007	3,00,000
Stock of finished goods on 31.3.2007 (750 tonnes)	?
Direct labour :	
60 skilled labour @ ₹ 50 per day for 250 days	
200 unskilled labours @ ₹ 30 per day for 250 days	
Indirect wages	40,000
Factory rent, rates and power	30,000
Salary of Managing Director	50,000
Office rent and taxes	1,00,000
Donation	30,000
Advertisement	4,50,000
Income tax	60,000
Depreciation on plant and machinery	35,000
Selling overhead	5,00,000
Packing and distribution expenses	85,990
Fuel	65,000

Other information :

- During the year 2006-07, 2,250 tonnes of finished goods were sold.
- The company valued the closing stock of finished goods under FIFO basis.
- The company maintains profit @ 20% on sales.

On the basis of above-mentioned data, you are required to prepare a detailed cost sheet for the year 2006-07.

7.16 Job Costing and Batch Costing

Solution

ARB Ltd. Cost Sheet for the year 2006–07

[*Production : 2,500 Tonnes]

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	22,00,000	
Direct labour		22,50,000	
Prime Cost		44,50,000	1,780
Factory overheads	(2)	1,70,000	
Factory Cost / Works Cost		46,20,000	1,848
Administrative overheads	(3)	1,50,000	
Cost of Production		47,70,000	1,908
Add: Opening stock of finished goods (500 tonnes)		8,00,000	
Less: Closing stock of finished goods (750 tonnes)	(4)	(14,31,000)	
Cost of Goods Sold		41,39,000	1,840
Selling and Distribution overheads	(5)	10,35,990	
Cost of Sales		51,74,990	2,300
Profit	(6)	12,93,748	575
Sales		64,68,738	2,875

*Production = Sales + Closing Stock – Opening Stock
= 2,250 tonnes + 750 tonnes – 500 tonnes = 2,500 tonnes

Working Notes :

(1) Calculation of raw materials consumed

	₹
Prime cost (given)	44,50,000
Less: Labour cost :	
Skilled labour (60 × 50 × 250)	7,50,000
Unskilled labour (200 × 30 × 250)	15,00,000
Raw materials consumed	22,00,000

Tutorial Note : It is assumed that there is no other direct cost. Freight paid is included in raw materials consumed. Therefore, it is to be ignored. Opening stock of raw materials and closing stock of raw materials are also to be ignored.

(2) Factory overheads

	₹
Indirect wages	40,000
Factory rent, rates and power	30,000
Depreciation on plant and machinery	35,000
Fuel	65,000
Total	1,70,000

(3) Administrative overheads

	₹
Salary of Managing Director	50,000
Office rent and taxes	1,00,000
	1,50,000

(4) Value of closing stock = 750 tonnes × ₹ 1,908 = ₹ 14,31,000

(5) Selling and Distribution overheads

	₹
Advertisement	4,50,000
Selling overheads	5,00,000
Packing and distribution expenses	85,990
	10,35,990

(6) Profit = 20% of Sales or 25% of cost. Therefore, profit = 25% of ₹ 51,74,990 = ₹ 12,93,748.

Tutorial Note : Income tax and donation are purely financial items. These are not part of cost records. So these are to be ignored at the time preparing a cost sheet.

Illustration 10

A firm produces and sells a single output. From the following particulars, prepare a statement showing cost of production and profit or loss assuming that LIFO method is allowed for valuation of closing stock of finished goods :

	1.4.2005 (₹)	31.3.2006 (₹)
Stock of raw materials	50,000	62,500
Work-in-progress	62,500	87,500
Stock of finished goods	90,000 (2,000 units)	? (2,500 units)
	₹	
Raw materials purchased	2,00,000	
Direct labour	1,37,500	
Chargeable expenses	50,000	
Machine hour rate		₹ 20 per hour
Machine hours worked		5,000 hours
Office and administration overhead		₹ 12.00 per unit
Selling and distribution overhead		₹ 7.50 per unit
Sales (12,000 units)		₹ 65.00 per unit

What would be the profit or loss of the firm following FIFO method for valuation of closing stock of finished goods ?

[C.U.B.Com. (Hons.) – 2006]

Solution Cost Sheet for the year ended 31st March, 2006 [*Production : 12,500 units]

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	1,87,500	
Direct labour		1,37,500	
Chargeable expenses		50,000	
Prime Cost		3,75,000	30
Factory overheads (5,000 hours × ₹ 20)		1,00,000	
Factory Cost / Works Cost		4,75,000	38
Add: Opening stock of W.I.P.		62,500	
Less: Closing stock of W.I.P.		(87,500)	
Works Cost of Finished Goods		4,50,000	36
Office and administration overheads (12,500 × ₹ 12)		1,50,000	12
Cost of Production		6,00,000	48
Add: Opening stock of finished goods		90,000	
Less: Closing stock of finished goods	(2)	(1,14,000)	
Cost of Goods Sold		5,76,000	48
Selling and Distribution overheads (12,000 × ₹ 7.50)		90,000	7.50
Cost of Sales		6,66,000	55.50
Profit (Balancing figure)		1,14,000	9.50
Sales	(4)	7,80,000	65.00

$$\begin{aligned}
 * \text{Production} &= \text{Sales} + \text{Closing Stock} - \text{Opening Stock} \\
 &= 12,000 \text{ units} + 2,500 \text{ units} - 2,000 \text{ units} = 12,500 \text{ units}
 \end{aligned}$$

7.18 Job Costing and Batch Costing

If FIFO method is followed for valuation of finished goods at the end of the year, the profit would have been ₹ 1,14,000 + 6,000 (Note 3) = ₹ 1,20,000

Working Notes :

- (1) **Calculation of raw materials consumed**
- | | ₹ |
|--------------------------------------|-----------------|
| Opening stock of raw materials | 50,000 |
| Add: Raw materials purchased | <u>2,00,000</u> |
| | 2,50,000 |
| Less: Closing stock of raw materials | <u>62,500</u> |
| | <u>1,87,500</u> |
- (2) **Value of closing stock of finished goods (LIFO method)**
- | | |
|--------------------|-----------------|
| 2,000 units @ ₹ 45 | 90,000 |
| 500 units @ ₹ 48 | <u>24,000</u> |
| 2,500 units | <u>1,14,000</u> |
- (3) **Value of closing stock of finished goods (FIFO method)**
- 2,500 units @ ₹ 48 = ₹ 1,20,000.
- Profit will be increased by ₹ 6,000 (₹ 1,20,000 – ₹ 1,14,000)
- (4) Sales = 12,000 units @ ₹ 65 per unit = ₹ 7,80,000

Illustration 11

From the following particulars regarding the single output of Anirban & Co. for the quarter ended on 31st December, 2001, prepare (a) a Statement of Cost of production, and (b) a Statement of profit and Loss, assuming weighted average method is followed by the company for valuation of closing stock of finished goods :

	1.10.2001	31.12.2001
Stock :	(₹)	(₹)
Raw materials	40,000	50,000
Work-in-progress	50,000	70,000
Finished goods	72,000	?
	(4,000 units)	(5,000 units)
Purchase of raw materials		₹ 1,60,000
Direct labour		₹ 1,10,000
Chargeable expenses		₹ 40,000
Machine hour rate		₹ 16 per hour
Machine hours worked		5,000 hours
Office and administration overhead		@ ₹ 4.80 per unit
Selling and distribution overhead		@ ₹ 3.00 per unit
Sale of 24,000 units		@ ₹ 26 per unit

What would be the difference in stock value if the company follows FIFO method for valuation of closing stock of finished goods ?

[C.U.B.Com. (Hons.) – 2002]

Solution

(a) Statement of Cost of Production

[*Production = 25,000 units]

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	1,50,000	
Direct labour		1,10,000	
Chargeable expenses		40,000	
Prime Cost		<u>3,00,000</u>	12

Factory overheads (5,000 x ₹ 16)		80,000	
	Factory Cost / Works Cost	3,80,000	15.20
Add: Opening stock of W.I.P.		50,000	
Less: Closing stock of W.I.P.		(70,000)	
	Works Cost of Finished Goods	3,60,000	14.40
Office and administration overheads (25,000 × ₹ 4.80)		1,20,000	
	Cost of Production	4,80,000	19.20

*Production = Number of Units Sold + Closing Stock – Opening Stock = 24,000 + 5,000 – 4,000 = **25,000 units**

(b) Statement of Profit and Loss

Particulars	Note	Total (₹)	Per unit (₹)
Cost of production (25,000 units)		4,80,000	19.20
Add: Opening stock of finished goods (4,000 units)		72,000	
		Total cost of 29,000 units	
	(2)	5,52,000	19.0345
Less: Closing stock of finished goods		95,172	
		Cost of Goods Sold	
		4,56,828	19.0345
Selling and distribution overheads (24,000 × ₹ 3)		72,000	
		Cost of Sales	
		5,28,828	22.03
		Profit (Balancing figure)	
		95,172	3.97
Sales (24,000 units @ ₹ 26)		6,24,000	26.00

(d) Statement Showing Changes in Profit/ Loss if FIFO Method is followed in Valuation of Finished Goods Stock

Particulars	₹
Value of closing stock of finished goods under weighted average method	95,172
Value of closing stock of finished goods under FIFO method [(4,80,000/25,000) × 5,000]	<u>96,000</u>
Increase in Profit	<u>828</u>

Working Notes :

(1) Calculation of raw materials consumed

	₹
Opening stock of raw materials	40,000
Add: Raw materials purchased	<u>1,60,000</u>
	2,00,000
Less: Closing stock of raw materials	<u>50,000</u>
	<u>1,50,000</u>

(2) Value of closing stock of finished goods under weighted average method

Total cost of 29,000 units = ₹ 5,52,000 (4,80,000 + 72,000)

Value of 5,000 units = 5,52,000 / 29,000 × 5,000 = ₹ **95,172 (approx.)**

Illustration 12

The equipments division of M/s. Centurion Engineering Works Limited have completed the manufacture of a rubber solution mixing equipment as per order received from one of its customers at an agreed price of ₹ 2,55,000. From the following details available, you are required to prepare a Job Order Cost Sheet for consideration by the management :

(a) Details of the Job

Customer	RSA Enterprises
Order No. of the Customer	RS 1691 dated December 21, 2000
Job Order No. allotted	30631
Date of starting the job at works	January 27, 2001
Date of completion at works	March 15, 2001
Date of delivery at site	March 28, 2001

7.20 Job Costing and Batch Costing

Date of commissioning	March 30, 2001			
(b) Details of expenditure	January	February	March	
Materials :				
Machining section	22,350	1,875	675	
Assembly section	4,683	517	6,100	
	Rate per hour			
Direct labour hours :	₹			
Machining	12,00	160 hrs	2000 hrs	1650 hrs
Assembly	15.00	40 hrs	800 hrs	1260 hrs
Total machine hours spent in machining section		60 hrs	1440 hrs	500 hrs
Cost of drawings = ₹ 6,500				

The company had to procure some dies and tools worth ₹ 15,000 specifically required for use in executing the above order. However, on completion the value of such used dies and tools was estimated at 30% of the original cost and the company envisages to use them up in executing a future order already in the pipe line.

The company has a system of absorbing production overheads at predetermined rates on machine hours utilised for machining section and direct labour hours spent for assembly section. The current rates are ₹ 18 per machine hour and ₹ 6 per labour hour for machining and assembly sections respectively.

The company also incurred an expenditure of ₹ 6,150 towards installing and carrying out trial runs at the customer's premises. As per the company's policy these expenses are to be charged as direct production cost.

Selling and distribution costs are to be charged to individual jobs at 16.67% of production cost.

[I.C.W.A. (Stage-1) – June, 2001]

Solution

M/s. Centurion Engineering Works Limited Job Order Cost Sheet

Customer : RSA Enterprise	Job Order No. : 30631	
	Order No. of the Customer : RS1691	
Date of Starting the Job : January 27, 2001	Date of Completion at Works : March 15, 2001	
Date of Delivery at Site : March 28, 2001	Date of Commissioning : March 30, 2001	
Particulars	Note	Total (₹)
Direct materials consumed	(1)	36,200
Direct labour	(2)	77,220
Other direct expenses	(3)	23,150
Prime Cost		1,36,570
Production overheads	(4)	48,600
Cost of Production		1,85,170
Selling and distribution overheads (16.67% of ₹ 1,85,170)		30,868
Cost of Sales		2,16,038
Profit (Balancing figure)		38,962
Agreed Price		2,55,000

Working Notes :

(I) Materials Consumed

Month	January	February	March	Total
(a) Machining	22,350	1,875	675	24,900
(b) Assembly	4,683	517	6,100	11,300

Total	<u>27,033</u>	<u>2,392</u>	<u>6,775</u>	<u>36,200</u>
(2) Direct Labour				
Month	January	February	March	Total
(a) Machining	$160 \times 12 = 1,920$	$2000 \times 12 = 24,000$	$1650 \times 12 = 19,800$	45,720
(b) Assembly	$40 \times 15 = \underline{600}$	$800 \times 15 = \underline{12,000}$	$1260 \times 15 = \underline{18,900}$	<u>31,500</u>
Total	<u>2,520</u>	<u>36,000</u>	<u>38,700</u>	<u>77,220</u>
(3) Other Direct Expenses				
(a) Cost of Drawings		₹ 6,500		
(b) Depreciation of Dies and Tools :				
Cost		15,000		
Less: Residual value (30%)		<u>4,500</u>	10,500	
(c) Installation and Commissioning Expenses		<u>6,150</u>		
Total		<u>23,150</u>		
(4) Production Overheads				
Month	January	February	March	Total
(a) Machining	$60 \times 18 = 1,080$	$1440 \times 18 = 25,920$	$500 \times 18 = 9,000$	36,000
(b) Assembly	$40 \times 6 = \underline{240}$	$800 \times 6 = \underline{4,800}$	$1260 \times 6 = \underline{7,560}$	<u>12,600</u>
Total	<u>1,320</u>	<u>30,720</u>	<u>16,560</u>	<u>48,600</u>

Special Problems

Illustration 13

A company provides a building repairs and maintenance service. A job costing system is in operation in order to identify the cost, and profit, of each job carried out. Several jobs are in progress at any one time. One such job is Job 126, which was started and completed in the month just ended.

Quantities of material P were issued from stores to the job, as well as other materials as required. Raw material issues are priced at the end of each month on a weighted average basis. Overtime is worked as necessary to meet the general requirements of the business, and is paid at a premium of 30% over the basic rate for direct personnel. The basic rate is ₹ 6.00 per hour. Overheads are absorbed into job costs at the end of each month at an actual rate per direct labour hour. Idle time, material wastage, and rectification work after jobs are completed, are a normal feature of the business. Idle time is not expected to exceed 2% of direct hours charged to jobs. Wastage is not expected to exceed 1% of the cost of materials issued to jobs. Rectification costs are not expected to exceed 1.5% of direct costs. All such costs are not charged as direct costs of individual jobs.

Information concerning Job 126 is as follows :

Issues of material P were 960 kilos. Issues of other materials were valued at ₹ 2,030. Of the total materials issued to the job, wastage cost ₹ 42 and materials used for rectification cost ₹ 33. The hours of direct personnel working on the job were 496. These included 37 overtime hours, 10 hours of idle time, and 12 hours spent on rectification work.

Information for all work carried out on jobs during the month is as follows :

Opening stock of material P was 3,100 kilos valued at ₹ 5,594.

Purchases during the month were 3,500 kilos at ₹ 1.81 per kilo and 3,800 kilos at ₹ 1.82 per kilo. 7,060 kilos of material P were issued from stores to jobs, including 60 kilos which were subsequently wasted and 340 kilos which were used for rectification work.

Other materials issued to jobs were valued at ₹ 19,427 (including ₹ 236 wastage and ₹ 197 rectification).

Hours of direct personnel paid at basic rate were 3,640, with a further 290 hours paid at overtime rate. These

7.22 Job Costing and Batch Costing

total hours include 82 hours of idle time and 37 hours spent on rectification work.

Other costs incurred in the month were :		₹
Supervisory labour		3,760
Depreciation		585
Cleaning materials		63
Stationery and telephone		275
Rent and rates		940
Vehicle running costs		327
Other administration		688

You are required to prepare a statement of the costs associated with Job 126.

Solution Statement of Costs Associated with Job 126			
Particulars			₹
Direct Materials :			
Issues of material P – 960 kilos @ ₹ 1.812 per kilo (Note 1)			1,740
Other materials at cost			2,030
			3,770
Less: Material cost not charged as direct cost :			
Wastage cost		42	
Materials used for rectification		33	75
			3,695
Direct Labour :			
474 hours (496 – 10 (idle time) – 12 (rectification)) @ ₹ 6 per hour			2,844
Overheads :			
474 hours @ ₹ 2.37 per hour (Note 4)			1,123
Total Cost associated with Job 126			7,662

Working Notes :

(1) Calculation of Average Price of Material P ₹

Opening stock	3,100 kilos	5,594
Purchases	3,500 kilos @ ₹ 1.81 per kilo	6,335
	<u>3,800 kilos @ ₹ 1.82 per kilo</u>	<u>6,916</u>
	10,400 kilos	18,845

Weighted average cost of Material P = (₹ 18,845 / 10,400 kilos = ₹ 1.812 per kilo

(2) Calculation of Direct Labour Hours

	(Hours)
At basic rate	3,640
At overtime rate	<u>290</u>
	3,930
Less: Idle time (not charged to individual job)	(82)
Less: Rectification work (not charged to individual job)	<u>(37)</u>
	3,811

(3) Total Overheads

Supervisory labour	3,760
Depreciation	585
Cleaning materials	63
Stationery and telephone	275
Rent and rates	940
Vehicle running costs	327
Other administration	688

(4) Calculation of Overhead Absorption Rate

$$\text{Overhead Absorption Rate} = \frac{\text{Total Overheads}}{\text{Direct Labour Hours}}$$

$$= \frac{9,032 \text{ (Note 3)}}{3,811 \text{ (Note 2)}}$$

$$= ₹ 2.37 \text{ per direct labour hour}$$

Overtime premium (Note 7)	522
Idle time (Note 6)	492
Material wastage (Note 5)	109
Other materials wasted	236
Labour for rectification work (Note 8)	222
Other materials for rectification	197
340 kilos of material P @ 1.812 (Note 9)	<u>616</u>
Total Overheads	<u>9,032</u>

- (5) Material wastage has not been charged to individual job, therefore, cost becomes an overhead : 60 kilos wasted @ ₹ 1.812 = ₹ **109 (approx.)**
- (6) Idle time (normal) is treated as an overhead : 82 hours @ ₹ 6 = ₹ **492**.
- (7) Overtime premium = 30% of ₹ 6 for 290 hours = ₹ 1.80 × 290 = ₹ **522** will be treated as an overhead.
- (8) Rectification work treated as an overhead : 37 hours @ ₹ 6 each = ₹ **222**.
- (9) Materials used for rectification work will be treated as an overhead : 340 kilos @ ₹ 1.812 = ₹ **616.08**

Cost Estimation and Determination of Quotation Price

In many cases, it is necessary to estimate the cost of the job(s) in advance for the purpose of quoting an appropriate price to the prospective customer(s). The estimation is done by the technical staff, with the help of the cost accountant of the organisation. At the time of determining the quotation price, each job is examined in detail and break it down into its different parts.

After thorough study of the job, material requirements are determined and they will be priced at the price expected to rule at the time of execution the job. Similarly, labour cost is also determined by the technical staff after considering the labour hours required and wages rate per hour. Direct expenses are also estimated in the similar way.

At this stage, it should be noted that a fair amount of production overhead are to be added with the prime cost (direct materials + direct labour + direct expenses). For this purpose, generally a pre-determined recovery rate is used. It may be based on labour hours or machine hours depending upon the nature of the jobs. If the job is labour-intensive, labour hour rate is used. If the job is machine-intensive, machine hours rate is used. Delivery cost, if incurred, is also to be added to find out the total cost of the job. Generally, a fair percentage of profit based on the cost / quotation price is also added to get the final price of the job.

Illustration 14

Quotation price of Job No. 440 was ₹ 50,000 in the year 2002. A profit of 25% on cost was included in the above quotation. From the following information, ascertain the quotation of Job No. 440 for the year 2003 :

- (a) Material, labour and overhead were included in the cost of the above job in 3 : 3 : 2.
- (b) 20% increase in material cost, 10% increase in labour cost and 5% increase in the overhead cost are expected in the year 2003.
- (c) Same percentage of profit as charged in 2002 on the quotation price is to be considered.

[C.U.B.Com. (Hons.) – 2003]

Solution

Quotation price of Job No. 440 in the year 2002	50,000
Less: Profit 25% on cost or 20% of selling price	<u>10,000</u>
Total Cost of Job No. 440 in 2002	<u>40,000</u>
Break-up of Cost	₹
(i) Material : $3/8 \times ₹ 40,000$	15,000
(ii) Labour : $3/8 \times ₹ 40,000$	15,000
(iii) Overhead $2/8 \times ₹ 40,000$	<u>10,000</u>
	<u>40,000</u>

7.24 Job Costing and Batch Costing

Statement Showing Quotation of Job No. 440 for the year 2003

Particulars	₹	₹
(a) Material	15,000	
Add: 20% increase in material cost	3,000	18,000
(b) Labour	15,000	
Add: 10% increase in labour cost	1,500	16,500
(c) Overhead	10,000	
Add: 5% increase in overhead cost	500	10,500
Total Cost of Job No. 440 in 2003		45,000
Profit 25% on cost		11,250
Quotation Price in 2003		56,250

Illustration 15

Mohit Ltd. furnished the following information in relation to the production of 2000 units of Product N for the year 2000 :

	₹
Direct material	2,00,000
Direct labour	1,50,000
Indirect wages (50% fixed)	40,000
Consumable stores (70% variable)	30,000
Office rent (100% fixed)	60,000
Selling expenses (40% variable)	80,000

In the year 2001, it is estimated that the production will be increased by 50%. The price of direct material and direct labour will go up by 10% and 20% respectively.

You are required to compute selling price per unit of Product N for the year 2001 if the company wishes to maintain profit @ 10% on cost.

[C.U.B.Com. (Hons.) – 2001]

Solution

Mohit Ltd.

Estimated Cost Sheet for the year 2001 [Estimated Production : 3,000 units]

Particulars	Note	Total (₹)	Per unit (₹)
Direct materials	(1)	3,30,000	110.00
Direct labour	(2)	2,70,000	90.00
Prime Cost		6,00,000	200.00
Factory overheads	(3)	90,500	30.17
Factory Cost		6,90,500	230.17
Office and administrative expenses	(4)	60,000	20.00
Cost of Production		7,50,500	250.17
Selling expenses	(5)	96,000	32.00
Cost of Sales		8,46,500	282.17
Profit (10% of cost)		84,650	28.22
Sales		9,31,150	310.39

Working Notes :

(1) Direct materials cost for 3,000 units (in 2001)

Direct materials = 2,00,000 / 2,000 units × 3,000 units	₹ 3,00,000
Add: 10% increase in price in 2001 (10% of ₹ 3,00,000)	30,000
	<u>3,30,000</u>

(2) Direct labour cost for 3,000 units (in 2001)

Direct labour = 1,50,000 / 2,000 units × 3,000 units	₹ 2,25,000
Add: 20% increase in price in 2001 (20% of ₹ 2,25,000)	45,000
	<u>2,70,000</u>

(3) Factory overheads :

(a) (i) Indirect wages (fixed) = ₹ 40,000 × 50%	20,000
(ii) Indirect wages (variable) [(₹ 40,000 × 50%) ÷ 2,000] × 3,000	<u>30,000</u>
	50,000
(b) (i) Consumable stores (fixed) = ₹ 30,000 × 30%	9,000
(ii) Consumable stores (variable) [(₹ 30,000 × 70%) ÷ 2,000] × 3,000	<u>31,500</u>
	40,500

Total factory overheads = ₹ 50,000 + ₹ 40,500 = ₹ 90,500.

(4) Office and administrative expenses (100% fixed) = ₹ 60,000.

(5) Selling expenses :

(a) Fixed portion = ₹ 80,000 × 60%	48,000
(b) Variable portion = [(80,000 × 40%) ÷ 2,000] × 3,000	<u>48,000</u>
	96,000

Illustration 16

A firm manufactures its products at ₹ 1,000 per unit. Total cost is composed of as follows :

Direct materials	40%
Direct wages	30%
Overhead	30%

An increase in material price by 15% and wage rate by 10% is expected in the next year. As a result, the profit at current selling price will decrease by 45% of the present profit. What is the current selling price per unit ?

[C.U.B.Com. (Hons.) – Adapted]

Solution

Current cost of the product = ₹ 1,000 per unit.

Break-up of cost :

	₹
Direct materials : 40% of ₹ 1,000	400
Direct labour : 30% of ₹ 1,000	300
Overhead : 30% of ₹ 1,000	<u>300</u>
	1,000

Next year's cost of the product will be as follows :

Direct materials : 400 + 15% of ₹ 400	460
Direct labour : 300 + 10% of ₹ 300	330
Overhead	<u>300</u>
	1,090

Let current selling price of the product = x per unit.

(a) Profit of **current year** = $(x - 1,000)$ per unit

(b) Profit of **next year** = $(x - 1,090)$ per unit

It is given in the problem that the profit at current selling price will decrease by 45% of the present profit as a result of change in material cost and labour cost.

Therefore, the equation will be as follows :

$$(x - 1,000) - 45\% \text{ of } (x - 1,000) = (x - 1,090)$$

$$\text{or, } 55\% \text{ of } (x - 1,000) = (x - 1,090)$$

$$\text{or, } 0.55(x - 1,000) = (x - 1,090)$$

$$\text{or, } 0.55x - 550 = (x - 1,090)$$

$$\text{or, } 0.45x = 540$$

$$\text{or, } x = 540/0.45$$

$$\text{or, } x = 1,200$$

Therefore, current selling price = ₹ 1,200.

7.26 Job Costing and Batch Costing

Illustration 17

The cost of a scooter for the year 2005, the selling price being ₹ 24,000 each, is given below :

Direct materials	50% of total cost
Wages	30% of total cost
Overhead charges	20% of total cost
Profit	20% on selling price

In 2006, the price of materials and labour rate shall increase by 20% and 10% respectively.

- What will be the rate of profit if the selling price remains unchanged ?
- What will be the selling price if the rate of profit remains unchanged ? [K.U.B.Com. (Hons.) – 2006]

Solution

Selling price of scooter in 2005	24,000	₹
Less: Profit (20% of selling price)	<u>4,800</u>	
Total cost of scooter in 2005	<u>19,200</u>	
Break-up of cost :	₹	
Materials : 50% of ₹ 19,200	9,600	
Wages : 30% of ₹ 19,200	5,760	
Overhead charges : 20% of ₹ 19,200	<u>3,840</u>	
	<u>19,200</u>	
(i) If the selling price remains unchanged in 2006, the profit will be as follows :		₹
Selling price (no change)		24,000
Less: Total cost in 2006 :		
Materials : $9,600 \times 120 \div 100$	11,520	
Wages : $5,760 \times 110 \div 100$	6,336	
Overhead charges (no change)	<u>3,840</u>	<u>21,696</u>
Expected Profit in 2006		<u>2,304</u>
Rate of profit = $2,304 / 24,000 \times 100 = 9.6\%$		
(ii) If the rate of profit remains unchanged in 2006, the selling price will be as follows :		₹
Total cost in 2006 (as calculated above)		21,696
Add: Profit 20% of selling price or 25% of cost		<u>5,424</u>
Selling Price in 2006		<u>27,120</u>

Illustration 18

A manufacturing company has an installed capacity of 1,50,000 units per annum. Its cost structure is given below :

Variable cost per unit :	₹
Materials	10
Labour (subject to a minimum of ₹ 1,00,000 per month)	10
Overheads	4
Fixed overheads per annum	1,92,300
Semi-variable overheads per annum at 75% capacity (it will increase by ₹ 4,000 per annum for increase of every 5% of the capacity utilization or any part thereof)	60,000

The capacity utilization for the next year is budgeted at 75% for the first three months, 80% for the next six months and 90% for the remaining three months.

Required : If the company is planning to have a profit of 20% on the selling price, calculate the selling price per unit for the next year.

Solution**Calculation of Estimated Production in next year :**

	Units
(i) Capacity utilisation in first 3 months = 75% Expected production = $(1,50,000 \div 12) \times 75\% \times 3$ months	28,125
(ii) Capacity utilisation in next 6 months = 80% Expected production = $(1,50,000 \div 12) \times 80\% \times 6$ months	60,000
(iii) Capacity utilisation in last 3 months = 90% Expected production = $(1,50,000 \div 12) \times 90\% \times 3$ months	33,750
Total expected production in next year	<u>1,21,875</u>

Calculation of Selling Price for the Next Year

Particulars	Total (₹)	Per Unit (₹)
Material (1,21,875 units $\times$ ₹ 10)	12,18,750	10.00
Labour (Note 1)	12,37,500	10.15
Prime Cost	24,56,250	20.15
Factory Overhead (Note 2)	7,44,800	6.11
Cost of Production	32,01,050	26.26
Profit (20% on sales or 25% on cost)	8,00,263	6.57
Selling Price	40,01,313	32.83

Working Notes :**(1) Calculation of Labour Cost**

(a) For first 3 months :

Actual wages = 28,125 units $\times$ ₹ 10 = ₹ 2,81,250 but minimum wages to be paid per month is @ ₹ 1,00,000, i.e., $3 \times ₹ 1,00,000 = ₹ 3,00,000$. Therefore, the wages for the first 3 months = ₹ 3,00,000.

(b) For next 6 months :

Actual wages = 60,000 $\times$ ₹ 10 = ₹ 6,00,000 and minimum wages is also ₹ 6,00,000 ($6 \times ₹ 1,00,000$). Therefore, the wages for next 6 months = ₹ 6,00,000.

(c) For last 3 months :

Actual wages = 33,750 $\times$ ₹ 10 = ₹ 3,37,500 but minimum wages is $3 \times ₹ 1,00,000 = ₹ 3,00,000$. Therefore, the wages for last 3 months = ₹ 3,37,500.

Total labour cost = ₹ 3,00,000 + ₹ 6,00,000 + ₹ 3,37,500 = ₹ 12,37,500.

(2) Calculation of Overheads

	₹
(a) Variable overhead (1,21,875 $\times$ ₹ 4)	4,87,500
(b) Fixed overhead	1,92,300
(c) Semi-variable overhead (Note 3)	65,000
	<u>7,44,800</u>

(3) Calculation of Semi-Variable Overheads

At 75% semi-variable overheads = 60,000 p.a.

Therefore, semi-variable overhead per months = ₹ 60,000 $\div$ 12 = ₹ 5,000.

Semi-variable overheads will increase by ₹ 4,000 p.a. for every 5% increase (or part thereof) in capacity utilisation. Therefore, increase in semi-variable overhead per month for every 5% increase in capacity (or part thereof) = $4,000 \div 12 = ₹ 333.33$.

Total Semi-variable Overheads

	₹
(i) For 1st 3 months (₹ 5,000 $\times$ 3) — 75% capacity	15,000
(ii) For next 6 months (₹ 5,000 $\times$ 6) + (333.33 $\times$ 6) — 80% capacity	32,000
(iii) For last 3 months (5,000 $\times$ 3) + (333.33 $\times$ 3 $\times$ 3*) — 90% capacity	18,000
Total semi-variable overheads	<u>65,000</u>

* 80%; 85% and 90%

7.28 Job Costing and Batch Costing

Illustration 19

In respect of a factory, the following particulars have been extracted for the year 2005 :

	₹
Cost of materials	6,00,000
Wages	5,00,000
Factory overheads	3,00,000
Administrative charges	3,36,000
Selling charges	2,24,000
Distribution charges	1,20,000
Profit	4,20,000

A work order has to be executed in 2006 and the estimated expenses are : Materials ₹ 8,000; Wages ₹ 5,000.

Assuming that in 2006 the rate of factory overheads has gone up by 20%, distribution charges have gone down by 10% and selling and administration charges have gone each up by 15%, at what price should the product be sold so as to earn the same rate of profit on the selling price as in 2005 ?

Factory overheads are based on wages and administration, selling and distribution overheads on factory cost.

[D.U.B.Com. (Hons.) – 2007]

Solution

Statement of Cost for the year 2005

Particulars	₹
Cost of materials	6,00,000
Wages	5,00,000
Prime Cost	11,00,000
Factory overheads	3,00,000
Factory Cost	14,00,000
Administrative charges	3,36,000
Cost of Production	17,36,000
Selling charges	2,24,000
Distribution charges	1,40,000
Cost of Sales	21,00,000
Profit	4,20,000
Sales	25,20,000

Statement of Cost of Work Order to be Executed in 2006

Particulars	₹
Cost of materials	8,000
Wages	5,000
Prime Cost	13,000
Factory overhead (72% of wages) – Note 2(a)	3,600
Factory Cost	16,600
Administrative charges (27.6% of factory cost) – Note 2(b)	4,582
Cost of Production	21,182
Selling charges (18.4% of factory cost) – Note 2(c)	3,054
Distribution charges (9% of factory cost) – Note 2(d)	1,494
Cost of Sales	25,730
Profit (20% of cost of Sales)	5,146
Selling Price	30,876

Working Notes :**(1) Calculation of Recovery Rate based on 2005**

(a) Factory Overheads are based on Wages :

$$\begin{aligned}\text{Factory Overheads Recovery Rate} &= \frac{\text{Factory Overheads}}{\text{Direct Wages}} \times 100 \\ &= \frac{3,00,000}{5,00,000} \times 100 = 60\%\end{aligned}$$

(b) Administration Charges are based on Factory Cost :

$$\begin{aligned}\text{Administrative Charges Recovery Rate} &= \frac{\text{Administrative Charges}}{\text{Factory Cost}} \times 100 \\ &= \frac{3,36,000}{14,00,000} \times 100 = 24\%\end{aligned}$$

(c) Selling Charges are based on Factory Cost :

$$\begin{aligned}\text{Selling Charges Recovery Rate} &= \frac{\text{Selling Charges}}{\text{Factory Cost}} \times 100 \\ &= \frac{2,24,000}{14,00,000} \times 100 = 16\%\end{aligned}$$

(d) Distribution Charges are based on Factory Cost :

$$\begin{aligned}\text{Distribution Charges Recovery Rate} &= \frac{\text{Distribution Charges}}{\text{Factory Cost}} \times 100 \\ &= \frac{1,40,000}{14,00,000} \times 100 = 10\%\end{aligned}$$

(e) Profit as a Percentage of Cost :

$$= \frac{\text{Profit}}{\text{Cost of Sales}} \times 100 = \frac{4,20,000}{21,00,000} \times 100 = 20\%$$

(2) Calculation of Revised Recovery Rate for 2006

- (a) Factory overheads recovery rate = 60% + (20% of 60%) = 72% of wages.
- (b) Administrative charges recovery rate = 24% + (15% of 24%) = 27.6% of factory cost.
- (c) Selling charges recovery rate = 16% + (15% of 16%) = 18.4% of factory cost.
- (d) Distribution charges recovery rate = 10% – (10% of 10%) = 9% of factory cost.

Illustration 20

A company presently sells an equipment for ₹ 35,000. Increase in prices of labour and material cost are anticipated to the extent of 15% and 10% respectively in the coming year. Material cost represents 40% of cost of sales and labour cost 30% of cost of sales. The remaining relate to overheads. If the existing selling price is retained, despite the increase in labour and material prices, the company would face a 20% decrease in the existing amount of profit on the equipment.

Now, you are required to arrive at a selling price so as to give the same percentage of profit on increased cost of sales, as before. Prepare a statement of profit / loss per unit, showing the new selling price and cost per unit in support of your answer.

7.30 Job Costing and Batch Costing

Solution Statement of Profit / Loss and Selling Price (Revised)

Particulars	Existing (₹)	Revised (₹)
A. Selling Price (Note 2*)	35,000	*37,975
B. Cost of Sales (Note 1 and 2) :		
Materials	9,825	10,808
Labour	7,368	8,473
Overhead	7,368	7,368
	24,561	26,649
Profit [A – B]	10,439	11,326
Percentage of Profit on Cost of Sales	42.50%	42.50%

Working Notes :

- (a) (i) Existing material cost 40% of cost of sales
(ii) Existing labour cost 30% of cost of sales
(iii) Existing overheads cost (balancing figure) 30% of cost of sales
100%
- (b) Anticipated increase in material and labour cost :
Material : 10% of existing, i.e., 10% of 40% 4.0%
Labour : 15% of existing, i.e., 15% of 30% 4.5%
Total increase 8.5%
- (c) Reduction in profit is anticipated at 20%.
- (d) If the existing selling price is retained, anticipated increase in cost of sales (8.5%) will lead to reduction in profit by 20%.

Let,

x = cost of sales

y = profit

Hence, selling price = $(x + y) = ₹ 35,000$... (1)

According to question :

$8.5\%x = 20\%y$

Or, $0.085x = 0.2y$

Or, $x = (0.2 \div 0.085)y$... (2)

Or, $x = 2.352941y$

Putting the value of x in equation (1), we get:

$2.352941y + y = 35,000$

or, $3.352941y = 35,000$

or, $y = 35,000 / 3.352941$

or, $y = 10,439$ (approx.)

$x = \text{Cost of Sales} = ₹ 35,000 - ₹ 10,439 = ₹ 24,561$.

$y = \text{Profit} = ₹ 10,439$.

Percentage of profit on cost = $10,439 / 24,561 \times 100 = 42.50\%$

Materials = 40% of ₹ 24,561

Labour : 30% of ₹ 24,561

Overheads = 30% of ₹ 24,561

₹
9,825
7,368
7,368
24,561

(2) Revised Cost of Sales :

(i) Materials	9,825	
Add: 10% increase	<u>983</u>	10,808
(ii) Labour	7,368	
Add: 15% increase	<u>1,105</u>	8,473
(iii) Overhead (no increase)		<u>7,368</u>
Total revised Cost of Sales		<u>26,649</u>
Profit = 42.50% of ₹ 26,649 = ₹ 11,326.		
Selling Price = Cost of Sales + Profit		
= ₹ 26,649 + 11,326 = ₹ 37,975.		

Illustration 21

Swithem Ltd. is considering putting in a bid for a job coded 'Zeron' that would have the following costs :

Materials :

11,000 kilos Rayex at ₹ 4 per kilo.
8,000 kilos Nayon at ₹ 2.50 per kilo.

Labour

Dept. A : 2,500 hours at ₹ 4 per hour.
Dept. B : 1,600 hours at ₹ 5 per hour.

Production overheads :

The policy is to use predetermined overhead rates for each department based upon :

Dept. A : per labour hour.
Dept. B : per % of labour cost.

Budgeted information for the year under review was :

Direct material : ₹ 7,63,000.
Labour : Dept. A : 38,000 hours at ₹ 4 per hour., Dept. B : 25,000 hours at ₹ 5 per hour.
Production overheads : Dept. A : ₹ 7,60,000. Dept. B : ₹ 7,50,000
Administrative overhead ₹ 5,10,000 and to be recovered on the basis of production cost.

You are told that usual company policy is to take profit of 40% of price.

Required : Cost job 'Zeron' for Swithem Ltd. and calculate the bid price that they should tender.

Solution

Swithem Ltd.

Statement Showing the Cost and Bid Price of 'Zeron'

Particulars	(₹)	(₹)
Materials :		
Rayex (11,000 kilos @ ₹ 4 per kilo)	44,000	
Nayon (8,000 kilos @ ₹ 2.5 per kilo)	20,000	64,000
Labour :		
Dept. A (2,500 hours @ ₹ 4)	10,000	
Dept. B (1,600 hours @ ₹ 5)	8,000	18,000
Production Overheads :		
Dept. A (Note 2)	50,000	
Dept. B (Note 3)	48,000	98,000
Production Cost		1,80,000
Administrative Overheads (Note 1)		36,000
Total Cost		2,16,000
Profit (40% of price or 2/3 of cost)		1,44,000
Bid Price		3,60,000

7.32 Job Costing and Batch Costing

Working Notes :

(1) Calculation of Budgeted Cost of Production

Materials	7,63,000
Labour :	
Dept. A (38,000 hours @ ₹ 4 per hour)	1,52,000
Dept. B (25,000 hours @ ₹ 5 per hour)	1,25,000
Production Overhead :	
Dept. A	7,60,000
Dept. B	<u>7,50,000</u>
Production Cost	<u>25,50,000</u>

$$\begin{aligned}\text{Recovery of Administrative Overhead} &= \frac{\text{Administrative Overhead}}{\text{Production Cost}} \\ &= \frac{5,10,000}{25,50,000} \times 100 = 20\% \text{ Production Cost}\end{aligned}$$

Therefore, administrative overheads to be charged to 'Zeron' = ₹ 1,80,000 × 20% = ₹ **36,000**.

(2) Recovery of Production Overheads

(a) Dept. A = (Production Overheads / Labour Hours)

$$= ₹ 7,60,000 / 38,000 \text{ hours} = ₹ 20 \text{ per labour hour.}$$

Therefore, production overheads of Dept. A to be charged to 'Zeron'

$$= 2,500 \text{ hours} \times ₹ 20 \text{ per hour} = ₹ **50,000**.$$

(b) Dept. B = (Production Overheads / Labour Cost) × 100 = (₹ 7,50,000 / ₹ 1,25,000) × 100 = 600% of Labour Cost

Therefore, production overheads of Dept. B to be charged to 'Zeron' = 60% of ₹ 8,000 = ₹ **48,000**.

Illustration 22

In the current quarter, a company has undertaken two jobs. The data relating to these jobs are as under :

	Job 1102	Job 1108
Selling price	₹ 1,07,325	₹ 1,57,920
Profit as percentage on cost	8%	12%
Direct materials	₹ 37,500	₹ 54,000
Direct wages	₹ 30,000	₹ 42,000

It is the policy of the company to charge factory overheads as percentage on direct wages and selling and administration overheads as percentage on factory cost.

The company has received a new order for manufacturing a similar job. The estimate of direct materials and direct wages relating to the new order are ₹ 64,000 and ₹ 50,000 respectively. A profit of 20% on sales is required.

You are required to compute :

(i) The rates of factory overheads and selling administration overheads to be charged.

(ii) The selling price of the new order.

[C.A. (Inter) - November, 2002]

Solution

(1) Computation of Total Cost of Sales

Job 1102 :

Selling price = ₹ 1,07,325

Profit as percentage on cost = 8%

$$\text{Therefore, total cost of the job} = \frac{1,07,325}{108} \times 100 = ₹ **99,375**$$

Job 1108 :

Selling price = ₹ 1,57,920. Profit as percentage on cost = 12%

 Therefore, total cost of the job = $\frac{1,57,920}{112} \times 100 = ₹ 1,41,000$
(2) Computation of Rate of Factory Overheads and Selling and Administration Overheads to be charged

Let the factory overhead to be charged at x% on direct wages and selling and administration overhead to be charged at y% on factory cost.

Job Cost Sheet

Particulars	Job 1102	Job 1108
Direct Materials	37,500	54,000
Direct Wages	30,000	42,000
Prime Cost	67,500	96,000
Factory Overheads :		
Job 1102 : x% on ₹ 30,000	300x	
Job 1108 : y% on ₹ 42,000		420x
Factory Cost	67,500 + 300x	96,000 + 420x
Selling and Administration Overheads :		
Job 1102 : y% on (67,500 + 300x)	675y + 3xy	
Job 1108 : y% on (96,000 + 420x)		960y + 4.2xy
Total Cost	67,500 + 300x + 675y + 3xy	96,000 + 420x + 960y + 4.2xy

∴ by condition :

$$67,500 + 300x + 675y + 3xy = 99,375 \quad \dots (1)$$

$$96,000 + 420x + 960y + 4.2xy = 1,41,000 \quad \dots (2)$$

Multiplying equation (1) by 4.2 and equation (2) by 3 we get,

$$-4,500 - 45y = -5,625$$

$$\text{or, } 45y = 1,125$$

$$\text{or, } y = 25$$

Now, putting the value of y in equation (1) we get,

$$67,500 + 300x + (675 \times 25) + (3x \times 25) = 99,375$$

$$\text{or, } 67,500 + 300x + 16,875 + 75x = 99,375$$

$$\text{or, } 375x = 99,375 - 67,500 - 16,875$$

$$\text{or, } 375x = 15,000$$

$$\text{or, } x = 40$$

Therefore, factory overhead is to be charged @ 40% of direct wages and selling and administration overhead is to be charged @ 25% of factory cost.

Statement Showing the Selling price of the New order

Particulars	₹
Direct Materials	64,000
Direct Wages	50,000
Prime Cost	1,14,000
Factory Overheads @ 40% of Direct Wages	20,000
Factory Cost	1,34,000
Selling and Administration Overhead @ 25% of Factory Cost	33,500
Total Cost	1,67,500
Profit (20% on Sales or 25% on Cost)	41,875
Selling Price of new Order	2,09,375

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 23

From the following particulars relating to production and sales for the year ended 31.03.2008, prepare a Statement of Cost showing therein the cost per unit at each stage :

	As on 1.04.2007	As on 31.03.2008
	(₹)	(₹)
Raw materials	28,000	32,000
Work-in-progress	19,700	26,300
Finished goods at cost	40,020	35,760
	(4,000 units)	(4,800 units)
	₹	
Raw materials purchased	1,18,000	
Direct wages	42,000	
Administrative overhead	29,100	
Selling and distribution expenses @ ₹ 1 per unit amounted to ₹ 29,200.		
Factory overhead — ₹ 1.50 per unit.		
Sales — ₹ 11 per unit.		

[C.U. B.Com. (General) – 2008]

Solution Statement of Cost for the year ended 31st March, 2008 [*Production : 30,000 units]

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	1,14,000	
Direct wages		42,000	
Prime Cost		1,56,000	5.20
Factory overheads (₹ 1.50 × 30,000 units)		45,000	
Factory Cost / Works Cost		2,01,000	6.70
Add: Opening stock of W.I.P.		19,700	
Less: Closing stock of W.I.P.		(26,300)	
Works Cost of Finished Goods		1,94,400	6.48
Administrative overheads		29,100	
Cost of Production		2,23,500	7.45
Add: Opening stock of finished goods		40,020	
Less: Closing stock of finished goods		(35,760)	
Cost of Goods Sold		2,27,760	7.80*
Selling and Distribution overheads (Given)		29,200	
Cost of Sales		2,56,960	8.80*
Profit (Balancing figure)		64,240	2.20
Sales (29,200 units @ ₹ 11)		3,21,200	11.00

* Based on number of units sold

Working Notes :

(1) Calculation of Raw Materials Consumed	(2) Calculation of Number of Units Produced
Opening stock of raw materials	Number of units sold
Add: Raw materials purchased	Add: Cl. Stock of finished goods
Less: Closing stock of raw materials	Less: Op. stock of finished goods

Illustration 24

From the following information, prepare a Statement of Cost for the year 2008 :

Opening Stock :	₹
Raw materials	18,000
Finished goods	5,000
Closing Stock :	
Raw materials	10,000
Finished goods	6,000
Purchase of raw materials	90,000
Indirect wages (factory)	5,000
Direct wages	18,000
Power & Fuel	12,000
Office Salary	14,000
Sundry Office Expenses	9,000
Salesman's Salaries	6,000

[C.U. B.Com. (General) – 2009]

Solution**Statement of Cost for the year 2008**

Particulars	Note	Total (₹)
Raw materials consumed	(1)	98,000
Direct wages		18,000
Prime Cost		1,16,000
Factory overheads	(2)	17,000
Factory Cost / Works Cost		1,33,000
Administrative overheads		23,000
Cost of Production		1,56,000
Add: Opening stock of finished goods		5,000
Less: Closing stock of finished goods		(6,000)
Cost of Goods Sold		1,55,000
Selling and Distribution overheads		6,000
Cost of Sales		1,61,000

Working Notes :**(1) Calculation of Raw Materials Consumed**

	₹
Opening stock of raw materials	18,000
Add: Purchase of raw materials	90,000
	1,08,000
Less: Closing stock of raw materials	10,000
	98,000

(2) Calculation of Factory Overhead

	₹
Indirect wages (factory)	5,000
Power and fuel	12,000
	17,000

(3) Calculation of Administrative Overhead

	₹
Office salary	14,000
Sundry office expenses	9,000
	23,000

7.36 Job Costing and Batch Costing

Illustration 25

Following particulars for the month of September, 2009 were extracted from the records of a factory :

	₹
Opening stock of finished goods (5,000 units)	45,000
Purchase of raw materials	2,50,000
Carriage inward	7,100
Direct wages	1,00,000
Factory overhead	150% of Direct wages
Administrative overhead	₹ 2.50 per unit
Selling overhead	10% of Sales
Sales (45,000 units)	6,60,000
Closing finished stock 10,000 units	?

From the above particulars, prepare a Cost Sheet for the month of September, 2009 assuming sales are made under FIFO method.

[C.U. B.Com. (General) – 2010]

Solution		Cost Sheet for the month of September, 2009		[*Production : 50,000 units]	
Particulars	Note	Total (₹)	Per unit (₹)		
Raw materials consumed	(1)	2,57,100			
Direct wages		1,00,000			
Prime Cost		3,57,100	7.142		
Factory overheads (150% of Direct Wages)		1,50,000			
Factory Cost / Works Cost		5,07,100	10.142		
Administrative overheads (50,000 × ₹ 2.50)		1,25,000			
Cost of Production		6,32,100	12.642		
Add: Opening stock of finished goods	(3)	45,000			
Less: Closing stock of finished goods		(1,26,420)			
Cost of Goods Sold		5,50,680	12.237		
Selling overheads (10% of ₹ 6,60,000)		66,000			
Cost of Sales		6,16,680	13.704		
Profit (Balancing figure)		43,320	0.963		
Sales		6,60,000	14.667		

Working Notes :

(1) Calculation of Raw Materials Consumed

	₹
Purchase of raw materials	2,50,000
Add: Carriage inwards	7,100
	<u>2,57,100</u>

(2) Calculation of Number of Units Produced

Sales	45,000 units
Add: Closing stock of finished stock	<u>10,000 units</u>
	55,000 units
Less: Opening stock of finished goods	<u>5,000 units</u>
	<u>50,000 units</u>

(3) Valuation of Closing Finished Stock

$$\text{Cost of Production per Unit} = \frac{\text{Total Cost of Production}}{\text{Number of Units Produced}} = \frac{6,32,100}{50,000} = ₹ 12.642$$

$$\text{Valuation of closing stock of finished goods} = 10,000 \times ₹ 12.642 = ₹ 1,26,420.$$

Illustration 26

From the following information, prepare a Statement of Cost for the year 2010, showing therein (a) Prime Cost; (b) Works Cost; (c) Cost of Production; (d) Profit or Loss :

	₹
Raw materials consumed	80,000
Direct wages	50,000
Direct expenses	15,000
Indirect wages	20,000
Depreciation on Machinery	16,000
Office overhead	20% on works cost
Selling overhead	₹ 2.50 per unit
Units produced	20,000
Units sold	16,000 @ ₹ 20 each

[C.U. B.Com. (General) – 2011]

Solution

Statement of Cost for the year 2010

Particulars	Note	Total (₹)
Raw materials consumed		80,000
Direct wages		50,000
Direct expenses		15,000
Prime Cost		1,45,000
Factory overheads	(1)	36,000
Factory Cost / Works Cost		1,81,000
Office overheads	(2)	36,200
Cost of Production		2,17,200
Less: Closing stock of finished goods	(3)	43,440
Cost of Goods Sold		1,73,760
Selling overheads (16,000 × ₹ 2.50)		40,000
Cost of Sales		2,13,760
Profit (Balancing figure)		1,06,240
Sales (16,000 × ₹ 20)		3,20,000

Working Notes :

(1) Calculation of Factory Overheads

	₹
Indirect wages	20,000
Depreciation on machinery	<u>16,000</u>
	<u>36,000</u>

(2) Calculation of Office Overheads

20% of works cost = 20% of ₹ 1,81,000 = ₹ 36,200

(3) Valuation of Closing Stock

Number of units produced	20,000 units
Less: Number of units sold	<u>16,000 units</u>
Number of units unsold	<u>4,000 units</u>

$$\begin{aligned}
 \text{Valuation of Closing Stock} &= \frac{\text{Total Cost of Production}}{\text{Number of Units Produced}} \times \text{Number of Units Unsold} \\
 &= \frac{2,17,200}{20,000} \times 4,000 = ₹ 43,440
 \end{aligned}$$

7.38 Job Costing and Batch Costing

Illustration 27

From the information given below, prepare a Statement of Cost

	₹		
Direct materials used	5,000	Factory overhead	30% of direct wages
Direct wages	3,000	Office overhead	12% of works cost
Direct expenses	1,000	Profit	20% of selling price

[C.U. B.Com. (General) – 2012]

Solution

Statement of Cost

Particulars	Note	Total (₹)
Raw materials used		5,000
Direct wages		3,000
Direct expenses		1,000
Prime Cost		9,000
Factory overheads (30% of ₹ 3,000)		900
Factory Cost / Works Cost		9,900
Office overheads (12% of ₹ 9,900)		1,188
Cost of Production		11,088
Selling and Distribution Overhead		Nil
Cost of Sales		11,088
Profit		2,772
Sales		13,860

Note : Profit = 20% of Selling Price = $(20 \div 80) \times 100 = 25\%$ on cost. So, Profit = 25% of ₹ 11,080 = ₹ **2,772**.

Illustration 28

From the following particulars, prepare a Cost Sheet for the month of January, 2013 : (all figures in ₹)

Raw materials (1.1.2013)	6,000	Depreciation on machine	4,000
Purchase of raw materials	56,000	Rent and rates for office	9,600
Raw materials (31.1.2013)	9,000	Administrative expenses	1,200
Direct wages	12,600	Selling and distribution overhead	3,000
Materials destroyed by fire	400	Stock of finished goods (31.1.2013)	1,000 units
Factory rent	3,600	Production during the month	8,000 units

[C.U. B.Com. (General) – 2013]

Solution

Cost Sheet for the month of January, 2013

[Production : 8,000 units]

Particulars	Note	Total (₹)
Raw materials consumed	(1)	52,600
Direct wages		12,600
Prime Cost		65,200
Factory overheads	(2)	7,600
Factory Cost / Works Cost		72,800
Administrative overheads	(3)	10,800
Cost of Production		83,600
Less: Closing stock of finished goods	(4)	10,450
Cost of Goods Sold		73,150
Selling and Distribution overheads		3,000
Cost of Sales		76,150

Working Notes :

(1) Calculation of Raw Materials Consumed	₹	(2) Calculation of Factory Overhead	₹
Raw materials at the beginning of the month	6,000	Factory rent	3,600
Add: Raw materials purchased	<u>56,000</u>	Depreciation on machinery	<u>4,000</u>
	62,000		<u>7,600</u>
Less: Materials destroyed by fire	<u>400</u>	(3) Calculation of Administrative Overhead	
	61,600	Rent and rates for office	9,600
Less: Raw materials at the end of the month	<u>9,000</u>	Administrative expenses	<u>1,200</u>
Raw Materials Consumed	<u>52,600</u>		<u>10,800</u>
(4) Valuation of Closing Finished Stock			
Valuation of closing stock of finished goods = $(83,600 \div 8,000) \times 1,000 = ₹ 10,450$.			

Illustration 29

Prepare a Cost Sheet from the following particulars :

Opening stock on 1.1.2013 :	₹
Raw materials	1,00,000
Work-in-progress	30,000
Finished goods	2,500
Closing stock on 31.12.2013 :	
Raw materials	90,000
Work-in-progress	25,000
Finished goods	7,500
Purchase of raw materials during the year	2,50,000
Direct wages	75,000
Manufacturing overheads	50,000
Administrative overheads	8,000
Selling and distribution overheads	2,000
Sales	4,20,000

[C.U. B.Com. (General) – 2014]

Solution **Cost Sheet for the year ended 31st December, 2013**

Particulars	Note	Total (₹)
Raw materials consumed	(1)	2,60,000
Direct wages		75,000
Prime Cost		3,35,000
Manufacturing overhead		50,000
Factory Cost / Works Cost		3,85,000
Add: Opening stock of W.I.P.		30,000
Less: Closing stock of W.I.P.		(25,000)
Works Cost of Finished Goods		3,90,000
Administrative overheads		8,000
Cost of Production		3,98,000
Add: Opening stock of finished goods		2,500
Less: Closing stock of finished goods		(7,500)
Cost of Goods Sold		3,93,000
Selling and Distribution overheads		2,000
Cost of Sales		3,95,000
Profit (Balancing figure)		25,000
Sales		4,20,000

7.40 Job Costing and Batch Costing

Working Notes :

(1) Calculation of Raw Materials Consumed

	₹
Opening stock of raw materials	1,00,000
Add: Purchase of raw materials	<u>2,50,000</u>
	3,50,000
Less: Closing stock of raw materials	<u>90,000</u>
Raw materials consumed	<u>2,60,000</u>

Illustration 30

From the following particulars, prepare a Statement of Cost for the year ended 31.3.2015 :

	₹		₹
Stock of materials on 1.4.2014	50,000	Carriage on goods sold	3,000
Purchase of materials during the year 2014-15	1,40,000	Rent, rates and taxes on the works	5,000
Materials returned to suppliers	4,000	Depreciation on machinery	2,800
Stock of materials as on 31.3.2015	37,600	Carriage on materials purchased	1,000
Wages paid to productive workers	36,000	Office stationery and other expenses	3,000
Wages paid to non-productive workmen	4,000	Abnormal loss of materials	2,400
Salaries paid to office staff	10,000	Chargeable expenses	1,600
Maintenance and repair to plant and machinery	1,200	Advertising and sales promotion	2,400

[C.U. B.Com. (General) – 2015]

Solution

Statement of Cost for the year ended 31st March, 2015

Particulars	Note	Total (₹)
Raw materials consumed	(1)	1,47,000
Direct wages		36,000
Chargeable expenses		1,600
Prime Cost		1,84,600
Factory overheads	(2)	13,000
Factory Cost / Works Cost		1,97,600
Office and administration overheads	(3)	13,000
Cost of Production		2,10,600
Selling and Distribution overheads	(4)	5,400
Cost of Sales		2,16,000

Working Notes :

(1) Calculation of Raw Materials Consumed

	₹
Raw materials at the beginning	50,000
Add: Purchase of raw materials	1,40,000
Add: Carriage on materials	<u>1,000</u>
	1,91,000
Less: Materials returned to supplier	<u>4,000</u>
	1,87,000
Less: Closing stock of raw materials	<u>37,600</u>
	1,49,400
Less: Abnormal loss of materials	<u>2,400</u>
Raw materials consumed	<u>1,47,000</u>

(2) Calculation of Factory Overhead	₹
Wages to non-productive overhead	4,000
Rent, rates and taxes on the works	5,000
Depreciation of machinery	2,800
Maintenance and repairs to plant and machinery	<u>1,200</u>
Factory overhead	<u>13,000</u>
(3) Calculation of Office and Administration Overhead	₹
Salary paid to office staff	10,000
Office stationery and other expenses	<u>3,000</u>
Office and Administration Overhead	<u>13,000</u>
(3) Calculation of Selling and Distribution Overhead	₹
Carriage on goods sold	3,000
Advertising and sales promotion	<u>2,400</u>
Selling and distribution overhead	<u>5,400</u>

Illustration 31

Particulars for the month of September, 2015 extracted from the records of a factory are given below :

	₹
Opening stock of finished goods (5,000 units)	45,000
Purchase of raw materials	2,50,000
Carriage inward	7,100
Direct wages	1,00,000
Factory overhead	150% of Direct Wages
Administrative overhead	2.50 per unit
Selling overhead	10% of Sales
Sales (45,000 units)	6,60,000
Closing finished stock (10,000 units)	?

From the above particulars, prepare a Cost Sheet for the month of September, 2015 assuming sales are made under FIFO method.

[C.U. B.Com. (General) – 2016]

Solution

Cost Sheet for the month of September, 2015

[Production : 50,000 units]

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	2,57,100	
Direct wages		1,00,000	
Prime Cost		3,57,100	7.142
Factory overheads (150% of Direct Wages)		1,50,000	
Factory Cost / Works Cost		5,07,100	10.142
Administrative overheads (50,000 × ₹ 2.50)		1,25,000	
Cost of Production		6,32,100	12.642
Add: Opening stock of finished goods		45,000	
Less: Closing stock of finished goods	(3)	(1,26,420)	
Cost of Goods Sold		5,50,680	12.237
Selling overheads (10% of ₹ 6,60,000)		66,000	
Cost of Sales		6,16,680	13.704
Profit (Balancing figure)		43,320	0.963
Sales		6,60,000	14.667

7.42 Job Costing and Batch Costing

Working Notes :

(1) Calculation of Raw Materials Consumed

	₹
Purchase of raw materials	2,50,000
Add: Carriage inwards	<u>7,100</u>
	<u>2,57,100</u>

(2) Calculation of Number of Units Produced

Sales	45,000 units
Add: Closing stock of finished stock	<u>10,000 units</u>
	55,000 units
Less: Opening stock of finished goods	<u>5,000 units</u>
	<u>50,000 units</u>

(3) Valuation of Closing Finished Stock

$$\text{Cost of Production per Unit} = \frac{\text{Total Cost of Production}}{\text{Number of Units Produced}} = \frac{6,32,100}{50,000} = ₹ 12.642$$

$$\text{Valuation of closing stock of finished goods} = 10,000 \times ₹ 12.642 = ₹ 1,26,420.$$

Illustration 32

From the following information, prepare a Cost Sheet for the month of May, 2016 :

	₹
Raw materials consumed	60,000
Direct wages	40,000
Direct expenses	8,000
Indirect expenses	10,000
Depreciation on machinery	12,000
Office overhead	20% on Works Cost
Selling overhead	₹ 2 per unit
Units produced	15,000 units
Units sold	12,000 units @ ₹ 15 each

[C.U. B.Com. (General) – 2017]

Solution

Cost Sheet for the month of May, 2016

[*Production : 15,000 units]

Particulars	Note	Total (₹)
Raw materials consumed		60,000
Direct wages		40,000
Direct expenses		8,000
		Prime Cost
Factory overheads (5,000 hours × ₹ 20)	(1)	1,08,000
		Factory Cost / Works Cost
Office (20% of ₹ 1,30,000)		26,000
		Cost of Production
Less: Closing stock of finished goods	(2)	31,200
		Cost of Goods Sold
Selling overheads (12,000 × ₹ 2)		24,000
		Cost of Sales
		Profit (Balancing figure)
Sales (12,000 × ₹ 15)		1,80,000

Working Notes :

(1) Calculation of Factory Overhead		₹	(2) Valuation of Closing Stock of Finished Goods		₹
Indirect expenses		10,000	Number of units produced		15,000
Add: Depreciation on machinery		<u>12,000</u>	Less: Number of units sold		<u>12,000</u>
		<u>22,000</u>	Number of units unsold		<u>3,000</u>

$$\begin{aligned}\text{Valuation of Closing Stock} &= \frac{\text{Total Cost of Production}}{\text{Number of Units Produced}} \times \text{Number of Units Unsold} \\ &= \frac{1,56,000}{15,000} \times 3,000 = \text{₹ } 31,200\end{aligned}$$

[For Honours Candidates Only]**Illustration 33**

The following figures for the month of April, 2008 were extracted from the records of a factory :

	Opening (1.4.2008)	Closing (30.4.2008)	
	(₹)	(₹)	
Stock of raw materials	20,000	25,000	
Semi-finished goods	25,000	35,000	
Unsold goods	36,000 (4,000 units)	? (5,000 units)	
Purchase of materials	₹ 80,000	Machine hour rate	16 per hour
Machine hours worked	2,500 hours	Productive labour	55,000
Chargeable expenses	20,000	General office overhead	₹ 2.40 per unit
Selling & Distribution overhead	₹ 1.50 per unit	Sales of 24,000 units	₹ 15 per unit

- (a) Prepare Cost Sheet for the month of April, 2008 assuming that sales are made on the basis of 'Last-In-First-Out' principle.
- (b) What would be the difference in profit and value of closing stock of unsold goods, if such stock is valued at '*Simple Average*' method' ?

[C.U. B.Com. (Hons.) – 2009]

Solution**(a) Cost Sheet for the month of April, 2008**

Particulars	Note	Total (₹)
Raw materials consumed	(1)	75,000
Productive labour		55,000
Chargeable expenses		20,000
Prime Cost		1,50,000
Factory overheads (2,500 × ₹ 16)		40,000
Factory Cost / Works Cost		1,90,000
Add: Opening stock of W.I.P.		25,000
Less: Closing stock of W.I.P.		(35,000)
Works Cost of Finished Goods	(2)	1,80,000
General office overheads (25,000 × ₹ 2.40)		60,000
Cost of Production		2,40,000
Add: Opening stock of finished goods		36,000
Less: Closing stock of finished goods		(45,600)
Cost of Goods Sold		2,30,400
Selling and Distribution overheads (24,000 × ₹ 1.50)		36,000
Cost of Sales		2,66,400
Profit (Balancing figure)		93,600
Sales (24,000 × ₹ 15)		3,60,000

7.44 Job Costing and Batch Costing

Working Notes :

(1) Calculation of Raw Materials Consumed ₹

Opening stock of raw materials	20,000
Add: Purchase of raw materials	80,000
	1,00,000
Less: Closing stock of raw materials	<u>25,000</u>
Raw materials consumed	<u>75,000</u>

(2) Value of Closing Stock of Finished Goods

Goods are sold on the basis of 'Last-In-First Out' principle :

Total production	25,000 units
Total sales	<u>24,000 units</u>
Closing stock from current production	<u>1,000 units</u>

Total number of units unsold = 5,000.

4,000 units to be valued at old rate @ ₹ 9.

Current cost per unit produced = $2,40,000 \div 25,000 = ₹ 9.60$.

Total Value of Closing Stock ₹

4,000 units @ ₹ 9.00	36,000
1,000 units @ ₹ 9.60	<u>9,600</u>
Total	<u>45,600</u>

- (b) When the valuation of closing stock of unsold goods are made on the basis of 'Simple Average', the average of rates are taken. Therefore, the value of closing stock will be :

5,000 units $\times \{(9 + 9.60) \div 2\} = ₹ 46,500$

The revised profit will be : ₹ 93,600 – ₹ 45,600 + ₹ 46,500 = ₹ 94,500.

Illustration 34

Quotation price of Job No. 356 was ₹ 25,000 in the year 2009. A profit of 25% on cost was included in the above quotation. From the following information, ascertain the quotation price of similar type of job for the year 2010:

- The ratio of cost of material, wages and overhead in the total cost of the above job is 2 : 2 : 1.
- 25% increase in material cost; 20% increase in labour cost and 25% decrease in overhead cost are expected in the year 2010.
- Same percentage of profit as charged in 2009 on the quotation price is to be maintained.

[C.U. B.Com. (Hons.) – 2010]

Solution

	₹
Quotation price	25,000
Less: Profit (25,000 $\times$ 20%)	<u>5,000</u>
Total	<u>20,000</u>
Materials : (20,000 $\div$ 5) $\times$ 2	8,000
Wages (20,000 $\div$ 5) $\times$ 2	8,000
Overhead (20,000 $\div$ 5) $\times$ 1	<u>4,000</u>
	<u>20,000</u>

Solution

Job Cost Sheet for the year 2010

Particulars	(₹)
Materials : $\{(8,000 \div 100) \times 125\}$	10,000
Labour : $\{(8,000 \div 100) \times 120\}$	9,600
	Prime Cost
Production Overhead : $\{(4,000 \div 100) \times 75\}$	3,000
	Cost of Production
Profit : 25% of cost of production	5,650
	Quotation Price
	28,250

Illustration 35

A firm produces and sells a single output. From the following particulars, prepare a Statement of Cost for the year ended 31.3.2011 showing therein —

(i) Prime cost; (ii) Works cost; (iii) Cost of production; (iv) Cost of sales; and, (v) Profit per unit :

₹			
Raw materials as on 1.4.2010	25,000		
Purchase of raw materials	2,20,000		
Work-in-progress as on 1.4.2010 :			
at prime cost	30,000		
at manufacturing expenses	<u>6,000</u>	36,000	
Finished goods at cost as on 1.4.2010 (16,000 units)	1,20,000	Administrative expenses	₹ 2 per unit
Freight on raw materials purchased	10,000	Selling expenses	₹ 1 per unit
Loss of materials by fire	10,000	Distribution expenses	₹ 15,000
Factory expenses	1,37,500	Sale of finished goods	
Chargeable expenses	50,000	(56,000 units)	8,00,000
Direct wages	2,70,000	Raw materials as on 31.3.2011	40,000
Work-in-progress as on 31.3.2011 :			
at prime cost	20,000		
at manufacturing expenses	<u>16,000</u>	36,000	
Stock on finished goods as on 31.3.2011 (10,000 units)			
Apply the principle of Simple Average in the valuation of finished goods.			

[C.U. B.Com. (Hons.) – 2011]

Solution **Statement of Cost for the year ended 31st March, 2011** [*Production : 50,000 units]

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	2,05,000	
Direct wages		2,70,000	
Chargeable expenses		50,000	
		5,25,000	
Add: Opening work-in-progress at prime cost		30,000	
		5,55,000	
Less: Closing work-in-progress at prime cost		20,000	
Prime Cost		5,35,000	10.70
Factory overheads		1,37,500	
		6,72,500	
Add: Opening stock of W.I.P. (Manufacturing expenses)		6,000	
Less: Closing stock of W.I.P. (Manufacturing expenses)		(16,000)	
Works Cost of Finished Goods		6,62,500	13.25
Administrative expenses (50,000 x ₹ 2)		1,00,000	
Cost of Production		7,62,500	15.25
Add: Opening stock of finished goods		1,20,000	
Less: Closing stock of finished goods	(3)	(1,13,750)	
Cost of Goods Sold		7,68,750	13.728*
Selling and Distribution overheads	(4)	71,000	
Cost of Sales		8,39,750	14.996
Loss (Balancing figure)		(39,750)	0.71
Sales			8,00,000

* Based on number of units sold.

7.46 Job Costing and Batch Costing

Working Notes :

(1) Calculation of Raw Materials Consumed

	₹
Raw materials at the beginning	25,000
Purchase of raw materials	2,20,000
Freight on raw materials purchased	<u>10,000</u>
	2,55,000
Less: Loss of materials by fire	(10,000)
Less: Raw materials at the year end	<u>(40,000)</u>
Raw materials consumed	<u>2,05,000</u>

(2) Calculation of Units Produced

Number of units sold	56,000 units
Add: Closing stock of finished goods	10,000 units
	66,000 units
Less: Opening stock of finished goods	<u>16,000 units</u>
Total units produced	<u>50,000 units</u>

(3) Current cost of production per unit	15.25
Old Cost of production per unit of finished goods (1,20,000 ÷ 16,000)	<u>7.50</u>
Total	<u>22.75</u>

Average cost of production per unit : $22.75 \div 2 = ₹ 11.375$

Value of closing stock = 10,000 units × ₹ 11.375 = ₹ 1,13,750.

(4) Calculation of Selling and Distribution Overhead

	₹
Selling expenses (56,000 × ₹ 1)	56,000
Distribution expenses	<u>15,000</u>
	<u>71,000</u>

Illustration 36

Bright Ltd. produces televisions. Following figures are extracted from the records of the company for the year ended 31st December, 2012 :

	₹
Raw materials	7,00,000
Wages	5,40,000
Factory overhead	1,62,000
Administrative overhead	1,12,160

In the next year, it is estimated that raw materials and wages required to produce a T.V. set will be ₹ 2,000 and ₹ 1,400 respectively. Factory overhead absorbs on the basis of wages and administrative overheads on the basis of works cost. A profit of 25% on selling price is required. Determine the quoted price of one television for the year 2013 of Bright Ltd.

[C.U. B.Com. (Hons.) – 2013]

Solution

Estimated Job Cost Sheet for the year 2013

Particulars	Note	Total (₹)
Raw materials		2,000
Wages		1,400
Prime Cost		3,400
Factory overheads	(1)	420
Factory Cost / Works Cost		3,820
Administrative overheads	(2)	306
Cost of Production		4,126
Profit	(3)	1,375
Sales		5,501

Working Notes :

(1) Calculation of Percentage of Factory Overhead on Wages

$$\begin{aligned}\text{Factory Overhead Rate} &= \frac{\text{Factory Overhead}}{\text{Wages}} \times 100 \\ &= \frac{1,62,000}{5,40,000} \times 100 = 30\%\end{aligned}$$

Factory overhead per TV = $1,400 \times 30\% = ₹ 420$.

(2) Calculation of Percentage of Administrative Overhead on Works Cost

$$\begin{aligned}\text{Administrative Overhead Rate} &= \frac{\text{Administrative Overhead}}{\text{Works Cost}} \times 100 \\ &= \frac{1,12,160}{14,02,000*} \times 100 = 8\%\end{aligned}$$

* Works Cost = ₹ 7,00,000 + ₹ 5,40,000 + ₹ 1,62,000
= ₹ 14,02,000

Administrative overhead per TV = $8\% \text{ of } ₹ 3,820$
= ₹ 305.60 (say ₹ 306)

(3) Required Profit on Selling Price = 25%

Let selling price	100
Profit	<u>25</u>
Cost	<u>75</u>

Percentage of profit on cost = $25 \div 75 \times 100 = 33\frac{1}{3}\%$ or $\frac{1}{3}$ of cost.

Therefore, profit = $\frac{1}{3}$ of ₹ 4,126 = ₹ 1,375.

Illustration 37

The books of X Ltd. presents the following data for the month of March, 2014 :

Direct labour cost — ₹ 35,000 (175% of works overhead)

Cost of Sales — ₹ 1,17,000

Inventory accounts showed the following :

	01.03.2014	31.03.2014
	(₹)	(₹)
Raw materials	16,000	21,200
Work-in-progress	21,000	29,000
Finished goods	35,200	38,000
	₹	
Selling expenses	7,000	
Administrative expenses	5,000	
Sales	1,50,000	

You are required to :

- compute the value of materials purchased; and
- prepare a Cost Statement for the month of March, 2014.

7.48 Job Costing and Batch Costing

Solution Statement Showing the Calculation of Raw Materials Purchased

Particulars	(₹)
Cost of Sales	1,17,000
Less: Selling Expenses	7,000
Cost of Goods Sold	1,10,000
Add: Closing Stock of finished goods	38,000
	1,48,000
Less: Opening stock of finished goods	35,200
Cost of Production	1,12,800
Less: Administrative expenses	5,000
Works Cost / Factory Cost of Finished Goods	1,07,800
Add: Closing work-in-progress	29,000
	1,36,800
Less: Opening work-in-progress	21,000
	1,15,800
Less: Factory Overhead $\{(35,000 \div 175) \times 100\}$	20,000
Prime Cost	95,800
Less: Direct Labour cost	35,000
Raw Materials Consumed	60,800
Add: Closing Stock of raw materials	21,200
	82,000
Less: Opening Stock of raw materials	16,000
Raw Materials Purchased	66,000

Solution X Ltd. Cost Statement for the month of March, 2014

Particulars	Note	Total (₹)
Raw materials consumed		60,800
Direct labour cost		35,000
	Prime Cost	95,800
Factory overheads		20,000
	Factory Cost / Works Cost	1,15,800
Add: Opening stock of W.I.P.		21,000
Less: Closing stock of W.I.P.		(29,000)
	Works Cost of Finished Goods	1,07,800
Administrative expenses		5,000
	Cost of Production	1,12,800
Add: Opening stock of finished goods		35,200
Less: Closing stock of finished goods		(38,000)
	Cost of Goods Sold	1,10,000
Selling expenses		7,000
	Cost of Sales	1,17,000

Illustration 38

In a factory, mobile sets are produced namely 'A' and 'B'. Labour cost of A is two times that of B. In 2014, 1500 of A and 3600 of B were produced, but 60% of product A and 80% of product B were sold during the year, there being no opening finished stock or work-in-progress.

From the following particulars, ascertain the cost of sales of each type of mobile sets :

	A (₹)	B (₹)	Total (₹)
Materials	42,000	63,000	1,05,000
Labour	—	—	1,17,000

Works overhead is 50% of labour cost and office overhead is 20% of works cost. Selling and distribution overhead is ₹ 40 and ₹ 30 per unit of product A and B respectively.

[C.U. B.Com. (Hons.) – 2015]

Solution

Cost Sheet for the year 2014

Particulars	Note	A (₹)	B (₹)
Direct materials	(1)	42,000	63,000
Direct labour		53,182	63,818
Prime Cost		95,182	1,26,818
Works overheads (50% of labour cost)		26,591	31,909
Factory Cost / Works Cost	(2)	1,21,773	1,58,727
Office overheads (20% of works cost)		24,355	31,745
Cost of Production		1,46,128	1,90,472
Less: Closing stock of finished goods		(58,451)	(38,094)
Cost of Goods Sold	(3)	87,677	1,52,378
Selling and Distribution overheads		36,000	86,400
Cost of Sales (X)		1,23,677	2,38,778
Number of Units Sold (Y)		900	2,880
Cost of Sales per unit (X ÷ Y) (₹)		137.42	82.91

Working Notes :

(1) Calculation of Labour Cost of Each Type of Mobile

Ratio of labour cost = $(1,500 \times 2) : (3,600 \times 1)$
or, 3000 : 3600
or 5 : 6

Therefore, labour cost of ₹ 1,17,000 is to be distributed between A and B in the ratio of 5 : 6.

Total labour cost of Type 'A' = $\frac{1,17,000}{11} \times 5 = ₹ 53,182$

Total labour cost of Type 'B' = $\frac{1,17,000}{11} \times 6 = ₹ 63,818$
₹ 1,17,000

(2) Number of Units Unsold

Type 'A' : $1,500 \times 40\% = 600$ units

Type 'B' : $3,600 \times 20\% = 720$ units

(3) Value of Closing Stock

Type 'A' $(1,46,128 \div 1,500) \times 600 = ₹ 58,451$

Type 'B' $(1,90,472 \div 3,600) \times 720 = ₹ 38,094$

(4) Selling and Distribution Overhead

Type 'A' $(900 \times ₹ 40) = ₹ 36,000$

Type 'B' $(2,880 \times ₹ 30) = ₹ 86,400$

7.50 Job Costing and Batch Costing

Illustration 39

Dasgupta Ltd. produces and sells a single product. From the following particulars, prepare a Statement showing Prime Cost, Factory Cost, Cost of Production, Cost of Sales and Profit or Loss assuming LIFO method is followed for valuation of closing stock of finished goods :

	1.4.2015 (₹)	31.3.2016 (₹)
Stock of raw materials	1,00,000	1,25,000
Stock of work-in-progress	1,25,000	1,75,000
Stock of finished goods	1,80,000 (4,000 units)	? (5,000 units)
Purchase of raw materials		₹ 4,00,000
Direct wages		₹ 2,75,000
Chargeable expenses		₹ 1,00,000
Machine hours worked		5,000 hours
Machine hour rate		₹ 40 per hour
Office and administrative overhead		₹ 7.00 per unit
Selling and distribution overhead		₹ 10.00 per unit
Sales (24,000 units)		₹ 70.00 per unit

[C.U. B.Com. (Hons.) – 2016]

Solution

Dasgupta Ltd.

Statement of Cost for the year ending on 31st March, 2016

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	3,75,000	
Direct wages		2,75,000	
Chargeable expenses		1,00,000	
Prime Cost		7,50,000	30
Factory overheads (5,000 hours × ₹ 40)		2,00,000	
Factory Cost / Works Cost		9,50,000	38
Add: Opening stock of W.I.P.		1,25,000	
Less: Closing stock of W.I.P.		(1,75,000)	
Works Cost of Finished Goods		9,00,000	36
Office and administrative overheads (25,000 × ₹ 7)		1,75,000	
Cost of Production		10,75,000	43
Add: Opening stock of finished goods		1,80,000	
Less: Closing stock of finished goods		(2,23,000)	
Cost of Goods Sold		10,32,000	*43
Selling and Distribution overheads (24,000 × ₹ 10)		2,40,000	
Cost of Sales		12,72,000	53
Net Profit (Balancing figure)		4,08,000	17
Sales (24,000 × ₹ 70)		16,80,000	70

* Based on number of units sold

Working Notes :

(1) Calculation of Raw Materials Consumed

	₹
Opening stock of raw materials	1,00,000
Add: Purchase of raw materials	4,00,000
	5,00,000
Less: Closing stock of raw materials	1,25,000
Raw materials consumed	3,75,000

(2) Valuation of Closing Stock of Finished Goods

Closing stock of finished stock is 5,000 units. Out of which 4,000 units from opening stock of finished goods and 1,000 units from current production. Therefore, the value of closing stock of finished stock under LIFO will be :

	₹
4,000 units	1,80,000
1,000 units @ ₹ 43	<u>43,000</u>
	<u>2,23,000</u>

Illustration 40

Prospects Ltd. is currently operating at 80% of its production capacity, producing and selling 4,000 units of a product. The following information is available from the cost book :

	₹		
Raw materials consumed in production	6,40,000	Office overhead (fixed)	2,00,000
Wages for the period	4,80,000	Selling overhead (100% variable)	1,60,000
Chargeable expenses	80,000	Distribution overhead (1/3rd fixed)	1,20,000
Production overhead (recovered on direct labour cost)	2,40,000	Selling price per unit	600

Following charges are anticipated in the coming year 2017-18 :

- The full production capacity is expected to achieve in the coming year.
- Rate of material will be reduced by 25%. however, there will be an increase in consumption of material by 40% due to inferior quality of materials.
- Labour rate will go up by 25% and efficiency of labour will increase by 20%.
- Chargeable expenses would be doubled in total.
- Production overhead will decrease by 20%.
- Profit per unit remain unchanged.
- Trade discount $16\frac{2}{3}\%$.

You are required to calculate the catalogue price of the product for the year 2017-18.

[C.U. B.Com. (Hons.) – 2017]

Solution**Prospect Ltd.****Statement Showing the Calculation of Catalogue Price the year 2017-18**

[*Production : 5,000 units]

Particulars	Note	Total (₹)	Per unit (₹)
Raw materials consumed	(1)	8,40,000	
Wages	(2)	6,00,000	
Chargeable expenses		1,60,000	
Prime Cost		16,00,000	320
Production overhead	(3)	2,40,000	
Factory Cost / Works Cost		18,40,000	368
Office overhead (fixed)		2,00,000	
Cost of Production		20,40,000	408
Selling overhead	(4)	2,00,000	
Distribution overhead	(5)	1,40,000	
Cost of Sales		23,80,000	476
Profit (5,000 x 120)		6,00,000	120
Selling Price		29,80,000	596
Add: Trade Discount		5,96,000	119.20
Catalogue Price		35,76,000	715.20

7.52 Job Costing and Batch Costing

*Present production is 4,000 units, which is 80% of the capacity. At 100% capacity, the total production will be : $\{(4,000 \div 80\%) \times 100\} = 5,000$ units.

Working Notes :

$$(1) \text{ Raw materials consumed} = 6,40,000 \times \frac{5,000}{4,000} \times \frac{75}{100} \times \frac{140}{100} = \text{₹ } 8,40,000$$

$$(2) \text{ Wages} = 4,80,000 \times \frac{5,000}{4,000} \times \frac{125}{100} \times \frac{80}{100} = \text{₹ } 6,00,000$$

$$(3) \text{ Production overhead} = \frac{2,40,000}{4,80,000} \times 6,00,000 \times \frac{80}{100} = \text{₹ } 2,40,000$$

$$(4) \text{ Selling overhead} = 1,60,000 \times \frac{5,000}{4,000} = \text{₹ } 2,00,000$$

$$(5) \text{ Distribution Overhead} = \left(1,20,000 \times \frac{1}{3}\right) + \left(1,20,000 \times \frac{2}{3} \times \frac{5,000}{4,000}\right) \\ = \text{₹ } 40,000 + \text{₹ } 1,00,000 \\ = \text{₹ } 1,40,000$$

$$(6) \text{ Profit per Unit} \quad \text{₹}$$

$$\text{Selling price} \quad 600$$

$$\text{Less: Total cost per unit } (19,20,000 \div 4,000) \quad 480$$

$$\text{Profit} \quad 120$$

$$(7) \text{ Catalogue price} \quad 100$$

$$\text{Less: Trade discount} \quad 16\frac{2}{3}$$

$$\text{Net selling price} \quad 83\frac{2}{3}$$

When net selling price is $83\frac{2}{3}$, the trade discount is $16\frac{2}{3}$. It means trade discount is 20% of net selling price. Therefore, trade discount = $596 \times 20\% = \text{₹ } 119.20$.

Batch Costing

Batch costing is similar to job costing. In case of job costing, cost is ascertained for a particular job which has been undertaken as per customer's order. Generally, batch costing is used where goods are manufactured in definite quantity and held in stock for sale to customers. In many cases, batch costing is also used to manufacture goods in definite quantity as per customer's specification. In batch costing, costs are assigned to each batch rather than each job.

It is to be noted that the costing and accounting procedures of batch costing are virtually the same to those adopted in job costing. Just as each job has its order number, so each batch is allotted a definite order number. All materials issued, all labour hours booked and overhead absorbed are based on that order number.

The costing of material and labour follows normal job costing principles. When each batch is completed, the cost sheet is totaled. The total cost of the batch is divided by the quantity produced in that batch to find out cost per article / per dozen / per 100 units, etc.

Features of Batch Costing

1. The batch is the cost unit
2. The batch cost sheet is prepared in the similar manner as it is done in case of job costing. It shows essentially the same information in respect of the batch that job cost sheet shows in respect of a job.
3. Economic batch quantity is calculated after considering set up cost, carrying cost and annual demand.
4. Batch Account is opened for each batch. All direct materials, direct labour and production overheads are debited to the Batch Account. After completion, batch cost is transferred to cost of sales.

Economic batch quantity calculation has been shown in details in Chapter 3 : Accounting for Materials (Page 3.39).

Illustration 41

Component SW-10X is made entirely in machine shop No. ASW-II. Material cost is ₹ 20 per component. Each component takes 6 minutes to produce and the machine operator is paid ₹ 15 per hour. Machine hour rate is ₹ 72 per hour.

The setting up of the machine to produce the component takes 3 hours for the operator.

You are required to prepare cost sheets showing the setting up costs and the production costs, both in total (i.e., for the batch) and per component, assuming a batch size of :

- (a) 100 components;
- (b) 150 components; and
- (c) 200 components.

[I.C.W.A. (Inter) - Adapted]

Solution Cost Sheet for a Batch of 100 Components SW-10X

Particulars	Cost of the Batch	Cost per Unit
Setting up Costs :	₹	₹
Wages : 3 hours @ ₹ 15	45	
Machine hours : 3 hours @ ₹ 72	216	
	261	2.61
Production Cost :		
Materials Cost : 100 @ ₹ 20	2,000	20.00
Wages : 10 hours @ ₹ 15	150	1.50
Machine hours : 10 hours @ ₹ 72	720	7.20
Total	3,131	31.31

Cost Sheet for a Batch of 150 Components SW-10X

Particulars	Cost of the Batch	Cost per Unit
Setting up costs :	₹	₹
Wages : 3 hours @ ₹ 15	45	
Machine hours : 3 hours @ ₹ 72	216	
	261	1.74
Production Cost :		
Materials Cost : 150 @ ₹ 20	3,000	20.00
Wages : 15 hours @ ₹ 15	225	1.50
Machine hours : 15 hours @ ₹ 72	1,080	7.20
Total	4,566	30.44

Cost Sheet for a Batch of 200 Components SW-10X

Particulars	Cost of the Batch	Cost per Unit
Setting up costs :	₹	₹
Wages : 3 hours @ ₹ 15	45	
Machine hours : 3 hours @ ₹ 72	216	
	261	1.30
Production Cost :		
Materials Cost : 200 @ ₹ 20	4,000	20.00
Wages : 120 hours @ ₹ 15	30	1.50
Machine hours : 20 hours @ ₹ 72	1,440	7.20
Total	6,001	30.00

7.54 Job Costing and Batch Costing

Illustration 42

The Acme Shelving Co. Ltd. manufactures shelving brackets in batches of 300. During May, Batch No. 23 was machined at a rate of 15 per hour. Sixty of the brackets failed to pass inspection, but of these, 40 were thought to be rectifiable. The remaining 20 were scrapped, and the scrap value was credited to the batch cost account. Rectification work took nine hours.

	Batch No. 23	(₹)
Raw materials per bracket	80	
Scrap value per bracket	43	
Machinists' hourly rate	210	
Machine hour overhead rate (running time only)	180	
Setting up of machine : Normal machining	1,050	
Rectification	900	

Calculate :

(a) the cost of Batch No. 23 in total and per unit, if all units pass inspection; (b) the actual cost of Batch No. 23, in total and per unit, after crediting the recovery value of the scrapped components, and including the rectification costs; and (c) the loss incurred because of defective work.

Solution

The Acme Shelving Co. Ltd.

(a) Statement Showing the Cost of Batch No. 23

Particulars	Total	Per unit
Number of units products	300	
	₹	₹
Materials	24,000	80.00
Labour (Note 1)	4,200	14.00
Overheads (Note 2)	3,600	12.00
Set-up of machine	1,050	3.50
	32,850	109.50

(b) Statement Showing the Actual Cost of Batch No. 23

Particulars	Total	Per unit
Number of units produced	300	
Less: Scrapped units	20	
	280	
	₹	
Materials	24,000	
Labour	4,200	
Overheads	3,600	
Set-up of machine	1,050	
Rectification Cost :		
Set-up of machine	900	
Labour – 9 hours (Note 3)	1,890	
Overhead – 9 hours	1,620	
	37,260	
Less: Realisation from Sale of 20 scrapped units	(860)	
Total Cost	36,400	
Cost per unit : ₹ 36,400 ÷ 280 = ₹ 130.		

(c) Loss Incurred because of Defective Work

280 units should have cost (280 x ₹ 109.50)	30,660
Actual cost	36,400
Loss incurred	5,740

Working Notes :

- (1) Calculation of labour cost for 300 brackets = ₹ 210 / 15 × 300 = ₹ 4,200.
- (2) Calculation of overhead cost = ₹ 180 / 15 × 300 = ₹ 3,600.
- (3) Labour cost for rectification = 9 hours × ₹ 210 = ₹ 1,890.
- (4) Overhead for rectification = 9 hours × ₹ 180 = ₹ 1,620.

Illustration 43

AB Ltd. manufactures product XL 101 in batches of 100 units by a series of operations in the Fabrication and Assembly Departments of a factory. The following details relate to 42 batches manufacture by the firm during June 2012 –

Fabrication Department

Materials : Issued 2,420 kg of an alloy costing ₹ 25 per kg; 200 kg were returned at the end of the month. Off-cuts and scrap fetched ₹ 500.

Labour : Normal rate of wages is ₹ 15 per hour. Time office recorded 2,460 hours for June 2012. This included 240 hours overtime work paid at double the normal rate.

Assembly Department

Materials : Cost of components used ₹ 57,900.

Labour : Workers are paid at a piece work rate of ₹ 4 per unit for production up to 3000 units. For excess production over 3000 units upto 4000 units, the rate is 25% more and for excess production over 4000 units the rate is 50% more. During June 2012 there was stoppage of production for 10 hours due to machine breakdown and for this stoppage ten workers in the department were paid wages at time rate of ₹ 15 per hour. Calculate the average prime cost per unit of XL 101 manufacturing during June 2012

[I.C.W.A. (Inter) - Adapted]

Solution

**AB Ltd.
Cost Sheet for 42 Batches of 100 Products - XL101**

Particulars	₹	₹
Direct Materials :		
<i>Fabrication Department :</i>		
Alloy : 2,420 kg @ ₹ 25	60,500	
Less: Return to Stores	5,000	
Less: Sale of cut-off and scrap	<u>500</u>	55,000
<i>Assembly Department : Cost of components issued</i>		57,900
(A) Total Direct Materials Cost		<u>1,12,900</u>
Direct Labour :		
Fabrication Department : 2,460 hours @ ₹ 15 (Note 1)		36,900
<i>Assembly Department :</i>		
First, 3,000 units @ ₹ 4	12,000	
Next, 1,000 units @ ₹ 5	5,000	
Next, 200 units @ ₹ 6	<u>1,200</u>	18,200
(B) Total Direct Labour		<u>55,100</u>
Prime Cost (A + B)		<u>1,68,000</u>

$$\text{Average Prime Cost per Unit} = \frac{\text{Total Prime Cost}}{\text{Total Quantity}} = \frac{1,68,000}{4,200} = ₹ 40$$

Working Notes :

- (1) Overtime premium of ₹ 3,600 (240 × 15) will not be included in the price cost. Generally, it is treated as production overhead.
- (2) Payment for break-down will not be included in the prime cost.

7.56 Job Costing and Batch Costing

THEORETICAL QUESTIONS

1. Define job costing. Discuss the features of job costing. (Page 7.1) *[C.U.B.Com. (Hons.) - 2005]*
2. What are the advantages and limitations of job costing ? (Page 7.2)
3. What are the industries which use job / batch costing ? Name at least five industries. (Page 7.2)
4. What is job order number ? (Page 7.3)
5. Describe the procedures of job costing with the help of a flow chart. (Page 7.3)
6. What is the cost unit in job order cost accounting ? (Page 7.1)
7. What is meant by cost sheet ? What purpose does the cost sheet serve ? (Page 7.3)
8. What is batch costing ? What are the features of batch costing ? (Page 7.34)

PRACTICAL QUESTIONS

- 7.1 Ideal Machinery Company (P) Ltd. produces special machines made to customer's specifications. The data related to Job No. 65 is given below :
- Customer : Alfa Engineering Co. Ltd.
Item : Lathe machine
Customer order No. : C70
Date of order : 10th June, 2017
Date of start : 5th July, 2017
Date of finish : 10th August, 2017
Agreed price : ₹ 4,50,000
- Cost incurred for the job :**
Materials used : ₹ 1,85,000
Labour hours used : 600 hours
Direct labour hour rate : ₹ 50 per hour
Machine hour used : 200 hours
Applied factory overhead : ₹ 60 per machine hour
Marketing and administrative costs are charged to each order at a rate of 30% of cost to manufacture.
You are required to prepare a Job Order Cost Sheet.
- 7.2 Electronic amplifiers are the main products of Ahuja & Co (Pvt) Ltd. The following information relates to company's transactions for the month of March 2017 and was taken from the adjusted Trial Balance for that month :

	₹
Raw materials	24,080
Work-in-process	47,130
Finished goods	34,842
Raw materials purchased	1,48,580
Repairs and maintenance	5,924
Gas, light and power	14,565
Indirect materials	3,480
Indirect labour	25,024
Direct labour	74,500
Supervisors' salaries	14,290
Inventories at March 31, 2017 :	
Raw materials	37,144
Work in process	49,460
Finished goods	32,956

Required : The following computations for March 2017 :

- (a) Cost of materials used
- (b) Cost of goods manufactured
- (c) Total cost of goods sold

7.3 Mini Trucks Limited has some idle capacity in its plant, which restored by accepting orders from other automobile companies. The company has finished assembly of 15 mini trucks against special order No. 25 from Eastern Motors Limited. The pertinent date are as under :

- (a) Started : October 3, 2017
Finished : November 2, 2017

(b)	Department	Material Cost (₹ '000)	Labour Hours	Rate per Labour Hour (₹)
(i)	Assembly	150	4,500	18
(ii)	Painting	75	1,200	15
(iii)	Finishing	45	600	12

- (c) Factory pay roll for the year is expected to amount ₹ 12,81,000.

Factory overhead for the year is estimated at ₹ 17,76,000. Departmental break-up is provided below :

Department	Payroll ₹ ('000)	Factory overhead ₹ ('000)
Assembly	972	1296
Painting	225	375
Finishing	84	105

- (d) Factory overhead is based on direct labour hours. The component inventory has been supplied by Western Motors Limited but the other materials have been added by the company.
- (e) The agreed price to be charged is cost plus 20% mark-up, subject to a maximum charge of ₹ 5,000 per truck.

You are required to prepare a Cost Sheet to show :

- (a) Total cost of the job
- (b) Cost per unit
- (c) Total gross profit

7.4 HMT Ltd. produces special machine tools. The following data relates to Job order No. 205.

Customer : Modern Machinery Co. (P) Ltd.

Customer Ordre No. : D-25

Date of order : 25th September, 2017

Date of start : 4th October, 2017

Date of finish : 18th October, 2017

Description : 18 Drilling machines

Agreed sale price : ₹ 2,40,000

Particulars	Week Ending 11.10.2017	Week Ending 18.10.2017
Materials used : Dept. 1 (₹)	24,000	13,000
Direct labour rate per hour :		
Dept. 1 (₹)	4.10	4.00
Dept. 2 (₹)	5.00	5.00
Direct labour hours worked :		
Dept. 1	600	410
Dept. 2	300	140
Machine hours : Dept. 2	200	120

Applied factory overhead : Dept. 2 ₹ 1.80 per machine hour.

Marketing and administrative expenses are charged to each order at a rate of 25% of the cost to manufacture.

7.5 From the following data taken from the books of M/s. New World Company Ltd., prepare a Cost Sheet showing (a) Prime Cost; (b) Factory Cost; and (c) Total Cost of Production for the period ended 30th June, 2017 :

7.6 From the books of M/s. Aryan Enterprise, the following details have been extracted for the year ending March 31, 2017 :

Stock of Materials : Opening	1,88,000
Closing	2,00,000
Materials Purchased during the year	8,32,000
Direct wages paid	2,38,400
Indirect wages	16,000
Salaries to administrative staff	40,000
Freight : Inward	32,000
Outward	20,000

Cash discount allowed	14,000
Bad debts written off	18,800
Repairs to Plant and Machinery	42,400
Rent, Rates and Taxes : Factory	12,000
Office	6,400
Travelling expenses	12,400
Salesmen's salaries and commission	33,600
Depreciation written off : Plant and Machinery	28,400
Furniture	2,400
Directors' Fees	24,000
Electricity Charges (factory)	48,000
Fuel (for boiler)	64,000
General Charges	24,800
Manager's Salary	48,000

The manager's time is shared between the factory and the office in the ratio of 20 : 80.

From the above details you are required to prepare : (a) Prime Cost; (b) Factory Overhead; (c) Factory Cost; (d) General Overhead; and (e) Total Cost.

[I.C.W.A. (Inter) - Adapted]

- 7.7 The product manufactured by a light engineering factory undergoes two operations : Machining and Finishing. The following data are available relating to expenses incurred on production during November, 2017 :

	Machining	Finishing
Units as input	90,000	60,000
Expenses incurred in process :	₹	₹
Direct material	2,70,000	Nil
Direct labour	1,28,000	45,000
Overheads	64,000	1,35,000

At the end of the month there were 30,000 units lying incomplete in Machining Operation. While the full quantity of materials had been consumed for the total production, the expenditure on labour and overheads was estimated to be $66\frac{2}{3}\%$ in respect of the incomplete products.

You are required to prepare a detailed cost statement showing the final cost per unit assuming :

- Completed units of Machining Operation are transferred to the Finishing Operation.
- Finishing Operation has completed all the units received from the earlier operation during November, 2017 leaving no work-in-process at the end of the month.

[I.C.W.A. (Inter) - Adapted]

- 7.8 AB and Co. manufactures two types of pens P and Q. The cost data for the year ended 30th September, 2017 is as follows :

	₹
Direct materials	4,00,000
Direct wages	2,24,000
Production overhead	<u>96,000</u>
	<u>7,20,000</u>

It is further ascertained that :

- Direct materials in type P cost twice as much direct materials in type Q.
- Direct wages for type Q were 60% of those for type P.
- Production overhead was of same rate for both types.
- Administration overhead for each was 200% of direct labour.
- Selling costs were 50 paise per pen for both types.

7.60 Job Costing and Batch Costing

(f) Production during the year :

Type P : 40,000

Type Q : 1,20,000

(g) Sales during the year :

Type P : 36,000

Type Q : 1,00,000

(h) Selling price were ₹ 14 per pen for type P and ₹ 10 per pen for type Q.

Prepare a statement showing per unit cost of production, total cost, profit and also total sales value and profit separately for two types of pen P and Q.

[I.C.W.A. (Inter) - Adapted]

7.9 Following costs were incurred in producing 800 M.T. of M.S. Rods :

	₹
Materials	2,80,000
Labour	1,00,000
Processing Charges	1,00,000
Total Cost	4,80,000

Of the total output, 10% was defective and had to be sold after a discount of 10% of the normal price. The scrap arising out of the production realised a sum of ₹ 8,760. The sale price is calculated to yield 15% profit on sales.

You are required to find out the normal price as well as the discounted price of M.T. of M.S. Rods.

[I.C.W.A. (Inter) - Adapted]

7.10 A firm has purchased a plant to manufacture a new product, the cost data for which is given below :

Estimated annual sales	24,000 units
<i>Estimated costs :</i>	
Material	₹ 4.00 per unit
Direct labour	₹ 0.60 per unit
Overheads	₹ 24,000 per year
Administrative expenses	₹ 28,800 per year
Selling expenses	15% of Sales

Calculate the selling price if profit per unit is ₹ 1.02.

[I.C.W.A. (Inter) - Adapted]

7.11 A company makes two distinct types of electronic toys X and Y. The total expenses during a period as shown by the books for assembly of 600 of X and 800 of Y are as under :

	₹		₹
Materials	1,98,000	Depreciation	2,200
Direct wages	12,000	Labour amenities	1,500
Stores overhead	19,000	Works general	30,000
Running expenses of machines	4,400	Administration and Selling	26,800

Other data available to you are :

	X	:	Y
Materials cost ratio per unit	1	:	1
Direct labour ratio per unit	2	:	3
Machine utilisation ratio per unit	1	:	2

Calculate the cost of each toy per unit giving reasons for the basis of apportionment of expenses adopted by you.

[C.U.B.Com. (Hons.) - Adapted]

- 7.12 The books of a company show the following information relating to the month of January, 2017 :

	₹
Direct labour cost (being 175% of Works overhead)	17,500
Cost of goods sold excluding administration expenses	56,000
General and administration expenses	2,500
Selling expenses	3,500
Sales for the month	75,000
Inventory Accounts show the following opening and closing balances :	

	01.01.2017	31.01.2017
	₹	₹
Raw materials	8,000	10,600
Work-in-progress	10,500	14,500
Finished goods	17,600	19,000

You are required to :

- Compute the value of raw materials purchased.
- Prepare a cost statement showing the various elements of cost and profit earned.

[C.A. (Inter) - Adapted]

- 7.13 Music India Ltd. has furnished the following information in relation to the production of 1,000 compact discs manufactured by it during the year 2017 :

	₹
Cost of materials	1,00,000
Direct wages paid	70,000
Cost of power and consumable stores (20% fixed)	15,000
Factory indirect wages paid (40% fixed)	20,000
Cost of lighting in the factory (fixed)	10,000
Office expenses incurred (fixed)	30,000
Selling expenses paid (70% variable)	50,000
Depreciation of plant (under straight line method)	10,000

The entire output were sold at ₹ 350 per unit.

For the year 2018, it is estimated that the production will be increased by 50% by utilising the spare capacity and the rates for materials and direct wages will be increased by 10% and 20% respectively. The expenses of the company are either fixed or variable and the company assumes that the nature of the expenses will not change in the coming days.

You are required to prepare :

- A cost sheet for the year 2017 showing the cost per unit.
- A statement showing estimated cost and profit for the year 2018 assuming that all the goods produced would be sold at a price of ₹ 340 per unit.

[C.U.B.Com. (Hons.) - Adapted]

- 7.14 The following data relates to the manufacture of a standard product during the four week to July 27, 2017:

Raw materials consumed	₹ 25,000
Manual and machine labour wages (directly chargeable)	₹ 15,000
Chargeable expenses	₹ 4,500
Machine hours worked	1000 hours
Machine hour rate	₹ 2.50
Establishment and general expenses	4,700
Selling and distribution overhead per unit	8 paise
Units produced	10,000
Units sold	8,000
Selling price per unit	₹ 6

7.62 Job Costing and Batch Costing

- (a) You are required to prepare a Cost Sheet in respect of the above showing therein the cost per unit under each element of cost and the profit for the period.
Also show the percentage that the works overhead cost bears to the manual and machine labour wages and the percentage that the establishment and general expenses bear to the works cost.
- (b) What price should the company quote to produce 1,000 units of another product which will require an expenditure of ₹ 8,000 for raw materials and ₹ 6,000 for direct wages, so that it will yield a profit of 25% on cost of sales ? *[C.U.B.Com. (Hons.) - Adapted]*

7.15 Ahuja Electronics Ltd. furnished the following information for 10,000 computer parts manufactured during the year 2017 :

	₹
Materials	90,000
Direct wages	60,000
Power and consumable stores	12,000
Factory indirect wages	15,000
Lighting of factory	5,500
Defective work (cost of rectification)	3,000
Selling expenses	5,500
Sale proceeds of scraps	2,000
Plant repairs, maintenance and depreciation	11,500
Clerical salaries and management expenses	33,500

The net selling price was ₹ 31.60 per unit sold and all the units were sold. As from 1st January, 2017, the selling price was reduced to ₹ 31.00 per unit. It was estimated that production could be increased in 2017 by 50% utilising spare capacity. Rates for materials and direct wages will increase by 10%.

You are required to prepare :

- (i) Cost sheet for the year 2017 showing various elements of cost.
- (ii) Estimated cost sheet for the year 2017 assuming that 15,000 units will be produced and sold during the year and factory overhead will be recovered as a % of direct wages and office and selling expenses as a % of works cost. *[C.S. (Inter) - Adapted]*

7.16 The Managing Director of a company producing consumer durables seeks your assistance in the matter of fixation of selling price for one its products called 'X'. The cost structure of product 'X', the unit selling price of which is ₹ 45,000 is as under :

Direct materials : 50%; Direct Labour : 20%; Overhead : 30%.

An increase of 15% in the cost of materials and 25% in the cost of labour is anticipated. These increased costs in relation to the present selling price would cause a 25% decrease in the amount of present profit per unit of 'X'.

You are required to :

- (i) Prepare a Statement of Profit per unit as at present.
- (ii) Find out the revised selling price to produce same percentage of profit to sales as before.

7.17 P Ltd. a manufacturer of fans, manufactured and sold 2000 fans during the year ended 31.3.2017. Following is the Profit and Loss Account of the company during the year :

P&L Account for the year ended 31.3.2017

	₹		₹
To Opening Stock of Raw Materials	20,000	By Sales	6,00,000
To Purchases of Raw Materials	1,30,000	By Closing Stock of Raw Materials	30,000
To Wages	1,80,000		
To Manufacturing Expenses	75,000		
To Gross Profit c/d	2,25,000		
	<u>6,30,000</u>		<u>6,30,000</u>

To Rent, Rates and Taxes	20,000	By Gross profit b/d	2,25,000
To Administration Expenses	1,00,000	By Dividend Received	3,000
To Selling and Distribution Expenses	45,000		
To Preliminary Expenses written off	8,000		
To Donation	5,000		
To Net Profit c/d	50,000		
	<u>2,28,000</u>		<u>2,28,000</u>

The estimates made by the company for the year ending 31.3.2018 are as under :

- The production and sale of fans will increase by 50%.
- The price of material per fan would increase by 20%.
- The labour cost per fan would go up by 10%.
- Of the manufacturing expenses, ₹ 15,000 are fixed and the balance are variable. The variable portion will be in the same proportion of material consumed and wages as in the previous year.
- Administration expenses are to be charged at the same respective percentage as in the previous year.
- Selling and distribution expenses per fan would remain unchanged.
- Selling price per fan will decrease by 10%.

You are required to prepare two separate cost sheets for the years 2016-17 and 2017-18 showing cost, profit and selling price per fan and the total cost, total profit and total sales.

[C.U.B.Com. (Hons.) - Adapted]

- 7.18 The comparative profit statement of two quarters of a firm is as under :

	1st quarter	2nd quarter
Units sold	2,500	3,750
	₹	₹
Direct materials	87,500	?
Direct wages	62,500	?
Fixed and variable factory overheads	75,000	95,000
Sales	2,75,000	?
Profit	50,000	66,250

In the 2nd quarter, the direct material price has increased by 20%. There was a saving of ₹ 5,000 in fixed overheads in the 2nd quarter. The other costs and selling price remained the same.

Determine the per unit selling price in the 2nd quarter.

[C.A. (Inter) - Adapted]

- 7.19 A company operates at 50% of capacity utilisation. At this level of operation, the sales value is ₹ 9,00,000. At 100% capacity utilisation, the following costs and relationship will apply :

Factory overheads (50% variable)	₹ 1,80,000
Factory cost	60% of Sales
Selling cost (75% variable)	20% of Sales

The company anticipates that its sales will increase upto 75% of capacity utilization. The company also receives a special order from a Government department. This order will occupy 15% of capacity utilisation of the plant. The prime cost of this order is ₹ 1,35,000 and the variable selling cost will only be 2% of the sales value offered. Besides, the cost of processing the order is ₹ 8,000. The sale price offered is ₹ 1,45,000.

You are required to :

- Present a statement of profitability at 50% and 75% levels of activity.
- Evaluate the Government order and state whether it is acceptable or not.

[C.A. (Inter) - Adapted]

7.64 Job Costing and Batch Costing

7.20 The works overhead of a factory producing a single article, at different operating levels are as follows :

Operating level capacity	Works overhead (₹)
80%	72,000
100%	80,000
60%	66,000
120%	1,00,000

At present the factory is working at a 60% operating level and its annual sales amount to ₹ 2,88,000. Selling prices are based on 100% capacity and bear the following relationship with costs at this level :

Factory cost	66.67% of sales value
Prime cost	75% of the factory cost
Administrative and selling expenses (75% variable)	20% of sales value

The management receives an order from Mr. Dalal for carrying out some work valued at ₹ 66,000 p.a. which will take 40% of capacity. The prime cost for the work is estimated at ₹ 40,000. There will be an addition of ₹ 3,000 p.a. to administrative expenses.

Calculate :

- Profit on current production.
- Is the order of Mr. Dalal is acceptable ?

[C.A. (Inter) - Adapted]

7.21 A factory can produce 60,000 units per annum at its optimum (100%) capacity. The estimated cost of production is as under :

Direct material	₹ 18 per unit
Direct labour	₹ 12 per unit
Indirect expenses :	
Fixed	₹ 9,00,000 p.a.
Variable	₹ 30 per unit
Semi-variable	₹ 3,00,000 p.a. upto 50% capacity

and an extra expense of ₹ 60,000 for every 20% increase in capacity or part thereof.

If the production programme of the factory is as indicated below, and the management desires to ensure a profit of ₹ 2,76,000 for the year, work out the average selling price at which each unit should be quoted:

First 3 months of the year	50% of capacity
Remaining 9 months	80% of capacity

Ignore selling, distribution and administration overheads.

[C.A. (Inter) - Adapted]

7.22 In an engineering company, the factory overheads are recovered on a fixed percentage basis on direct wages and the administrative overheads are absorbed on a fixed percentage basis on factory cost. The company has furnished the following data relating to two jobs undertaken by it in a period :

	Job 101 (₹)	Job 102 (₹)
Direct materials	54,000	37,500
Direct wages	42,000	30,000
Selling price	1,66,650	1,28,250
Profit percentage on total cost	10%	20%

Required :

- (1) Computation of percentage recovery rates of factory overheads and administrative overheads.
- (2) Calculation of the amount of factory overheads, administration overheads and profit for each of the two jobs.
- (3) Using the above recovery rates fix the selling price of Job 103. The additional data being :

Direct materials	₹ 24,000
Direct wages	₹ 20,000
Profit percentage on selling price	12½%.

[C.A. (Inter) - Adapted]

Guide to Answers

Practical Questions

- 7.1 Works cost : ₹ 2,27,700; Total cost : ₹ 2,95,100; Profit : ₹ 1,54,900.
- 7.2 (a) ₹ 1,36,516 (cost of materials used)
 (b) ₹ 2,71,969 (cost of goods manufactured)
 (c) ₹ 2,74,855 (total cost of goods sold)
- 7.3 (a) Total cost of the job : ₹ 33,27,000*
 (b) Cost per unit : ₹ 2,21,800
 (c) Total gross profit : ₹ 6,65,400
 *(Materials ₹ 2,70,000; Labour ₹ 12,81,000; Factory overheads ₹ 17,76,000)
- 7.4 Direct materials : ₹ 37,000; Direct labour : ₹ 6,300; Factory overhead charged : ₹ 2,576; Total cost to manufacture : ₹ 45,876; Administrative expenses : ₹ 11,469; Profit : ₹ 1,82,655.
- 7.5 (a) Prime Cost : ₹ 70,00,000.
 (b) Factory cost : ₹ 1,07,80,000
 (c) Cost of production : ₹ 1,07,80,000
 [Note : Expenses relating to office and sales department including directors' fees have not been taken into consideration for calculating cost of production.]
- 7.6 (a) Prime Cost : ₹ 10,90,400;
 (b) Factory overhead : ₹ 2,20,400;
 (c) Factory cost : ₹ 13,10,800;
 (d) General overhead : ₹ 2,02,000; (e) Total cost : ₹ 15,12,800.
 [Note : Cash discount and bad debts being financial items are excluded in cost calculations.]
- 7.7 (i) Cost per unit after Machining operation : ₹ 5.40 (Direct materials : ₹ 3.00 + Direct labour : ₹ 1.60 + Overhead : ₹ 0.80)
 (ii) Total cost per unit after Finishing operation (₹ 5.40 + ₹ 0.75 + ₹ 2.25) = ₹ 8.40
 (iii) Cost charged to Work-in-Progress (90,000 + 32,000 + 16,000) = ₹ 1,38,000.
 (iv) Equivalent Units :

Units totally completed	60,000
W.I.P. (30,000 × 66 ⅔%)	<u>20,000</u>
	80,000
- 7.8 (a) Prime cost : P - ₹ 2,40,000; – ₹ 3,84,000
 (b) Cost of production : P : ₹ 4,24,000; Q : ₹ 7,44,000
 (c) Profit : P : ₹ 1,04,400; Q : ₹ 3,30,000
- 7.9 Net cost of production = ₹ 4,71,240; Sales - ₹ 5,54,400; Equivalent good production : 792 MT.
 (i) Normal price of good production = (5,54,400 / 792) = ₹ 700.
 (ii) Discounted price = ₹ 700 – ₹ 70 = ₹ 630.

7.66 Job Costing and Batch Costing

- 7.10 (a) Total cost of production = ₹ 1,63,200.
(b) Sales = ₹ 2,20,800; Selling price per unit = ₹ 9.20
(c) Selling expenses = ₹ 33,120.
- 7.11 Total cost of each toy : X - ₹ 138.43; Y - ₹ 263.55
Direct materials X - ₹ 90.000; Y - ₹ 180.00
Direct wages X - ₹ 6.67; Y - ₹ 10.00
Works cost X - ₹ 125.81; Y - ₹ 239.52
- 7.12 (a) Value of raw materials purchased : ₹ 36,500
(b) Prime cost : ₹ 51,400; Works cost : ₹ 57,400; Cost of goods sold : ₹ 58,300; Cost of sales : ₹ 62,000; Profit : ₹ 13,000.
- 7.13 (a) Prime cost : ₹ 170; Works cost : ₹ 225; Cost of production : ₹ 255; Cost of sales : ₹ 305; Profit : ₹ 45.
(b) Prime cost : ₹ 194; Works cost : ₹ 238.67; Cost of production : ₹ 258.67; Cost of sales : ₹ 303.67; Profit : ₹ 36.33.
- 7.14 (a) Prime cost per unit : ₹ 4.45; Works cost per unit : ₹ 4.70; Cost of production per unit : ₹ 5.17; Cost of goods sold per unit : ₹ 5.17; Cost of sales per unit : ₹ 5.25; Profit per unit : ₹ 0.75.
(b) Prime cost per unit : ₹ 14.00; Works cost per unit : ₹ 15; Cost of production : ₹ 16.50; Cost of sales per unit : ₹ 16.58; Quotation price : ₹ 20.725 per unit.
- 7.15 (a) Prime cost : ₹ 1,50,000; Works cost : ₹ 1,95,000; Cost of production : ₹ 2,28,500; Cost of sales : ₹ 2,34,000; Profit : ₹ 82,000.
(b) Prime Cost : ₹ 2,47,500; Works cost : ₹ 3,21,750; Cost of sales : ₹ 3,86,100; profit : ₹ 78,900.
- 7.16 (i) Profit per unit at present : ₹ 15,000; Total cost : ₹ 30,000.
(ii) Revised selling price : ₹ 50,625; Profit : ₹ 16,875.
- 7.17 (i) **For the year 2016-17**
Prime cost : ₹ 3,00,000; Works cost : ₹ 3,75,000; Cost of production : ₹ 4,95,000; Cost of sales : ₹ 5,40,000; Profit : ₹ 60,000.
(ii) **For the year 2017-18**
Prime cost : ₹ 5,13,000; Works cost : ₹ 6,30,000; Cost of production : ₹ 8,18,781; Cost of sales : ₹ 8,86,281; Loss : ₹ 76,281.
- 8.18 Cost per unit in 2nd quarter : Direct materials : ₹ 42; Direct labour ₹ 25; Factory overhead : ₹ 25.33; Profit: ₹ 17.67; Selling price : ₹ 110; Total Sales : ₹ 4,12,500.
- 8.19 (i) Profit at 50% : ₹ 90,000; Profit at 75% : ₹ 2,25,000
(ii) Special order for Government can not be accepted as it will lead to a loss of ₹ 14,400.
- 8.20 (a) Profit on current production : ₹ 10,800; Prime cost : ₹ 1,44,000; Works cost : ₹ 2,10,000; Cost of sales : ₹ 2,77,200.
(b) New order from Mr. Dalal is not acceptable. It will lead to a loss of ₹ 900.
- 8.21 (i) Total production for the year : 43,500 units.
(ii) Total semi-variable overhead for the year : ₹ 3,90,000.
(iii) Total prime cost : ₹ 13,05,000; Total cost : ₹ 39,00,000.
(iv) Average selling price per unit : ₹ 96.
- 8.22 (1) Recovery of factory overhead : 60% of direct wages. Recovery of administration overhead : 25% of factory cost.
(2) Factory overhead : Job 101 - ₹ 25,200; Job 102 - ₹ 18,000
Administration overhead : Job 101 - ₹ 30,300; Job 102 - ₹ 21,375
Profit : Job 101 - ₹ 15,150; Job 102 - ₹ 21,375.
(3) Selling price of Job 103 : ₹ 80,000.

Contract Costing

Introduction

Contract costing is an extension of job costing system. It follows the same principles as job costing. In contract costing, a separate account is opened for each contract. All cost relating to such contract is debited to the Contract Account.

The objectives of contract costing is to ascertain the cost incurred and to show the profit earned or loss suffered on each contract undertaken after its completion as also from time to time during the period of its execution.

Contract costing method can be applied in the following industries:

1. Civil Engineering,
2. Shipbuilding,
3. Aircraft Manufacturing,
4. Construction and Mechanical Engineering, etc.

Characteristics of Contract Costing

The main characteristics of contract costing are the following:

- (i) The work is undertaken as per customer's special requirements.
- (ii) The work may continue over more than one accounting period.
- (iii) The contract price is usually fixed in advance. Any additional work may be charged separately. There may be a provision in the contract to allow the contractor to pass on to the client additional costs incurred due to price rise of materials or wages awards, etc..
- (iv) The work is usually site-based – carried out away from the contractor's premises.
- (v) Most costs can be classified as direct since a contract is physically separate from other contracts.
- (vi) Payments are received at regular intervals which is based on work certified.
- (vii) Materials may be purchased specially for the contract and delivered direct to the contract site. Some materials may be issued from central stores located near head office.
- (viii) Specialist sub-contractors may be employed for the contract, e.g., electricians, lift manufacturers and plumbers, etc.
- (ix) Special plant and equipment is often purchased or hired from outside for the duration of the contract.
- (x) The completion date is usually fixed in advance and penalties may be incurred by the contractor for non-completion within the stipulated time.
- (xi) In case of a long-term contract (extends over more than one accounting period), a certain portion of **Notional Profit** (value of work certified *plus* cost of work uncertified *less* cost of contract upto date) is credited to Profit and Loss Account at the year end. But in case of **loss**, the entire loss is debited to Profit and Loss Account.
- (xii) Ascertainment of profit under contract costing is an exception to the concept of realization. Here, costs are not matched against revenues. Instead, revenues are matched against costs.

8.2 Contract Costing

Types of Contract

There are two types of contract:

- (i) Fixed price contract and (ii) Cost-plus contract

Fixed-price Contract

In this type of contract, price is usually fixed and ***agreed upon*** in advance. Generally, tenders are invited giving details of the contract to fix up the contract price. As per agreement between the parties, any additional work may be charged separately. There may be a provision in the agreement to allow the contractor to pass to the contractee additional costs incurred due to price rise of materials or wages awards, etc.

Cost-plus Contract

Cost-plus contract is a contract in which price is ***not agreed upon*** in advance for one reason or other. This type of contract is entered into when it is ***impossible*** to calculate future price or cost with reasonable accuracy because of lack of past records and experience or because of peculiar circumstances, ***for example***, drilling of oil well. The contract price is ascertained later by adding a fixed percentage of profit to the total cost of the contract. Different items of expenditure to be considered for ascertaining cost of the contract are agreed upon in advance.

Advantages of Cost-plus Contract

For the Contractor

- (1) The contractor is assured of a fixed profit margin.
- (2) There is no chance of incurring any loss on the contract.
- (3) The contractor is not affected by any fluctuations in the market prices of different elements of cost.
- (4) Submission of tenders becomes simple.

For the Contractee

- (1) The contractee feels satisfied because the price is based on actual cost.
- (2) In an uncertain situation, the contractee is completely protected.

Disadvantages of Cost-plus Contract

For the Contractor

- (1) It discourages contractor to take measures for cost reduction because the profit is based on cost. Lower cost will lead to lower profit.
- (2) Disputes may arise between the parties.

For the Contractee

- (1) Generally profit is based on cost. It encourages wasteful expenditure since the higher the cost, the larger will be the profit.
- (2) The amount to be paid by the contractee is uncertain because it can not be determined until the work is completed. It may create certain problems in cash management.

In this chapter, we will consider fixed price contract only.

Important Terms Used in Contract Costing

Contractor: Contractor is the party who undertakes to carry out the contract against customer's specific requirements.

Contractee: Contractee is the party for whom the contract is undertaken by the contractor.

Value of Work Certified: In case of long-term contracts, the contractor insists upon the payment of contract price in installments. If the contractor does not receive payment until completion of the entire contract then his financial liquidity is likely to be hampered. Generally, contract provides for the contractee to make interim payments either at specific stages of work, e.g., when 1st floor is completed or at particular agreed intervals, e.g., quarterly or half-yearly. Engineers and/or architects, as appropriate, acting for the contractee will issue certificate (on completion of each stage of the contract) to the contractor. This is a document which certifies the value of work so far done at *selling prices*. This certificate accompanies the invoice sent to the contractee. The amount of any particular installment depends upon the value of work certified. The contractee is debited and the Contract Account is credited with the *value of work certified*.

Retention Money: A contract may provide that a percentage of the total value of the work certified will be withheld from payment for a specified period or until shortly after the contract is completed. This withheld amount is known as *retention money*. The purpose of this deduction is to place the contractee in a favourable position if any faults or defects are discovered after the payment is made. This retention money is released when the contract is successfully completed and accepted by the contractee.

Cash Received: It is the amount received by the contractor against work certified after deduction of retention money. *For example*, value of work certified is ₹ 2,00,000. Retention money is 10%. In this case cash received will be ₹ 2,00,000 – ₹ 20,000 = ₹ 1,80,000.

Cost of Work Uncertified: This is the cost of work which has been incurred but *not yet certified* by the contractee.

Recording of Costs in a Contract

For each contract, *a separate* Contract Account is opened where all the costs are debited. Since each contract has its own identity and is physically separate, it is possible to identify a substantial proportion of costs as direct. The following is the procedure for recording various costs:

The Cost of Materials

Materials may be issued to the contract in any of the following ways:

- (a) Ordered specifically for the contract and delivered direct to the site.
- (b) Issued from central stores as per requisition of the contract foreman.
- (c) Unused materials transferred from other contracts site.

All materials sent to the contract site are *debited* to the Contract Account. Contract Account is *credited* with the cost of the materials which are either returned to stores or transferred to another contract. If a part of the material is stolen or lost by fire, Contract Account is also credited from the *cost of goods lost*. Lastly, for stock adjustment, Contract Account is credited for any materials lying unconsumed at the year end.

The Cost of Labour

Wages paid to all the workers engaged in a particular contract are debited to that Contract Account. Any outstanding wages, at the year end, should be added with the wages that have already been paid. Conversely, any wages which have been paid in advance, should be deducted from the total wages paid.

Direct Expenses

All direct expenses such as architect's fees and consultants' fees, insurance, telephone, postage, etc. are debited to the Contract Account. Any outstanding expenses, at the year end, should be added with the

8.4 Contract Costing

expenses that have already been paid. Similarly, any expenses which have been paid in advance should be deducted from the total expenses paid.

Plant and Machinery

Plant and machinery used in contracts may be classified as (i) General Plant; and (ii) Special Plant.

A plant is general when it is used for several contracts. These plants are sent to contract site only for a short period. **Examples of general plants** are : cement mixers, compressors, bulldozers, mobile cranes, tractors, etc.

A plant is special when it is specifically purchased for a particular contract. It is used in that contract for several years.

Special plants and general plants are charged to a contract in the following manner:

Special Plant: The original cost of new plant or the written-down value of "past used" plant is debited to the Contract Account. At the year end, it will be revalued and credited to the Contract Account. When contract is completed or the plant is no longer required, it may be sold at the site. The sale proceeds are credited to the Contract Account. If the plant is required for use on the other contract, the New Contract Account is debited and the existing Contract Account is credited.

General Plant: An hourly rate for each item of general plant and machinery is calculated and a charge for the hire of the plant and machinery may be made to each contract, based upon the hours of use. The hourly rate is calculated in a similar way to a machine hour rate and may include all charges for plant such as operator's wages, fuel, power, repairs, maintenance, depreciation etc. The rate may be segregated between standing costs and variable costs. Standing costs may be charged to a contract on a weekly or monthly basis, whereas variable costs can be charged on an hourly basis.

If a plant is taken on hire, actual hire charges are debited to the Contract Account.

The Cost of Overhead

All indirect expenses such as materials handling cost, expenses of central stores, supervisor's salary, office expenses, etc. are apportioned among the contracts on a reasonable basis. Generally **direct labour hour** is used as the basis of apportionment of indirect cost.

The Cost of Sub-Contract Work

When the contractor gives sub-contract for certain types of specialist work, e.g., electrical installations, lift, etc. the Contract Account is debited with the full value of sub-contracted work. A provision must be made in the Contract Account for expenses not yet charged by the sub-contractor.

Ascertainment of Profit or Loss of a Short-term Contract

A contract is termed as a **short-term contract** if it is initiated or commenced and completed during the course of a financial year. The profit for a short-term contract is the difference between the contract price and the total cost incurred for the contract.

All costs (e.g., material, labour and overhead) incurred for the contract are debited to the Contract Account. Contract price and unconsumed materials are credited to the Contract Account. If the credit side is more, it indicates a profit. If the debit side is more, it indicates a loss. At the end of the accounting period, profit or loss on contract is transferred to the Profit and Loss Account.

The following illustration will explain it.

Illustration 1

X Ltd. had two contracts which were initiated and completed within the Company's financial year ended on 31st March, 2017.

	Contract A	Contract B
Date of commencement	1.4.2016	1.7.2016
Date of completion	31.3.2017	31.3.2017

	₹	₹
Total contract price	18,00,000	6,00,000
Value of plants installed at the beginning	2,00,000	1,00,000
Materials issued	5,00,000	3,00,000
Wages paid	6,00,000	2,00,000
General expenses paid	2,00,000	1,20,000
Accrued wages on 31.3.2017	30,000	20,000
Accrued general expenses on 31.3.2017	20,000	10,000
Materials in hand on 31.3.2017	10,000	5,000

Plants at site are to be depreciated @ 20% p.a.

You are required to prepare Contract Accounts showing the profit or loss on contracts.

Solution

In the books of X Ltd.

Contract Account – A

Dr.	[Period : April 1, 2016 to March 31, 2017]		Cr.
Particulars	₹	Particulars	₹
To Materials	5,00,000	By Materials in hand	10,000
To Wages 6,00,000		By Plant at Valuation (Note 1)	1,60,000
Add: Outstanding wages <u>30,000</u>	6,30,000	By Contractee A/c	18,00,000
To General expenses 2,00,000			
Add: Outstanding Expenses <u>20,000</u>	2,20,000		
To Plant at cost	2,00,000		
To Profit and Loss A/c	4,20,000		
	19,70,000		19,70,000

Working Note: (1) Depreciation on plant has been charged @ 20% p.a. on ₹ 2,00,000, i.e., ₹ 40,000. The written-down value of the plant on 31st March, 2017 = (₹ 2,00,000 – ₹ 40,000) = ₹ 1,60,000. *Alternatively*, Contract Account can be debited with ₹ 40,000.

Contract Account – B

Dr.	[Period : July 1, 2016 to March 31, 2017]		Cr.
Particulars	₹	Particulars	₹
To Materials	3,00,000	By Materials in hand	5,000
To Wages 2,00,000		By Plant at Valuation (Note 2)	85,000
Add: Outstanding wages <u>20,000</u>	2,20,000	By Contractee A/c	6,00,000
To General expenses 1,20,000		By Profit and Loss A/c (Loss)	60,000
Add: Outstanding expenses <u>10,000</u>	1,30,000		
To Plant at cost	1,00,000		
	7,50,000		7,50,000

Working Note: (2) Depreciation on plant has been charged @ 20% p.a. on ₹ 1,00,000, for 9 months, i.e., ₹ 15,000. The written-down value of the plant on 31st March, 2017 = (₹ 1,00,000 – ₹ 15,000) = ₹ 85,000. *Alternatively*, Contract Account can be debited with ₹ 15,000.

Ascertainment of Profit of a Long-term Contract

A contract which takes several years for completion is termed as **Long-term Contract**. In case of a long-term contract, it is extremely difficult to find out the true and correct profit of the contract until it is completed. If the period of the contract is long, the cost of the contract may be affected by many adverse factors, e.g., Government policies, adverse weather conditions, unknown geological faults, etc. Because of uncertain future, a prudent and conservative attitude should be followed in the calculation of profits earned at an intermediate stage of a long-term contract. There is no hard and fast rule regarding this – the attitude of the individual firms vary. Some of these are as under:

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- (1) Some firms are of the opinion that no part of the profit should be transferred to Profit and Loss Account until the contract has been completed. The entire profit of the intermediate period should be carried forward as reserve.
- (2) Some firms make a little variation from the above. In their opinion no part of the profit should be transferred to Profit and Loss account until the contract is nearing completion and the future costs to be incurred for completing the contract, can be ascertained with reasonable accuracy.
- (3) Other firms ascertain **notional profit** (value of work certified + cost of work uncertified – cost of contract upto date) at the end of the each accounting period and a portion of the notional profit is taken to Profit and Loss Account.

For a long term contract, it is usual to take a part of the **notional profit** to the Profit and Loss Account each year. There are different factors which are to be taken into consideration while transferring a portion of the notional profit to Profit and Loss Account. These are as follows:

- (1) The degree of completion of the contract.
- (2) The value of work certified.
- (3) The retention percentage.
- (4) The amount of notional profit.
- (5) The possibility of penalties.
- (6) Future estimated costs to be incurred.
- (7) Contingencies likely to affect the ultimate profit.

The following methods are generally adapted for calculating profit to be credited to Profit and Loss Account in case of an incomplete contract.

(1) When the contract is upto 25% complete

No portion of the notional profit is to be taken to the Profit and Loss Account, i.e., the entire amount of the notional profit is to be carried forward as reserve.

(2) When the contract is above 25% complete but not exceeding 50% complete

The portion of the notional profit to be taken to the Profit and Loss Account is ascertained by applying the following formula :

$$\frac{1}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

Alternatively, 1/3 × Notional Profit

(3) When the contract is above 50% complete but not exceeding 75% complete

The portion of the notional profit to be taken to the Profit and Loss Account is ascertained by applying the following formula :

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

(4) When the contract is above 75% complete or nearing completion

In this case a certain portion of **estimated profit** is transferred to the Profit and Loss Account. The future cost to be incurred, with reasonable accuracy to complete the contract as increased by an adequate provision for contingencies are added with the costs **already incurred** to arrive at the total estimated cost of the contract. This is deducted from the total contract price and estimated profit is ascertained.

For calculating the amount of profit to be transferred to the Profit and Loss Account, any of the following formula can be adopted according to availability of information:

$$(i) \text{Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}}$$

$$(ii) \text{Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

$$(iii) \text{Estimated Profit} \times \frac{\text{Cost of Work to Date}}{\text{Estimated Total Cost}}$$

$$(iv) \text{Estimated Profit} \times \frac{\text{Cost of Work to Date}}{\text{Estimated Total Cost}} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

Students should note that 'Notional Profit' and 'Estimated Profit' are two different things and these are calculated as follows :

(1) Calculation of Notional Profit		(2) Calculation of Estimated Profit	
Value of Work Certified	***	Contract Price	***
Add: Cost of Work not Certified	***	Less: Estimated total cost:	
	***	Cost of work completed	***
Less: Cost of Contract upto Date	***	Add: Additional cost to be incurred	
Notional Profit	***	to complete the contract	***
		Add: Contingencies, if any	***
		Estimated Profit	***

(5) In case of a loss, the entire amount is transferred to the Profit and Loss Account irrespective of the percentage of completion.

Calculation of Percentage of Completion of a Contract

The progress of a contract has a direct relationship with the amount of profit to be transferred to Profit and Loss Account. For calculation of progress of a contract, any of the following formula can be adopted depending upon the information available:

$$(i) \text{Percentage of Completion} = \frac{\text{Cost of Work to Date}}{\text{Total Estimated Cost of Contract}} \times 100$$

$$(ii) \text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$(iii) \text{Percentage of Completion} = \frac{\text{Labour Hours up to Date}}{\text{Total Estimated Labour Hours}} \times 100$$

For measuring the profit of an accounting period, first we ascertain the revenues of that accounting period and then match the costs incurred for achieving that revenue. But in Contract Account, the above procedure is reversed. Here cost incurred for an accounting period is first identified and then revenue is matched against these costs.

8.8 Contract Costing

Calculation of Work-in-Progress for Balancing Sheet Purpose

There are different methods of calculating work-in-progress for Balance Sheet purpose. Some of them are as follows. It is to be noted that the value of work-in-progress will be same in all the methods.

Method 1	₹	Method 2	₹	Method 3	₹
Cost of Contract to Date	***	Value of Work Certified	***	Work not yet Certified	***
Add: Profit transferred to Profit and Loss A/c	***	Work not yet Certified	***	Add: Retention money	***
	***		***		***
Less: Cash Received	***	Less: Reserve Profit	***	Less: Reserve Profit	***
Work-in-Progress	***		***	Work-in-Progress	***
		Less: Cash Received	***		
		Work-in-Progress	***		

Illustration 2

The following particulars are available in respect of a contract as on 31st March, 2017 (all figures in rupees).

- (i) Contract price 9,00,000
- (ii) Total cost of contract upto date 4,26,900
- (iii) Cost of uncertified work 15,000
- (iv) Cash received 3,60,000
- (v) Retention money @ 20%

Compute the amount of profit that may be credited to Profit and Loss Account and Value of Work-in-Progress.

Solution

(a) Calculation of Notional Profit

	₹
Value of work certified (Note 1)	4,50,000
Add: Cost of work uncertified	15,000
	4,65,000
Less: Total cost of contract	4,26,900
Notional Profit	<u>38,100</u>

(b) Calculation of Percentage of Completion :

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{4,50,000 + 15,000}{9,00,000} \times 100 = 51.67\%$$

$$\text{(c) Profit to be Credited to Profit and Loss Account} = \frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

$$= \frac{2}{3} \times 38,100 \times \frac{3,60,000}{4,50,000} = ₹ 20,320$$

(d) Calculation of Work-in-Progress

Total cost of contract	4,26,900
Add: Profit credited to Profit and Loss Account	20,320
	4,47,220
Less: Cash received	3,60,000
Value of work-in-progress	<u>87,220</u>

Working Note :

$$\text{(1) Value of Work Certified} = \frac{\text{Cash Received}}{100\% - \text{Retention Percentage}} = \frac{3,60,000}{100\% - 20\%} = ₹ 4,50,000$$

Illustration 3

A contract is expected to be completed in year 4, exhibits the following information :

End of year	Value of work certified (₹)	Cost of work to date (₹)	Cost of work not yet certified (₹)	Cash received (₹)
1	0	50,000	50,000	0
2	3,00,000	2,30,000	10,000	2,75,000
3	8,00,000	6,00,000	20,000	7,50,000

The contract price is ₹ 10,00,000 and the estimated profit is 20%.

You are required to calculate, how much profit should have been credited to the Profit and Loss Account by the end of the year 1, 2 and 3.

Solution

- (i) Estimated total cost of the contract = Contract price *less* estimated profit.

Estimated total cost = ₹ 10,00,000 – ₹ 2,00,000 = ₹ **8,00,000**.

- (ii) **Profits to be transferred at the end of the year 1**

$$\text{Percentage of Completion} = \frac{\text{Cost of work upto date}}{\text{Estimated total cost}} \times 100 = \frac{50,000}{8,00,000} \times 100 = 6.25\%$$

No profit is to be transferred to Profit and Loss Account as the percentage of completion is below 25%.

- (iii) **Profits to be transferred at the end of the year 2**

$$\text{(a) Percentage of Completion} = \frac{\text{Cost of work upto date}}{\text{Estimated total cost}} \times 100 = \frac{2,30,000}{8,00,000} \times 100 = 28.75\%$$

(b) Notional Profit

	₹
Value of work certified	3,00,000
Add: Cost of work not certified	<u>10,000</u>
	3,10,000
Less: Cost of contract upto date	<u>2,30,000</u>
Notional Profit	<u>80,000</u>

The contract is above 25% complete but less than 50% complete. The amount of profit is to be transferred to Profit and Loss Account :

$$= \frac{1}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{1}{3} \times 80,000 \times \frac{2,75,000}{3,00,000} = ₹ \mathbf{24,444}$$

- (iv) **Profits to be transferred at the end of the year 3**

$$\text{(a) Percentage of Completion} = \frac{\text{Cost of work upto date}}{\text{Estimated total cost}} \times 100 = \frac{6,00,000}{8,00,000} \times 100 = 75\%$$

(b) Notional Profit

	₹
Value of work certified	8,00,000
Add: Cost of work not certified	<u>20,000</u>
	8,20,000
Less: Cost of contract upto date	<u>6,00,000</u>
Notional Profit	<u>2,20,000</u>

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The contract is above 50% complete but not exceeding 75%. The amount of profit is to be transferred to Profit and Loss Account :

$$= \frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 2,20,000 \times \frac{7,50,000}{8,00,000} = ₹ 1,37,500$$

Re: When Contract is Completed upto 25%

Illustration 4

The following information relates to a building contract for the year 2017. Contract price is ₹ 32,00,000 (all figures in rupees).

Materials issued	3,00,000	Work uncertified	8,000
Direct wages	2,30,000	Materials at site	5,000
Direct expenses	22,000	Plant issued	14,000
Indirect expenses	6,000	Cash received from contractee	6,00,000
Work certified	7,50,000		

The value of plant at the end of 2017 was ₹ 7,000.

Prepare (i) Contract Account, and (ii) Contractee Account for 2017 taking into consideration such profit for transfer to Profit and Loss Account as you think proper.

[C.U.B.Com. (Hons.) – Adapted]

Solution

Contract Account

Dr.		[Period: January 1, 2017 to December 31, 2017]		Cr.	
Particulars	₹	Particulars	₹		
To Direct Materials	3,00,000	By Direct Materials – In hand c/d	5,000		
To Direct Wages	2,30,000	By Plant at Valuation c/d	7,000		
To Direct Expenses	22,000	By Cost of Contract c/d (Balancing figure)	5,60,000		
To Indirect Expenses	6,000				
To Plant at Cost	14,000				
	5,72,000		5,72,000		
To Cost of Contract b/d	5,60,000	By Contractee A/c (value of work certified)	7,50,000		
To Notional Profit c/d	1,98,000	By Work Uncertified c/d	8,000		
	7,58,000		7,58,000		
To Reserve Profit c/d (Note 1)	1,98,000	By Notional Profit b/d	1,98,000		
To Direct Materials b/d	5,000	By Reserve Profit b/d	1,98,000		
To Plant, at valuation b/d	7,000				
To Work Uncertified b/d	8,000				

Working Note:

Calculation of Percentage of Completion

$$\frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100 = \frac{7,50,000 + 8,000}{32,00,000} \times 100 = 23.69\%$$

Since the contract is only 23.69% complete, no profit should be credited to Profit and Loss Account. Entire notional profit is to be transferred to next period as **Reserve Profit**.

Re : When Contract is above 25% Complete but not Exceeding 50% Complete

Illustration 5

ABC Ltd. entered into a contract of road construction for a total price of ₹ 10,00,000. For the year ended on 31.12.2017 the following information is collected on account of the contract (all figures in ₹) :

Raw materials	1,30,000	Proportion of expenses of office overheads	10,000
Wages paid	1,20,000	Materials in hand (closing date)	15,000

Plant installed on site (cost)	2,00,000	Materials returned to stores (closing date)	3,000
Supervision expenses	60,000	Wages accrued due (closing date)	3,000

Depreciation on plant was estimated at 10% p.a. The contractee agreed and paid ₹ 2,80,000 being 80% of the certified work. Uncertified work was valued at ₹ 35,000.

Solution

In the books of ABC Ltd.

Contract Account

Dr.	[Period: January 1, 2017 to December 31, 2017]		Cr.
Particulars	₹	Particulars	₹
To Raw Materials	1,30,000	By Raw Materials – In hand c/d	15,000
To Wages	1,20,000	By Raw Materials (Returned)	3,000
To Supervision Expenses	60,000	By Plant at Valuation (₹ 2,00,000 – ₹ 20,000)	1,80,000
To Plant, at cost	2,00,000	By Cost of Contract c/d (Balancing figure)	3,25,000
To Office Overhead	10,000		
To Wages Accrued c/d	3,000		
	5,23,000		5,23,000
To Cost of Contract b/d	3,25,000	By Contractee A/c (Note 1)	3,50,000
To Notional Profit c/d	60,000	By Work Uncertified c/d	35,000
	3,85,000		3,85,000
To Profit and Loss A/c (Note 4)	16,000	By Notional Profit b/d	60,000
To Reserve Profit c/d	44,000		
	60,000		60,000
To Raw Materials b/d	15,000	By Wages Accrued b/d	3,000
To Plant, at Valuation b/d	1,80,000	By Reserve Profit b/d	44,000
To Work Uncertified b/d	35,000		

Working Notes :

(1) Value of work certified = ₹ 2,80,000 / 80% × 100% = ₹ 3,50,000.

(2) Calculation of Notional Profit

	₹
Value of Work Certified	3,50,000
Add: Work Uncertified	35,000
	3,85,000
Less: Cost of Contract	3,25,000
	60,000

(3) Calculation of Percentage of Completion

$$\frac{\text{Value of Work Certified} + \text{Work Uncertified}}{\text{Contract Price}} \times 100$$

$$\frac{\text{₹ 3,50,000} + \text{₹ 35,000}}{\text{₹ 10,00,000}} \times 100 = 38.5\%$$

(4) Profit to be transferred to Profit and Loss Account

Since the contract is 38.50% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$\frac{1}{3} \times \text{Notional Profit} \times \text{Cash Received} / \text{Work Certified}$$

$$= \frac{1}{3} \times \text{₹ 60,000} \times \text{₹ 2,80,000} / \text{₹ 3,50,000} = \text{₹ 16,000.}$$

Re : When Contract is above 50% Complete but not Exceeding 75% Complete

Illustration 6

A building contractor undertook a contract to construct a building for which following details are supplied (all figures in rupees) :

Construction started	January 1, 2017	Proportionate overhead expenses	20,000
Total contract price	5,00,000	Materials in hand on closing date	2,000
Raw materials supplied	1,00,000	Expenses accrued but not paid	1,000
Direct labour cost	60,000	Work certified	2,50,000
Other expenses	5,000	Work not certified	10,000
Plant installed at site (cost)	80,000	Cash received from contractee	2,00,000

8.12 Contract Costing

Prepare a Contract Account of the building for the year ending on 31.12.2017 by transferring a reasonable profit to Profit and Loss Account, after adjusting depreciation on plant @ 20% p.a.

[C.U.B.Com. (Hons.) – Adapted]

Solution

Contract Account

Dr.

[Period: January 1, 2017 to December 31, 2017]

Cr.

Particulars	₹	Particulars	₹
To Direct Materials	1,00,000	By Direct Materials – In hand c/d	2,000
To Direct Labour	60,000	By Plant at Valuation c/d (Note 1)	64,000
To Other Expenses	5,000	By Cost of Contract c/d (Balancing figure)	2,00,000
To Expenses Accrued c/d	1,000		
To Plant at Cost	80,000		
To Overhead Expenses	20,000		
	2,66,000		2,66,000
To Cost of Contract b/d	2,00,000	By Contractee A/c (value of work certified)	2,50,000
To Notional Profit c/d	60,000	By Work Uncertified c/d	10,000
	2,60,000		2,60,000
To Profit and Loss A/c (Note 4)	32,000	By Notional Profit b/d	60,000
To Reserve Profit c/d	28,000		
	60,000		60,000
To Plant, at Valuation b/d	64,000	By Expenses Accrued b/d	1,000
To Direct Materials b/d	2,000	By Reserve Profit b/d	28,000
To Work Uncertified b/d	10,000		

Working Notes :

(1) Cost of Plant = ₹ 80,000. 20% depreciation on ₹ 80,000, i.e., ₹ 16,000. Therefore, value of plant as on 31.12.2017 is ₹ (80,000 – 16,000) = ₹ **64,000**.

(2) Calculation of Notional Profit

Value of Work Certified	2,50,000
Add: Cost of Work not Certified	10,000
	2,60,000
Less: Cost of Contract upto Date	2,00,000
	60,000

(3) Calculation of Percentage of Completion

$\frac{\text{Value of Work Certified} + \text{Work Uncertified}}{\text{Contract Price}} \times 100$
$\frac{\text{₹ 2,50,000} + \text{₹ 10,000}}{\text{₹ 5,00,000}} \times 100 = 52\%$

(4) Profit to be transferred to Profit and Loss Account

Since the contract is 52% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 60,000 \times \frac{2,00,000}{2,50,000} = \text{₹ } 32,000.$$

Illustration 7

The following are the particulars in respect of contract No. B93 for the year ended 31.12.2017. Prepare a Contract Account.

	₹		₹
Contract price	8,00,000	Materials returned to stores	5,000
Materials sent to site	1,50,000	Materials lying unconsumed	8,000
Wages paid	1,80,000	Materials stolen from site	10,000
Wages unpaid	3,000	Insurance claim	
Other expenses	26,000	(admitted for materials stolen)	7,000
Plant sent to site	2,00,000	Work uncertified	11,000
Cash received	3,60,000		

Plant is subject to depreciation @ 7.5% p.a. and cash has been received to the extent of 90% of work certified.

[C.U.B.Com. (Hons.) – Adapted]

Solution

Dr.

Contract Account (B-93)
[Period: January 1 to December 31, 2017]

Cr.

Particulars	₹	Particulars	₹
To Direct Materials	1,50,000	By Direct Materials :	
To Direct Wages	1,80,000	– Returned to stores	5,000
To Direct Wages Accrued c/d	3,000	– Stolen from site (Note 1)	10,000
To Other Expenses	26,000	– On site 31.12.2017 c/d	8,000
To Plant at Cost	2,00,000	By Plant at Valuation c/d (Note 2)	1,85,000
		By Cost of Contract c/d (Balancing figure)	3,51,000
	5,59,000		5,59,000
To Cost of Contract b/d	3,51,000	By Contractee A/c (Note 3) (value of work certified)	4,00,000
To Notional Profit c/d	60,000	By Work Uncertified c/d	11,000
	4,11,000		4,11,000
To Profit and Loss A/c (Note 6)	36,000	By Notional Profit b/d	60,000
To Reserve Profit c/d	24,000		60,000
	60,000		60,000
To Direct Materials b/d	8,000	By Direct Wages b/d	3,000
To Plant, at Valuation b/d	1,85,000	By Reserve Profit b/d	24,000
To Work Uncertified b/d	11,000		

Dr.

Direct Materials Stolen Account

Cr.

Particulars	₹	Particulars	₹
To Contract A/c	10,000	By Insurance Claim A/c	7,000
		By Profit and Loss A/c	3,000
	10,000		10,000

Working Notes:

- Alternatively**, Contract Account can be credited by Insurance claim of ₹ 7,000 and by Profit and Loss Account ₹ 3,000. The ultimate effect is same.
- Cost of plant is ₹ 2,00,000. 7.5% depreciation is ₹ 15,000. Therefore, value of plant as on 31.12.2017 is ₹ 1,85,000.
- Cash has been received for, but 90% of work is certified. Therefore, work certified is ₹ 3,60,000 / 90 × 100 = ₹ 4,00,000.

(4) Calculation of Notional Profit

	₹
Value of Work Certified	4,00,000
Add: Work Uncertified	11,000
	4,11,000
Less: Cost of Contract	3,51,000
	60,000

(5) Calculation of Percentage of Completion

$\frac{\text{Value of Work Certified} + \text{Work Uncertified}}{\text{Contract Price}} \times 100$
$\frac{₹ 4,00,000 + ₹ 11,000}{₹ 8,00,000} \times 100 = 51.375\%$

(6) Profit to be transferred to Profit and Loss Account

Since the contract is 51% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 60,000 \times \frac{3,60,000}{4,00,000} = ₹ 36,000.$$

- It is assumed that the contract started on 1st January, 2017.

Illustration 8

Utility Builders obtained a contract to construct a building for ₹ 2.9 crores. Building work commenced on 1st October, 2016 and at the close of the financial year as on 31st March, 2017 the construction was still in progress.

8.14 Contract Costing

The following information is available:

- Contractee paid ₹ 1.2 crores being 80% of the amount as per surveyor's certificate of work completed as on 31st March, 2017.
- Total cost as per Contract Account after adjustment of closing work-in-progress was ₹ 1.35 crores.

As a prudent accountant, determine the amount of profit Utility Builders are justified in taking to the credit of their Profit and Loss Account.

[Company Secretaries – Adapted]

Solution

For determining the amount of profit to be credited to Profit and Loss Account of Utility Builders, the first step is to calculate the percentage of completion and notional profit.

(1) Calculation of Notional Profit	₹ (Crores)	(2) Calculation of Percentage of Completion
Value of Work Certified	1.50	$\frac{\text{Value of Work Certified}}{\text{Contract Price}} \times 100$
Less: Cost of Work Certified	1.35	
	0.15	$\frac{₹ 1.50 (1.20 / 80\%)}{₹ 2.90} \times 100 = 51.72\%$

Since the contract is 51.72% completed, the profit to be transferred to Profit and Loss Account is to be calculated as under:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 0.15 \text{ crores} \times \frac{1.20}{1.50} = ₹ 0.08 \text{ crores.}$$

Illustration 9

United Construction Company got a contract in January 2017 for constructing a bridge. The contract price was ₹ 5,00,000. The company incurred the following expenses upto 31.12.2017 (all figures in ₹) :

Material issued — 1,10,000; Wages — 40,000; Direct Expenses — 20,000; Plant purchased on 30.6.2017 — 1,00,000; Materials in hand — 5,000; Cost of uncertified work — 2,000.

Depreciation to be charged on plant @ 10% p.a. Other works expenses to be charged @ 20% of wages and office expenses @ 10% of works cost. The amount certified by the engineer upto 31.12.2017 was ₹ 3,00,000, retention money being 20% of the certified value. Prepare a Contract Account showing therein the amount of profit or loss to be transferred to Profit and Loss Account.

[C.U.B.Com. (Hons.) – Adapted]

Solution

United Construction Company

Contract Account

Dr.		[Period: January 1, 2017 to December 31, 2017]		Cr.	
Particulars		₹	Particulars		₹
To Direct Materials		1,10,000	By Direct Materials – in hand		5,000
To Direct Labour		40,000	By Plant at Valuation c/d		95,000
To Direct Expenses		20,000	By Cost of Contract c/d (Balancing figure)		1,95,800
To Plant at Cost		1,00,000			
To Other Works Expenses (20% of ₹ 40,000)		8,000			
To Office Expenses (Note 1)		17,800			
		2,95,800			2,95,800
To Cost of Contract b/d		1,95,800	By Contractee A/c (value of work certified)		3,00,000
To Notional Profit c/d		1,06,200	By Cost of Uncertified Work c/d		2,000
		3,02,000			3,02,000
To Profit and Loss A/c (Note 5)		56,640	By Notional Profit b/d		1,06,200
To Reserve Profit c/d		49,560			
		1,06,200			1,06,200
To Direct Materials b/d		5,000	By Reserve Profit b/d		49,560
To Plant, at valuation b/d		95,000			
To Cost of Uncertified Work b/d		2,000			

Working Notes :

(1) Calculation of Office Expenses

	₹
Materials Consumed (₹ 1,10,000 – ₹ 5,000)	1,05,000
Wages	40,000
Direct Expenses	20,000
Prime Cost	1,65,000
Depreciation on Plant	5,000
Other Works Expenses	8,000
Works Cost	1,78,000
Office Expenses will be 10% of Works Cost, i.e., 17,800	

(2) Calculation of Notional Profit

	₹
Value of Work Certified	3,00,000
Add: Cost of Work Uncertified	2,000
	3,02,000
Less: Cost of Contract	1,95,800
	1,06,200
(3) Value of Work Certified	3,00,000
Less: Retention Money 20%	60,000
Cash Received	2,40,000

(4) Calculation of percentage of Completion :

$$\frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100 = \frac{3,00,000 + 2,000}{5,00,000} \times 100 = 60.4\%$$

(5) Profit to be transferred to Profit and Loss Account

Since the contract is 60% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 1,06,200 \times \frac{2,40,000}{3,00,000} = ₹ 56,640.$$

Illustration 10

Mirik Construction Ltd. entered into a contract to construct a building. The contract value is ₹ 6,50,000 to be realised in installments on the basis of the value of work certified by the architect subject to a retention of 10%. The work commenced on 1.4.2017 but it remained incomplete on 31.12.2017 when the final accounts are to be prepared. The facts and figures of the contract are as follows :

Plant charged to contract at the commencement – ₹ 32,000; Wages paid – ₹ 87,000; Expenses incurred on the contract – ₹ 38,750; and Materials charged to contract – ₹ 1,80,000.

Total establishment expenses amounted to ₹ 41,000 out of which 25% is attributable to this contract. Out of the materials issued to the contract, materials costing ₹ 4,000 were sold for ₹ 5,000. A part of the plant (cost ₹ 2,000) was damaged on 1.10.2017 and the scrap realised ₹ 300 only. Plant costing ₹ 3,000 was transferred to another contract site on 31.12.2017.

Plant is to be depreciated @ 10% p.a.

Materials in hand on 31.12.2017 ₹ 17,500.

Cash received from the contractee ₹ 3,06,000

Cost of work yet to be certified is ₹ 30,000.

Prepare a Contract Account showing therein the amount of profit or loss to be transferred to Profit and Loss Account.

[C.U.B.Com. (Hons.) – Adapted]

Solution

Mirik Construction Ltd.

Contract Account

Dr.

[Period: April 1, 2017 to December 31, 2017]

Cr.

Particulars	₹	Particulars	₹
To Direct Materials	1,80,000	By Bank – Sale of Materials	5,000
To Direct Wages	87,000	By Direct Materials in hand c/d	17,500
To Direct Expenses	38,750	By Plant :	
To Establishment Expenses	10,250	Damaged (Note 1)	1,900

8.16 Contract Costing

To Plant at Cost	32,000	Returned (Note 2)	2,775
To Profit and Loss A/c (Profit on sale of materials)	1,000	At Site (Note 3)	24,975
		By Cost of Contract A/c (Balancing figure)	2,96,850
	3,49,000		3,49,000
To Cost of Contract b/d	2,96,850	By Contractee A/c (value of work certified)	3,40,000
To Notional Profit c/d (Note 5)	73,150	By Cost of Uncertified Work c/d	30,000
	3,70,000		3,70,000
To Profit and Loss A/c (Note 7)	43,890	By Notional Profit b/d	73,150
To Reserve Profit c/d	29,260		
	73,150		73,150
To Direct Materials b/d	17,500	By Reserve Profit b/d	29,260
To Plant, at Valuation b/d	24,975		
To Cost of Uncertified Work b/d	30,000		

Dr.		Plant Damaged Account		Cr.	
Particulars	₹	Particulars	₹		
To Contract A/c (Note 1)	1,900	By Bank – Sale of Scrap	300		
		By Profit and Loss A/c – Loss	1,600		
	1,900		1,900		

Working Notes:

- (1) Cost of damaged plant ₹ 2,000. Depreciation upto the date of accident = $10 / 100 \times 6/12 \times ₹ 2,000 = ₹ 100$.
W.D.V. of the plant on the date of damage = ₹ 2,000 – ₹ 100 = ₹ **1,900**.
- (2) Cost of plant transferred is ₹ 3,000. Depreciation upto 31.12.2017 = $₹ 3,000 \times 10/100 \times 9/12 = ₹ 225$. W.D.V. of the plant on the date of transfer = ₹ 3,000 – ₹ 225 = ₹ **2,775**.
- (3) Cost of plant at site (₹ 32,000 – ₹ 2,000 – ₹ 3,000) = ₹ 27,000. Depreciation upto 31.12.2017 = $₹ 27,000 \times 10/100 \times 9/12 = ₹ 2,025$. W.D.V. on 31.12.2017 = ₹ 27,000 – ₹ 2,025 = ₹ **24,975**.
- (4) Cash has been received for 90% of work certified.
Therefore, work certified = $₹ 3,06,000 / 90 \times 100 = ₹ **3,40,000**$.

(5) Calculation of Notional Profit		₹	(6) Calculation of Percentage of Completion
Value of Work Certified	3,40,000		$\frac{\text{Value of Work Certified} + \text{Work Uncertified}}{\text{Contract Price}} \times 100$
Add: Work Uncertified	30,000		
	3,70,000		
Less: Cost of Contract	2,96,850		
	73,150		$\frac{₹ 3,40,000 + ₹ 30,000}{₹ 6,50,000} \times 100 = 56.92\%$

(7) **Profit to be transferred to Profit and Loss Account** : Since the contract is 56.92% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows :

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 73,150 \times \frac{3,06,000}{3,40,000} = ₹ **43,890**.$$

Illustration 11

Alcon Construction Company Ltd. commenced its business of construction on 1.1.2017. The trial balance as on 31.12.2017 showed the following balances :

	Dr. (₹)	Cr. (₹)
Paid-up Share Capital		1,00,000
Cash received on account of contract (80% of work certified)		1,20,000
Land and Buildings	30,000	
Machinery at cost (75% at site)	40,000	
Bank	4,000	

Materials at site	40,000	
Direct labour	55,000	
Expenses at site	2,000	
Lorries and Vehicles	30,000	
Furniture	1,000	
Office equipment	10,000	
Postage and Telegrams	500	
Office expenses	2,000	
Rates and taxes	3,000	
Fuel and Power	2,500	
	2,20,000	2,20,000

The contract price is ₹ 3,00,000 and work certified is ₹ 1,50,000. The work completed since certification is estimated at ₹ 1,000 (at cost). Machinery costing ₹ 2,000 was returned to stores at the end of the year. Stock of materials at site on 31.12.2017 was of the value of ₹ 5,000. Wages outstanding were ₹ 200. Depreciation on machinery at 10%. You are required to prepare a Contract Account and show how the work-in-progress will appear in the Balance Sheet as on 31.12.2017.

[D.U. B.Com. (Hons.) – Adapted]

Solution

Alcon Construction Company Ltd.

Contract Account

Dr.		Cr.	
[Period: January 1, 2017 to December 31, 2017]			
Particulars	₹	Particulars	₹
To Materials	40,000	By Materials : in hand c/d	5,000
To Direct Labour	55,000	By Machinery :	
To Expenses at Site	2,000	Returned (Note 1)	1,800
To Postage and Telegrams	500	At Site (Note 1)	25,200
To Office Expenses	2,000	By Cost of Contract c/d (Balancing figure)	1,03,200
To Rates and Taxes	3,000		
To Fuel and Power	2,500		
To Wages Outstanding c/d	200		
To Machinery, at Cost (75% of ₹ 40,000)	30,000		
	1,35,200		1,35,200
To Cost of Contract b/d	1,03,200	By Contractee A/c (value of work certified)	1,50,000
To Notional Profit c/d	47,800	By Cost of Uncertified Work c/d	1,000
	1,51,000		1,51,000
To Profit and Loss A/c (Note 4)	25,493	By Notional Profit b/d	47,800
To Reserve Profit c/d	22,307		
	47,800		47,800
To Materials b/d	5,000	By Wages Outstanding b/d	200
To Machinery b/d	25,200	By Reserve Profit b/d	22,307
To Cost of Uncertified Work b/d	1,000		

Working Notes :

(1) Cost of machinery at site ₹ 30,000. Written-down value of machinery returned = (₹ 2,000 – ₹ 200) = ₹ 1,800.

The written-down value of machinery still at site :	₹
Original cost of machinery	30,000
Less: Original cost of machinery returned	2,000
	28,000
Less: Depreciation @ 10% on 28,000	2,800
	25,200

8.18 Contract Costing

(2) Calculation of Notional Profit		₹	(3) Calculation of Percentage of Completion
Value of Work Certified		1,50,000	$\frac{\text{Value of Work Certified} + \text{Work Uncertified}}{\text{Contract Price}} \times 100$
Add: Work Uncertified		1,000	
		1,51,000	
Less: Cost of Contract		1,03,200	$\frac{₹ 1,50,000 + ₹ 1,000}{₹ 3,00,000} \times 100 = 50.33\%$
		47,800	

(4) Profit to be taken to Profit and Loss Account = $\frac{2}{3} \times ₹ 47,800 \times \left(\frac{₹ 1,20,000}{1,50,000} \right) = ₹ 25,493$.

(5) Valuation of Work-in-Progress (See page 9.8 for details.)

Method 1	₹	Method 2	₹
Cost of Contract to Date	1,03,200	Value of Work Certified	1,50,000
Add: Profit transferred to Profit and Loss A/c	25,493	Work not yet Certified	1,000
	1,28,693		1,51,000
Less: Cash Received	1,20,000	Less: Reserve Profit	22,307
	8,693		1,28,693
		Less: Cash Received	1,20,000
			8,693

Balance Sheet as at 31st December, 2017

Liabilities	₹	Assets	₹
		Work-in-Progress (Note 5)	8,693

Illustration 12

M/s. S.V. Construction Ltd. have obtained a contract for the construction of a bridge. The value of the contract is ₹ 12 lakhs and the works commenced on 1st October, 2016. The following details are shown in their books for the year ended 30th September, 2017.

	₹		₹
Plant purchased	60,000	Wages accrued as on 30.9.2017	2,800
Wages paid	3,40,000	Materials at site as on 30.9.2017	4,000
Material issued to site	3,36,000	Direct expenses accrued as on 30.9.2017	1,200
Direct expenses	8,000	Work not yet certified at cost	14,000
General overheads apportioned	32,000	Cash received being 80% of work certified	6,00,000

Life of plant purchased in 5 years and scrap value is nil.

You are required to :

- Prepare the Contract Account for the year ended 30th September, 2017.
- Evaluate the work-in-progress as at 30th September, 2017.

Solution

In the books of M/s. S.V. Construction Ltd.

Contract Account

Dr.		[Period: October 1, 2016 to September 31, 2017]	Cr.
Particulars	₹	Particulars	₹
To Direct Materials : issued to Site	3,36,000	By Direct Materials : at site c/d	4,000
To Direct Wages	3,40,000	By Plant, at valuation c/d (Note 1)	48,000
To Direct Expenses	8,000	By Cost of Contract c/d (Balancing figure)	7,28,000
To General Overhead	32,000		
To Wages Accrued c/d	2,800		
To Direct Expenses Accrued c/d	1,200		
To Plant, at Cost	60,000		
	7,80,000		7,80,000

To Cost of Contract b/d	7,28,000	By Contractee A/c (value of work certified)	7,50,000
To Notional Profit c/d	36,000	By Cost of Uncertified Work c/d	14,000
	7,64,000		7,64,000
To Profit and Loss A/c (Note 4)	19,200	By Notional Profit b/d	36,000
To Reserve Profit c/d	16,800		36,000
	36,000		36,000
To Direct Materials b/d	4,000	By Wages Accrued b/d	2,800
To Plant, at valuation b/d	48,000	By Direct Expenses Accrued b/d	1,200
To Cost of Uncertified Work b/d	14,000	By Reserve Profit b/d	16,800

Valuation of Work-in-Progress

Method 1	₹	Method 2	₹
Cost of Contract to Date	7,28,000	Value of Work Certified	7,50,000
Add: Profit transferred to Profit and Loss A/c	19,200	Work not yet Certified	14,000
	7,47,200		7,64,000
Less: Cash Received	6,00,000	Less: Reserve Profit	16,800
	1,47,200		7,47,200
		Less: Cash Received	6,00,000
			1,47,200

Working Notes:

(1) Cost of plant is ₹ 60,000. Depreciation for the year ₹ 60,000 / 5 = ₹ 12,000. Therefore, value of plant on 30.9.2017 = ₹ 48,000 (₹ 60,000 – ₹ 12,000).

(2) Calculation of Notional Profit	₹	(3) Calculation of Percentage of Completion
Value of Work Certified	7,50,000	$\frac{\text{Value of Work Certified} + \text{Work Uncertified}}{\text{Contract Price}} \times 100$
Add: Work Uncertified	14,000	
	7,64,000	
Less: Cost of Contract	7,28,000	$\frac{₹ 7,50,000 + ₹ 14,000}{₹ 12,00,000} \times 100 = 63.67\%$
	36,000	

(4) Profit to be transferred to Profit and Loss Account

Since the contract is 63.67% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 36,000 \times \frac{6,00,000}{7,50,000} = ₹ 19,200.$$

Illustration 13

Kurian Construction Company undertook the construction of a bridge. The value of contract was ₹ 1 crore subject to retention of 20% until one year after the certified completion of the contract and the final approval of contractee's engineer. The following are the details as shown in the books on 30th September, 2017 :

	₹		₹
Labour on site	24,30,000	Materials on hand (30.9.2017)	37,800
Materials direct to site	19,20,000	Wages accrued (30.9.2017)	9,600
Materials from stores	4,97,200	Work not yet certified – cost	99,000
Hire of plant	72,600	Value of Work certified	66,00,000
Direct expenses	1,38,000	Cash received on account	52,80,000
Overhead charged to Contract	2,22,600	Materials lost in fire accident	10,000

Prepare (a) Contract Account; (b) Contractee's Account; (c) Show how the items relating to contract appear in the Balance Sheet.

8.20 Contract Costing

Solution

In the books of Kurian Construction Company Contract Account

Dr. [Period: October 1, 2016 to September 30, 2017] **Cr.**

Particulars	₹	Particulars	₹
To Labour on Site	24,30,000	By Direct Materials :	
To Materials :		In hand	37,800
Direct to Site	19,20,000	Lost by fire	10,000
From Stores	4,97,200	By Cost of Contract c/d (Balancing figure)	52,42,200
To Hire of Plant	72,600		
To Direct Expenses	1,38,000		
To Overhead	2,22,600		
To Wages Accrued c/d	9,600		
	52,90,000		52,90,000
To Cost of Contract b/d	52,42,200	By Contractee A/c (value of work certified)	66,00,000
To Notional Profit c/d	14,56,800	By Cost of Uncertified Work c/d	99,000
	66,99,000		66,99,000
To Profit and Loss A/c (Note 3)	7,76,960	By Notional Profit b/d	14,56,800
To Reserve Profit c/d	6,79,840		14,56,800
	14,56,800		
To Materials b/d	37,800	By Wages Accrued b/d	9,600
To Cost of Uncertified Work b/d	99,000	By Reserve Profit b/d	6,79,840

Dr. Contractee Account Cr.

Particulars	₹	Particulars	₹
To Contract A/c	66,00,000	By Bank A/c	52,80,000
		By Balance c/d	13,20,000
	66,00,000		66,00,000

Balance Sheet of Kurian Construction Company as at 30th September, 2017

Liabilities	₹	Assets	₹
Wages Accrued	9,600	Materials in Hand	37,800
Profit	7,76,960	W.I.P. (Note 4)	7,39,160
		Contractee A/c	13,20,000

Working Notes :

1) Calculation of Notional Profit

	₹
Value of Work Certified	66,00,000
Add: Work Uncertified	99,000
	66,99,000
Less: Cost of Contract	52,42,200
	14,56,800

(2) Calculation of Percentage of Completion

$\frac{\text{Value of Work Certified} + \text{Work Uncertified}}{\text{Contract Price}} \times 100$
$\frac{₹ 66,00,000 + ₹ 99,000}{₹ 1,00,00,000} \times 100 = 66.99\%$

(3) Profit to be transferred to Profit and Loss Account

Since the contract is 66.99% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$\begin{aligned} & \frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} \\ &= \frac{2}{3} \times 14,56,800 \times \frac{52,80,000}{66,00,000} \\ &= ₹ 7,76,960. \end{aligned}$$

(4) Valuation of Work-in-Progress

Method 1	₹	Method 2	₹
Cost of Contract to Date	52,42,200	Work not yet Certified	99,000
Add: Profit transferred to Profit and Loss A/c	7,76,960	Add: Retention Money	13,20,000
	60,19,160		14,19,000
Less: Cash Received	52,80,000	Less: Reserve Profit	6,79,840
	7,39,160		7,39,160

Illustration 14

The data given below refers to contract M101 for the construction of a section of a motorway.

The contract was commenced on 1st April, 2016 at an agreed price of ₹ 10 crores. The contract was expected to take four years to complete. Retention money was agreed at 10% of work certified.

Details of the contract during the first year are as follows:

	₹'000		₹'000
Direct Materials:		Plant:	
Received on site	2,560	In use on site at cost	2,000
Returned from site	25	Valuation at 31st March, 2017	1,500
Lost from site, but insured	30	Site overhead	370
On site at 31st March, 2017	355	Allocated head office charges	180
Direct Wages:		Cash received in respect of work certified	4,500
Paid	1,320	Cost of work completed but not yet certified	700
Accrued at 31st March, 2017	30		
Direct Expenses:			
Paid	240		
Accrued at 31st March, 2017	10		

You are required to: (a) Prepare the account of the Contract; (b) Contractee's Account; and (c) Evaluate the work-in-progress as at 31st March, 2017.

Solution

Contract Account – M101

Dr. [Period: April 1, 2016 to March 31, 2017] **Cr.**

Particulars	₹ '000	Particulars	₹ '000
To Direct Materials	2,560	By Direct Materials :	
To Direct Wages	1,320	Returned from Site	25
To Direct Wages Accrued c/d	30	Lost from Site	30
To Direct Expenses	240	On Site 31.3.2017 c/d	355
To Direct Expenses Accrued c/d	10	By Plant – On Site 31.3.2017 c/d	1,500
To Plant, at cost	2,000	By Cost of Contract (Balancing figure) c/d	4,800
To Site Overhead	370		
To Head Office Charges	180		
	6,710		6,710
To Cost of Contract b/d	4,800	By Contractee A/c (value of work certified)	5,000
To Notional Profit c/d	900	By Cost of Work completed but not yet certified c/d	700
	5,700		5,700
To Profit and Loss A/c (Note 3)	540	By Notional Profit b/d	900
To Reserve Profit c/d	360		
	900		900
To Direct Materials b/d	355	By Direct Wages b/d	30
To Plant, at Valuation b/d	1,500	By Direct Expenses b/d	10
To Cost of Work Completed but not yet certified b/d	700	By Reserve Profit b/d	360

8.22 Contract Costing

Dr.		Contractee Account		Cr.
Particulars	₹ '000	Particulars		₹ '000
To Contract A/c – M101	5,000	By Bank A/c – Cash received (Note 1)		4,500
		By Balance c/d		500
	5,000			5,000

Valuation of Work-in-Progress

Method 1	₹ '000	Method 2	₹ '000
Cost of Contract to Date	4,800	Value of Work Certified	5,000
Add: Profit transferred to Profit and Loss A/c	540	Cost of Work Uncertified	700
	5,340		5,700
Less: Cash Received	4,500	Less: Reserve Profit	360
	840		5,340
		Less: Cash Received	4,500
			840

Working Notes :

(1) Value of Work Certified = $(₹ 45,00,000 / 90 \times 100) = ₹ 50,00,000$

2) Calculation of Notional Profit	₹ '000	(4) Calculation of Percentage of Completion
Value of Work Certified (Note 1)	5,000	$\frac{\text{Value of Work Certified} + \text{Work Uncertified}}{\text{Contract Price}} \times 100$
Add: Work Uncertified	700	
	5,700	
Less: Cost of Contract	4,800	$\frac{₹ 5,000 + ₹ 700}{₹ 10,000} \times 100 = 57\%$
	900	

(3) Profit to be transferred to Profit and Loss Account

Since the contract is 57% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 9,00,000 \times \frac{45,00,000}{50,00,000} = ₹ 5,40,000.$$

Illustration 13

On January 1, 2017 P.S. Construction Ltd. started work on the construction of an office block for a contracted price of ₹ 15 crores with completion promised by March 31, 2018. Budgeted cost of the contract was ₹ 12 crores. The construction company's financial year ended on October 31, 2017 and on that date the accounts appropriate to the contract contained the following balances :

	₹		₹
Materials issued to site	32,20,000	Supervisory staff – Direct	2,20,000
Materials returned from site	2,80,000	Indirect	2,40,000
Wages paid	13,60,000	Value of work certified to 31.10.2017	80,00,000
Own plant in use on site, at cost	19,20,000	Cost of work not yet certified	8,00,000
Hire of plant and scaffolding	14,40,000	Cash received related to work certified	66,00,000
Head office charges	12,60,000		

Additional Information:

- Depreciation on own plant is to be provided at the rate of 12.5% p.a. on cost.
- ₹ 40,000 is owing for wages.
- Estimated value of materials on site is ₹ 4,80,000.
- No difficulties are envisaged during the remaining time to complete the contract.

You are required to :

- Prepare the Contract Account for the period ended October 31, 2017 showing the amount to be included in the construction company's Profit and Loss Account.
- Calculate the value of work-in-progress.
- Show extracts from the construction company's Balance Sheet at October 31, 2017 so far as the information provided will allow.

Solution

(a) In the books of P.S. Construction Ltd.

Contract Account

Dr.	[Period: January 1 to October 31, 2017]		Cr.
Particulars	₹	Particulars	₹
To Direct Materials – issued to Site	32,20,000	By Direct Materials :	
To Wages	13,60,000	Returned from Site	2,80,000
To Plant, at cost	19,20,000	In Hand, c/d	4,80,000
To Hire Charges (Plant)	14,40,000	By Plant, at Valuation c/d (Note 1)	17,20,000
To Head Office Charges	12,60,000	By Cost of Contract (Balancing figure) c/d	72,20,000
To Supervisory Staff : Direct	2,20,000		
Indirect	2,40,000		
To Wages Accrued c/d	40,000		
	97,00,000		97,00,000
To Cost of Contract b/d	72,20,000	By Contractee A/c (value of work certified)	80,00,000
To Notional Profit c/d	15,80,000	By Cost of Work completed but not yet certified c/d	8,00,000
	88,00,000		88,00,000
To Profit and Loss A/c (Note 4)	8,69,000	By Notional Profit b/d	15,80,000
To Reserve Profit c/d	7,11,000		
	15,80,000		15,80,000
To Direct Materials b/d	4,80,000	By Wages Accrued b/d	40,000
To Plant, at Valuation b/d	17,20,000	By Reserve Profit b/d	7,11,000
To Cost of Work Completed but not yet certified b/d	8,00,000		

(b) Calculation of Work-in-Progress

	₹
Cost of contract	72,20,000
Add: Profit credit to Profit and Loss Account	8,69,000
	80,89,000
Less: Cash received	66,00,000
	14,89,000

Balance Sheet of P.S. Construction Ltd. (Extract) as at 31st October, 2017

Liabilities	₹	Assets	₹
Profit and Loss A/c (Profit from Contract)	8,69,000	Plant at Cost	19,20,000
Wages Accrued	40,000	Less: Depreciation	2,00,000
		Stock of Materials at Site	4,80,000
		Work-in-Progress (b)	14,89,000

Alternative Presentation,

Balance Sheet of P.S. Construction Ltd. (Extract) as at 31st October, 2017

Liabilities	₹	Assets	₹
Profit and Loss A/c (Profit from Contract)	8,69,000	Plant at Cost	19,20,000
Profit Reserve	7,11,000	Less: Depreciation	2,00,000
Wages Accrued	40,000	Stock of Materials at Site	4,80,000
		Cost of Work not yet Certified	8,00,000
		Debtors (Retention Money)	14,00,000

8.24 Contract Costing

Tutorial Note : Work-in-progress can also be calculated as follows: Cost of work not yet certified ₹ 8,00,000 plus Retention money (Debtors) ₹ 14,00,000 *minus* Profit Reserve ₹ 7,11,000 = ₹ **14,89,000**.

Working Notes :

- (1) Cost of plant is ₹ 19,20,000. 12.5% depreciation for 10 months = ₹ 2,00,000. Therefore, value of plant as on 30.10.2017 is ₹ 17,20,000.

(2) Calculation of Notional Profit		₹	(3) Calculation of Percentage of Completion
Value of Work Certified	80,00,000		$\frac{\text{Value of Work Certified} + \text{Work Uncertified}}{\text{Contract Price}} \times 100$
Add: Work Uncertified	8,00,000		
	88,00,000		
Less: Cost of Contract	72,20,000		$\frac{₹ 80,00,000 + ₹ 8,00,000}{₹ 1,50,00,000} \times 100 = 58.67\%$
	15,80,000		
			Alterantively, $\frac{\text{Cost of Contract}}{\text{Budgeted Cost}} \times 100 = \frac{₹ 72,20,000}{₹ 1,20,00,000} \times 100 = 60.17\%$

(4) Profit to be transferred to Profit and Loss Account

Since the contract is 58.67% completed, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 15,80,000 \times \frac{66,00,000}{80,00,000} = ₹ 8,69,000.$$

Illustration 16

A railway contractor makes up his accounts to 31st March. Contract No. SER/15 for construction of a culvert between Bhilai and Raipur commenced on 1st July, 2016. The costing records yield the following information at 31st March, 2017:

	₹
Materials charged out to site	31,540
Labour	75,300
Foreman	11,700

A machine costing ₹ 25,000 has been on the site for 73 days. Its working life is estimated at five years and its final scrap value at ₹ 1,000.

A Supervisor, who is paid ₹ 18,000 per annum, has spent approximately six months on this contract.

All other expenses and administration amount to ₹ 17,000.

Materials in store at the end of the year cost ₹ 2,500.

The contract price is ₹ 3,00,000. At the end of the year two-thirds of the contract was completed for which amount, the Architect's Certificate has been issued and ₹ 1,60,000 has so far been received on account.

It was decided that the profit made on the contract in the year should be arrived at by deducting the cost of work certified from the total value of the architect's certificate, that 1/3 of the profit so arrived at should be regarded as a provision against contingencies and that such provision should be increased by taking to the credit of Profit and Loss Account only such portion of the 2/3 profit as the cash received bore to the work certified.

Prepare a Contract Account showing profit or loss to be included in respect of this contract in the financial accounts to 31st March, 2017.

Solution

Dr.

Contract Account – SER/15 [Period: July 1, 2016 to March 31, 2017]

Cr.

Particulars	₹	Particulars	₹
To Direct Materials – Charge out to Site	31,540	By Direct Materials – at Site c/d	2,500
To Labour	75,300	By Cost of Contract c/d (Balancing figure)	1,43,000
To Foreman's Salary	11,700		

To Supervisor's Salary	9,000		
To Other Expenses and Admn.	17,000		
To Depreciation (Note 1)	960		
	1,45,500		1,45,500
To Cost of Contract b/d	1,43,000	By Value of Work Certified (Note 3)	2,00,000
To Notional Profit c/d	57,000		
	2,00,000		2,00,000
To Profit and Loss A/c (Note 2)	30,400	By Notional Profit b/d	57,000
To Reserve Profit c/d	26,600		
	57,000		57,000
To Direct Materials b/d	2,500	By Reserve Profit b/d	26,600
			26,600

Working Notes:

(1) Calculation of Depreciation	₹	(2) Calculation of Profit	₹
Cost of Machine	25,000	Value of Work Certified	2,00,000
Less: Scrap Value	1,000	Less: Cost of Work Certified	1,43,000
	24,000	Profit	57,000
Depreciation p.a. ₹ 24,000 / 5 = ₹ 4,800.		Realised Profit = ₹ 57,000 × ₹ 1,60,000 / ₹ 2,00,000 = ₹ 45,600.	
Depreciation for 73 days = ₹ 4,800 / 365 × 73 = ₹ 960.		2/3 of the realised profit to be transferred to Profit and Loss	
		Account which will = 2/3 × ₹ 45,600 = ₹ 30,400 .	

- (3) Contract price is ₹ 3,00,000. $\frac{2}{3}$ of the work has been done and it has been certified by the architect. Therefore, the value of work certified is $\frac{2}{3} \times ₹ 3,00,000 = ₹ 2,00,000$.

Re : When Contract is above 75% Complete

Illustration 17

Compute a conservative estimate of profit on a contract (which has been 80% complete) from the following particulars (Illustrate at least 4 methods of computing the profit).

	₹		₹
Total expenditure to date	85,000	Work certified	1,00,000
Further expenditure to complete the		Work not certified	8,500
Contract (including contingencies)	17,000	Cash received	81,600
Contract price	1,53,000		

[I.C.W.A. (Inter) – Adapted]

Solution

Since the contract is 80% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$(1) \text{Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}} = 51,000 (\text{Note 1}) \times \frac{1,00,000}{1,53,000} = ₹ 33,333.$$

$$(2) \text{Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}} \times \frac{\text{Cash Received}}{\text{Work Certified}} \\ = 51,000 \times \frac{1,00,000}{1,53,000} \times \frac{81,600}{1,00,000} = ₹ 27,200.$$

$$(3) \text{Estimated Profit} \times \frac{\text{Cost of Work to Date}}{\text{Estimated Total Cost}} \times \frac{\text{Cash Received}}{\text{Work Certified}} \\ = 51,000 \times \frac{85,000}{1,02,000} \times \frac{81,600}{1,00,000} = ₹ 34,680.$$

8.26 Contract Costing

$$(4) \text{Estimated Profit} \times \frac{\text{Cost of Work to Date}}{\text{Estimated Total Cost}} = 51,000 \times \frac{85,000}{1,02,000} = ₹ 42,500.$$

Working Note :

(1) Calculation of Estimated Profit

	₹
Contract Price	1,53,000
Less: Expenditure to date	85,000
Add: Further estimated expenditure to complete the contract	<u>17,000</u>
Estimated Profit	<u>51,000</u>

Illustration 18

An expenditure of ₹ 1,94,000 has been incurred on a contract to the end of 31st March, 2016. The value of the work certified is ₹ 2,20,000. The cost of work done but not yet certified is ₹ 6,000. It is estimated that the contract will be completed by 30th June 2016 and an additional expenditure of ₹ 40,000 will have to be incurred to complete the contract. The total estimated expenditure on the contract is to include a provision of 2.5% for contingencies. The contract price is ₹ 2,80,000 and ₹ 2,00,000 has been realised in cash upto 31st March, 2016.

Calculate the proportion of profit to be taken to the Profit and Loss Account as on 31st March, 2016 under different methods.

[I.C.W.A. (Inter) – Adapted]

Solution

Calculation of Estimated Profit

	₹
Contract Price	2,80,000
Less: Estimated Total Cost :	
Cost upto Date	1,94,000
Additional Cost to be incurred	<u>40,000</u>
	2,34,000
Add: Contingencies @ 2.5% of ₹ 2,34,000	<u>5,850</u>
Estimated Profit	<u>40,150</u>

Calculation of Profit to be taken to Profit and Loss Account

$$\text{Method (1) Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}} :$$

$$= 40,150 \times \frac{2,20,000}{2,80,000} = ₹ 31,546.$$

$$\text{Method (2) Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

$$= 40,150 \times \frac{2,20,000}{2,80,000} \times \frac{2,00,000}{2,20,000} = ₹ 28,679.$$

$$\text{Method (3) Estimated Profit} \times \frac{\text{Cost of Work to date}}{\text{Estimated Total Cost}} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

$$= 40,150 \times \frac{1,94,000}{2,39,850} \times \frac{2,00,000}{2,20,000} = ₹ 29,523.$$

Illustration 19

The following is a summary of the expenditure on a contract upto 31st December, 2016 (all figures in rupees) :

Direct wages	6,900	Stores returned	500
Direct materials	34,000	Sub-contracts Cost	6,300
Stores issued	3,800	Plant	12,000

The following additional information is supplied to you:

- The job started in 2016 and the contract price is ₹ 60,000.
- The architects had certified that 4/5th of the contract had been completed on 31st December, 2016.
- Depreciation of plant upto 31st December, 2016 is ₹ 4,800.
- Materials on site on 31st December, 2016 had cost ₹ 5,000 and stores on site had cost ₹ 400.
- Establishment charges are 40% of direct wages.

You are required to prepare a Contract Account and show the profit or loss on the contract and suggest how much of profit / loss should be taken to Profit and Loss Account for the year ended 31st December, 2016.

[Nagarjuna B.Com – Adapted]

Solution

Dr.		Contract Account		Cr.	
Particulars	₹	Particulars	₹		
To Direct Wages	6,900	By Stores			
To Direct Materials	34,000	Returned	500		
To Stores	3,800	In Hand, c/d	400		
To Sub-Contractor Cost	6,300	By Direct Materials : in Hand, c/d	5,000		
To Plant	12,000	By Plant, at Valuation (Note 1)	7,200		
To Establishment Charge	2,760	By Cost of Contract c/d	52,660		
	65,760		65,760		
To Cost of Contract b/d	52,660	By Contractee A/c (value of work certified)	48,000		
	52,660	By Profit and Loss A/c (Note 3)	4,660		
			52,660		
To Stores b/d	400				
To Direct Materials b/d	5,000				
To Plant, at valuation b/d	7,200				

Working Notes :

- Cost of plant is ₹ 12,000. Depreciation for the year is ₹ 4,800. Therefore, written-down value of plant is ₹ (12,000 – 4,800) = ₹ 7,200.
- Percentage of completion = 4/5 or 80% (given)
- When there is any loss, it should be transferred to Profit and Loss Account in total, irrespective of percentage of completion.

Illustration 20

Kapur Engineering Company undertakes long-term contract which involves the fabrication of prestressed concrete blocks and the erection of the same on customer's site. The following information is supplied regarding the contract which is incomplete on 31.3.2016:

Cost incurred:		₹	₹
Fabrication cost to date :		Contract price	8,19,000
Direct materials	2,80,000	Cash received on account	6,00,000
Direct labour	90,000	Technical estimate of work completed to date :	
Overheads	75,000	Fabrication:	
	4,45,000	Direct materials	80%
Erection cost to date	15,000	Direct labour and overheads	75%
Total	4,60,000	Erection	25%

8.28 Contract Costing

You are required to prepare a statement for submission to the management indicating:

- The estimated profit on the completion of the contract;
- The estimated profit to date on the contract.

[C.A. (Inter) and I.C.W.A. (Inter) – Adapted]

Solution (a) Calculation of Estimated Profit on Completion

Contract Price	8,19,000
Less: Total Estimated Cost (Note 1)	6,30,000
Estimated Profit	1,89,000

(b) Calculation of Estimated Profit to date on the Contract

$$(i) \text{ Estimated Profit} \times \frac{\text{Cash Received}}{\text{Contract Price}} :$$

$$= 1,89,000 \times \frac{6,00,000}{8,19,000} = ₹ 1,38,462.$$

$$(ii) \text{ Estimated Profit} \times \frac{\text{Cost Upto Date}}{\text{Estimated Total Cost}} :$$

$$= 1,89,000 \times \frac{4,60,000}{6,30,000} = ₹ 1,38,000.$$

Working Notes : Calculation of Estimated Total Cost

Elements of Cost	Cost to Date (₹)	Additional Cost (₹)	Estimated Total Cost (₹)
Direct Materials	2,80,000 (80%)	70,000 (20%)	3,50,000
Direct Labour	90,000 (75%)	30,000 (25%)	1,20,000
Overhead	75,000 (75%)	25,000 (25%)	1,00,000
Erection Cost	15,000 (25%)	45,000 (75%)	60,000
	4,60,000	1,70,000	6,30,000

Illustration 21

One of the building contracts currently engaged in by a construction company commenced 15 months ago and remains unfinished. The following information relating to work on the contract has been prepared for the year just ended.

	₹		₹
Contract price	21,00,000	Cost incurred during the year :	
Value of work certified at end of year	18,40,000	Materials delivered to site	5,12,000
Cost of work not yet certified	35,000	Wages	4,87,000
Cost incurred :		Hire of plant	96,000
Opening balances :		Other expenses	74,000
Cost of work completed	2,50,000	Closing balance :	
Materials on site (physical stock)	10,000	Materials on site (physical stock)	18,000

As soon as materials are delivered to the site, they are charged to the Contract Account. A record is also kept of materials as they are actually used on the contract. Periodically a stock check is made and any discrepancy between book stock and physical stock is transferred to a general contract materials discrepancy account. This is absorbed back into each contract, currently at a rate of 0.4% of materials booked. The stock check at the end of the year revealed a stock shortage of ₹ 4,000.

In addition to the direct charges listed above, general overheads of the company are charged to contracts at 5% of the value of work certified. General overheads of ₹ 13,000 had been absorbed into the cost of work completed at the beginning of the year.

It has been estimated that further costs to complete the contract will be ₹ 2,15,000. This estimate includes the cost of materials on site at the end of the year just finished and also a provision for rectification.

You are required to: (a) determine the profitability of the above contract and recommend how much profit should be taken for the year just ended.

Solution Determination of the Profitability of the Contract

Particulars	₹	₹
Contract Price		21,00,000
Less: Estimated Total Costs:		
Cost of work completed	2,50,000	
Materials consumed (Note 1)	5,00,000	
Wages	4,87,000	
Plant hire	96,000	
Other expenses	74,000	
Materials discrepancies (₹ 5,00,000 x 0.4%)	2,000	
General overhead (₹ 18,40,000 x 5%) = ₹ 13,000	79,000	
Cost of work to date	14,88,000	
Further cost to complete the contract	2,15,000	17,03,000
Estimated Profit		3,97,000

Since the contract is 87% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows:

$$\text{Estimated Profit} \times \frac{\text{Cost of Work to Date}}{\text{Estimated Total Cost}} = 3,97,000 \times \frac{14,88,000}{17,03,000} = \text{₹ } 3,46,880.$$

Working Notes:

(1) Materials Consumed

	₹
Opening Stock	10,000
Add: Materials delivered at site	5,12,000
	5,22,000
Less: Closing Stock	18,000
	5,04,000
Less: Shortage	4,000
	5,00,000

(4) Calculation of Percentage of Completion

$$\text{Cost to date / Estimated Total Cost} \times 100 \\ = ₹ 14,88,000 / ₹ 17,03,000 \times 100 = 87.37\%$$

General Illustrations

Illustration 22

M/s. Promising Company undertook a contract for erecting a sewage treatment plant for Prosperous Municipality for a total value of ₹ 24 lakhs. It was estimated that the job would be completed by January 31, 2018.

You are asked to prepare the Contract Account for the year ended January 31, 2018 from the following particulars:

(1) Materials ₹ 3,00,000; (2) Wages ₹ 6,00,000; (3) Overhead charges ₹ 1,20,000; (d) Special plant ₹ 2,00,000; (5) Work certified was for ₹ 16 lakhs and 80% of the same was received in cash; (6) Materials lying at site on January 31, 2018 were ₹ 40,000; (7) Depreciate plant by 10%; (8) 5% of the value of materials issued and 6% of wages may be taken to have been incurred for the portion of the work completed, but not yet certified. Overheads are charged as a direct percentage on wages; (9) Ignore depreciation on plant for use on uncertified portion of the work.

Ascertain the amount to be transferred to Profit and Loss Account on the basis of realised profit.

[C.U.B.Com. (Hons.) – Adapted]

8.30 Contract Costing

Solution

In the books of M/s. Promising Company Contract Account

Dr.	[Period: February 1, 2017 to January 31, 2018]		Cr.
Particulars	₹	Particulars	₹
To Materials	3,00,000	By Materials in hand c/d	40,000
To Wages	6,00,000	By Special Plant c/d (₹ 2,00,000 – 20,000)	1,80,000
To Overhead Charges	1,20,000	By Cost of Contract c/d (Balancing figure)	10,00,000
To Special Plant	2,00,000		
	12,20,000		12,20,000
To Cost of Contract b/d	10,00,000	By Contractee A/c (value of work certified)	16,00,000
To Notional Profit c/d	6,58,200	By Cost of Work Uncertified c/d (Note 1)	58,200
	16,58,200		16,58,200
To Profit and Loss A/c (Note 4)	3,51,040	By Notional Profit b/d	6,58,200
To Reserve Profit c/d	3,07,160		
	6,58,200		6,58,200
To Materials b/d	40,000	By Reserve Profit b/d	3,07,160
To Plant, at Valuation b/d	1,80,000	To Cost of Work Uncertified	58,200

Working Notes:

(1) Calculation of Uncertified Work	₹	(2) Calculation of Notional Profit	₹
Materials (5% of ₹ 3,00,000)	15,000	Value of work certified	16,00,000
Wages (6% of ₹ 6,00,000)	36,000	Cost of work uncertified (Note 1)	58,200
Overhead (20% of ₹ 36,000)*	7,200		16,58,200
	58,200	Less: Cost of contract	10,00,000
		Notional Profit	6,58,200

*Overhead rate = ₹ 1,20,000 / ₹ 6,00,000 x 100 = 20%.

(3) Calculation of Percentage of Completion

$$\frac{\text{Value of Work Certified} + \text{cost of Work Uncertified}}{\text{Contract Price}} \times 100 = \frac{16,00,000 + 58,200}{24,00,000} \times 100 = 69\%$$

- (4) Since, the contract is 69% complete, profit to be transferred to Profit and Loss Account is calculated as follows:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 6,58,200 \times \frac{12,80,000}{16,00,000} = ₹ 3,51,040.$$

Illustration 23

A contractor undertook a contract for ₹ 50,000 on 1.1.2017 to be completed over a period of two years. His accounting year ends on 31st December. State with reasons at what value the work-in-progress on 1st January, 2010 will appear in the Contract Account in each of the following cases:

- Work-in-progress on 1.1.2018 ₹ 14,000 (including ₹ 800 estimated profit which was taken to Profit and Loss Account in 2017).
- Work-in-progress on 1.1.2018 ₹ 14,000 (including ₹ 800 estimated profit which was not taken to Profit and Loss Account in 2017).
- Work-in-progress on 1.1.2018 ₹ 14,000 (excluding ₹ 800 estimated profit which was not taken to Profit and Loss Account in 2017).
- Work-in-progress on 1.1.2018 ₹ 14,000 (excluding ₹ 800 estimated profit which was taken to Profit and Loss Account in 2017).

[D.U.B.Com. (Hons.) – Adapted]

Solution

For the purpose of valuation of W.I.P. at the year end, the profit taken to Profit and Loss Account is included in the value of W.I.P. It, however, does not include that part of the profit which has not been taken to Profit and Loss Account of that year. (*See Page 9.8 for details.*)

On the basis of the above, the W.I.P. on 1.1.2018 will be shown in each of the cases as follows:

- Here the value of W.I.P. ₹ 14,000 includes the profit of ₹ 800 which was taken to Profit and Loss Account of 2017. So the value of W.I.P. will be shown on 1.1.2018 at ₹ **14,000**.
- Here the value of W.I.P. ₹ 14,000 includes the profit of ₹ 800 which was not taken to Profit and Loss Account of 2017. So the value of W.I.P. will be shown on 1.1.2018 at ₹ 14,000 – ₹ 800 = ₹ **13,200**.
- Here the value of W.I.P. ₹ 14,000 excludes the profit of ₹ 800 which was not taken to profit and loss Account of 2017. So the value of W.I.P. will be shown on 1.1.2018 at ₹ **14,000**.
- Here the value of W.I.P. ₹ 14,000 excludes the profit of ₹ 800 which was taken to Profit and Loss Account of 2017. So the value of W.I.P. will be shown on 1.1.2018 at ₹ 14,000 + ₹ 800 = ₹ **14,800**.

Illustration 24

The following particulars relate to two houses which a firm of builders had in course of construction under contract:

	House A	House B
	(₹)	(₹)
Work-in-progress on 1.1.2017 (excluding ₹ 800 estimated profit which was taken to Profit and Loss Account in 2016)	14,000	—
Materials purchased	23,000	16,600
Wages	20,000	14,000
Electrical services and fittings	1,400	300
Road-making charges	8,000	—
Contract price (including road making)	60,000	60,000
Cash received on 31.12.2017	60,000	24,000
Percentage of cash received to work certified	100%	66 ² / ₃ %
Value of materials in hand on 31.12.2017	400	540
Completed work not certified	—	2,500
Value of plant used on sites	12,000	6,000
Period of plants remained on sites during the year	10 months	8 months

The total establishment expenses incurred during the year 2017 amounted to ₹ 12,240. These are to be charged to the two contracts in proportion to wages. Depreciation of plant is to be taken into account @ 10% p.a.

Prepare the two Contract Accounts (in columnar form) showing the profit or loss on each house for the year 2017 and the sums which you consider appropriately transferable to the Profit and Loss Account.

[D.U.B.Com. (Hons.) – Adapted]

Solution

Dr.

Contract Account

Cr.

[Period: January 1, 2017 to December 31, 2017]

Particulars	House A (₹)	House B (₹)	Particulars	House A (₹)	House B (₹)
To Work-in-Progress (Note 1)	14,800	—	By Materials :		
To Materials	23,000	16,600	In Hand, c/d	400	540
To Wages	20,000	14,000	By Cost of Contract c/d	75,000	35,800
To Electrical Fittings	1,400	300			
To Road-making Charges	8,000	—			
To Depreciation on Plant	1,000	400			
To Establishment Expenses (Note 2)	7,200	5,040			
	75,400	36,340		75,400	36,340

8.32 Contract Costing

To Cost of Contract c/d	75,000	35,800	By Contractee A/c (value of work certified)	60,000	36,000
To Notional Profit c/d	–	2,700	By Cost of Work Uncertified	–	2,500
			By Profit and Loss A/c (Note 5)	15,000	–
	75,000	38,500		75,000	38,500
To Profit and Loss A/c (Note 4)		1,200	By Notional Profit b/d		2,700
To Reserve Profit c/d		1,500			
		2,700			2,700
To Materials b/d		540	By Reserve Profit b/d		1,500
To Cost of Work Uncertified b/d		2,500			

Working Notes:

- (1) Actual value of W.I.P. is calculated after taking into consideration the profit credited to Profit and Loss Account. Therefore, the value of W.I.P. will be ₹ 14,000 + ₹ 800 = ₹ 14,800.
- (2) The establishment expenses of ₹ 12,240 to be shared by House A and House B in the ratio of 20 : 14 (Ratio of Wages). Share of House A : ₹ 12,240 / 34 × 20 = ₹ 7,200; House B : ₹ 12,240 / 34 × 14 = ₹ 5,040.
- (3) **Percentage of Completion (Contract B)**

$$= \frac{\text{Valuation of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{36,000 + 2,500}{60,000} \times 100 = 64.16\%$$

(4) Profit to be taken to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} \text{ or,}$$

$$\frac{2}{3} \times 2,700 \times \frac{24,000}{36,000} = ₹ 1,200.$$

- (5) Loss of House A to be transferred to Profit and Loss Account in full.

Illustration 25

From the following information, prepare a Contract Account for the year ended 31st December, 2017:

	₹		₹
Contract Price	5,00,000	Plant installed at site at the beginning	1,00,000
Materials Consumed	1,20,000	(Rate of Depreciation 10% p.a.)	
Wages paid during the year	30,000	Work completed	50%
Other costs incurred during the year	40,000	Work certified	40%
		Retention	10%

[D.U.B.Com. (Hons.) – Adapted]

Solution

Contract Account

Dr.

[Period: January 1 to December 31, 2017]

Cr.

Particulars	₹	Particulars	₹
To Materials Consumed	1,20,000	By Plant, at Valuation c/d	90,000
To Wages	30,000	By Cost of Contract c/d (Balancing figure)	2,00,000
To Other Expenses	40,000		
To Plant at Cost	1,00,000		
	2,90,000		2,90,000

To Cost of Contract b/d	2,00,000	By Contractee A/c (value of work certified) (Note 2)	2,00,000
To Notional Profit c/d	40,000	By Cost of Work Uncertified c/d (Note 1)	40,000
	2,40,000		2,40,000
To Profit and Loss A/c (Note 3)	12,000	By Notional Profit b/d	40,000
To Reserve Profit c/d	28,000		40,000
	40,000		40,000
To Plant, at Valuation b/d	90,000	By Reserve Profit b/d	28,000
To Cost of Work Uncertified b/d	40,000		28,000

Working Notes :

(1) Cost of Work Uncertified

50% cost of contract is ₹ 2,00,000. Therefore, the total cost of contract is ₹ 2,00,000 × 2 = ₹ 4,00,000.

The cost of work certified by the Architect is equal to 40% of the cost of contract, i.e., 40% of ₹ 4,00,000 = ₹ 1,60,000.

The cost of work not certified = Cost of contract less cost of work certified (₹ 2,00,000 – ₹ 1,60,000) = ₹ 40,000.

(2) Value of work certified = 40% of ₹ 5,00,000 = ₹ 2,00,000.

(3) Calculation of Notional Profit

	₹	
Value of work certified	2,00,000	Since the contract is 50% complete, the profit to be transferred to Profit and Loss Account is to be calculated as : 1/3 x Notional Profit x Cash Received / Work Certified = 1/3 x ₹ 40,000 x ₹ 1,80,000 / ₹ 2,00,000 = ₹ 12,000.
Cost of work uncertified	40,000	
	2,40,000	
Less: Cost of contract	2,00,000	
Notional Profit	40,000	

Illustration 26

M/s. Excellent Erectors Ltd. took up a contract for the construction of a building at a contract price of ₹ 15,00,000. During the **first year** the following amounts were spent as against which a sum of ₹ 5,62,500 which represented 90% of the work certified was received by the contractor.

Materials ₹ 2,62,500; Wages paid to workers ₹ 1,50,000; Overhead expenses ₹ 37,500.

During the second year, the company spent the following amounts:

Materials ₹ 3,75,000; Labour cost ₹ 3,00,000; Overhead expenses ₹ 75,000.

In the second year, the contract was completed and a sum of ₹ 8,75,000 was received by the contractor.

You are required to prepare the Contract Accounts and Contractee's Account for both the years and calculate the profit.

Note: Consider only 2/5 or 40% of the notional profit to be taken to the credit of Profit and Loss Account in the **first year**.

[I.C.W.A. (Inter) – Adapted]

Solution

In the books of M/s. Excellent Erectors Ltd.

Dr.		Contract Account		Cr.	
		[Period: First Year]			
Particulars	₹	Particulars	₹		
To Materials	2,62,500	By Cost of Contract c/d (Balancing figure)	4,50,000		
To Wages	1,50,000				
To Overhead Expenses	37,500				
	4,50,000				4,50,000
To Cost of Contract b/d	4,50,000	By Contractee A/c (value of work certified) (Note 1)	6,25,000		
To Notional Profit c/d	1,75,000				
	6,25,000				6,25,000
To Profit and Loss A/c (Note 2)	70,000	By Notional Profit b/d	1,75,000		
To Reserve Profit c/d	1,05,000				
	1,75,000				1,75,000

8.34 Contract Costing

Dr. Contract Account [Period: Second Year] Cr.

Particulars	₹	Particulars	₹
To Materials	3,75,000	By Reserve Profit b/d	1,05,000
To Labour Cost	3,00,000	By Contractee A/c (Note 3)	8,75,000
To Overhead Expenses	75,000		
To Profit and Loss A/c (Note 4)	2,30,000		
	9,80,000		9,80,000

Dr. Contractee Account Cr.

Date	Particulars	₹	Date	Particulars	₹
1st Year	To Contract A/c	6,25,000	1st Year	By Bank A/c	5,62,500
		6,25,000		By Balance c/d	62,500
					6,25,000
2nd Year	To Balance b/d	62,500	2nd Year	By Bank A/c	8,75,000
	To Contract A/c	8,75,000		By Balance c/d	62,500
		9,37,500			9,37,500
3rd Year	To Balance b/d	62,500			

Calculation of Profit

Particulars	₹	₹
Contract Price		15,00,000
Less: Cost – 1st Year	4,50,000	
2nd Year	7,50,000	12,00,000
Total Profit of the Contract		3,00,000

Working Notes :

- (1) Cash received is 90% of work certified. Therefore, value of work certified = ₹ 5,62,500 × 100/90 = ₹ 6,25,000.
- (2) It has been given in the question that only 2/5 of notional profit is to be credited to Profit and Loss Account in the first year. Therefore, the profit to be transferred to Profit and Loss Account = 2/5 × ₹ 1,75,000 = ₹ 70,000.
- (3) In the year of completion, the balance amount of contract price due = (₹ 15,00,000 – ₹ 6,25,000) = ₹ 8,75,000.
- (4) In the year of completion, the total profit of that year is to be transferred to Profit and Loss Account.

Illustration 27

The following particulars are obtained from the books of Vinak Construction Ltd. as on March 2017:

Plant and Equipment at cost – ₹ 4,90,000 and Vehicles at cost – ₹ 2,00,000

Details of contract which remain uncompleted as on 31.3.2017 :

(₹ Lacs)

	Contract Nos.		
	V20	V24	V25
Estimated final sales value	8.00	5.60	16.00
Estimated final cost	6.40	7.70	12.00
Wages	2.40	2.00	1.20
Materials	1.00	1.10	0.44
Overheads (excluding Depreciation)	1.44	1.46	0.58
Total costs to date	4.84	4.56	2.22
Value certified by architects	7.20	4.20	2.40
Progress payments received	5.00	3.20	2.00

Depreciation of Plant and Equipment and Vehicle should be charged at 20% to the three contracts in proportion to work certified.

You are required to prepare statements to show contract-wise and total:

- Profit / loss to be taken to the Profit and Loss Account for the year ended 31st March, 2017;
- Work-in-progress in the Balance Sheet as at 31st March, 2017. [C.A. (Inter) – Adapted]

Solution

Vinak Construction Co. Ltd.

Statement of Profit / Loss to be taken to Profit and Loss Account
[Period: April 1, 2016 to March 31, 2017]

Particulars	Contract Nos			Total (₹ in Lacs)
	V-20 (₹ in Lacs)	V-24 (₹ in Lacs)	V-25 (₹ in Lacs)	
(A) Estimated Profit on Completion :				
Estimated final sales value	8.00	5.60	16.00	29.60
Estimated costs	6.40	7.00	12.00	25.40
	1.60	(1.40)	4.00	4.20
(B) Notional Profit / Loss to Date :				
Work Certified	7.20	4.20	2.40	13.80
Less: Total Cost to Date (Note 1)	5.56	4.98	2.46	13.00
	1.64	(0.78)	(0.06)	0.80
(C) Percentage of Completion :				
Total Cost to Date (Note 1)	5.56	4.98	2.46	
Estimated Final Cost	6.40	7.70	12.00	
Percentage (Note 2)	87%	65%	21%	
(D) Profit / Loss to be taken to Profit and Loss A/c (Note 3)	1.00	(0.78)	(0.06)	

Vinayak Construction Co. Ltd.

Statement of Work-in-Progress as on 31.3.2017

Particulars	Contract Nos			Total (₹ in Lacs)
	V-20 (₹ in Lacs)	V-24 (₹ in Lacs)	V-25 (₹ in Lacs)	
Total Cost to Date (Note 1)	5.56	4.98	2.46	13.00
Add: Profit credited to Profit and Loss A/c (Note 3)	1.00	–	–	(0.46)
Less: Loss debited to Profit and Loss A/c	–	0.78	0.06	–
Less: Provision for Contingencies (1.4 – 0.78)	–	0.62	–	–
	6.56	3.58	2.40	12.54
Less: Cash Received	5.00	3.20	2.00	10.20
	1.56	0.38	0.40	2.34

Working Notes:

(1) Total Cost to Date

Particulars	V-20 (₹ in Lacs)	V-24 (₹ in Lacs)	V-25 (₹ in Lacs)
(1) Total Cost to Date :			
Cost to Date (excluding depreciation)	4.84	4.56	2.22
Add: Depreciation (Note 4)	0.72	0.42	0.24
	5.56	4.98	2.46

$$(2) \text{ Percentage of Completion} = \frac{\text{Total Cost to Date}}{\text{Estimated Final Cost}} \times 100$$

$$V - 20 = \frac{5,56,000}{6,40,000} \times 100 = 87\% \text{ (approx.)}$$

8.36 Contract Costing

$$V - 24 = \frac{4,98,000}{7,70,000} \times 100 = 65\% \text{ (approx.)} \quad V - 25 = \frac{2,46,000}{12,00,000} \times 100 = 21\% \text{ (approx.)}$$

Alternatively, Percentage of Completion = $\frac{\text{Work Certified}}{\text{Estimated Sales Value}} \times 100$

$$V - 20 = \frac{7.20}{8.00} \times 100 = 90\% ; V - 24 = \frac{4.20}{5.60} \times 100 = 75\% ;$$

$$V - 25 = \frac{2.40}{16.00} \times 100 = 15\%$$

It should be noted that the percentage of completion, under each method will vary slightly. I suggest to follow the first method when estimated final cost is given in the problem or can be computed from the given information.

(3) Profit to be taken to Profit and Loss Account

Contract No. V-20 : Since this contract is 87% completed, the following formula is applied:

$$\text{Estimated Profit} \times \frac{\text{Value of Work Certified}}{\text{Contract Price}} \times \frac{\text{Cash Received}}{\text{Value of Work Certified}}$$

$$= 1.60 \text{ (A)} \times \frac{7.20}{8.00} \times \frac{5.00}{7.20} = \text{₹ 1.00 Lac}$$

Contract Nos. V-24 and V-25: Since there is a loss in both the contracts, it is prudent accounting practice to transfer the full loss to Profit and Loss Account.

(4) Total Depreciation = 20% of (₹ 4,90,000 + ₹ 2,00,000) = ₹ 1,38,000.

Share of Depreciation :

$$V-20 : ₹ 1,38,000 / ₹ 13,80,000 \times ₹ 7,20,000 = ₹ 72,000$$

$$V-24 : ₹ 1,38,000 / ₹ 13,80,000 \times ₹ 4,20,000 = ₹ 42,000$$

$$V-25 : ₹ 1,38,000 / ₹ 13,80,000 \times ₹ 2,40,000 = ₹ 24,000$$

Escalation Clause

Now-a-days price fluctuation of different elements of costs are very common. In case of a long-term contract, it is very difficult to predict the price and protect the interest of the contractor. To avoid the future losses for the increases in prices of different elements of costs, the contractor may endeavor to cover himself by quoting a very high price. But, he will soon have no business or his business transactions would be considerably restricted. To protect the contractor against inordinately high cost increases, the only way to quote for a contract is on the basis of present prices, with proper and reasonable provisions for increases in materials, labour and other overheads.

An **escalation clause** is a provision inserted into a contract to allow the price to rise under certain conditions above the initially quoted. To make sure that the contractor is adequately protected, it is necessary to examine escalation clauses, since it is the duty of the accountant to prepare and present the evidence required when increases are called for. Escalation clauses should be made in such a fashion that both the parties to a contract should agree on the detailed method by which increases or decreases are to be calculated.

Illustration 28

SB Construction Limited has entered into a big contract at an agreed price of ₹ 1,50,00,000 subject to an escalation clause for material and labour as spent out on the contract and corresponding actuals are as follows:

Materials	Standard		Actual	
	Quantity (Tonnes)	Rate per Tonne ₹	Quantity (Tonnes)	Rate per Tonne ₹
A	3,000	1,000	3,400	1,100
B	2,400	800	2,300	700
C	500	4,000	600	3,900
D	100	30,000	90	31,500
Labour	Hours	Hourly Rate ₹	Hours	Hourly Rate ₹
L1	60,000	15	56,000	18
L2	40,000	30	38,000	35

You are required to :

- Give your analysis of admissible escalation claim and determine the final contract price payable.
 - Prepare Contract Account, if all the expenses other than material and labour related to the contract are ₹ 13,45,000.
- [C.A. (IPCC) – May, 2010]*

Solution Statement Showing Additional Claim Due to Escalation Clause

Materials	Standard Quantity (Tonnes) (a)	Standard Rate ₹ (b)	Actual Rate ₹ (c)	Difference in Rate ₹ (d = c – b)	Escalation Claims ₹ (a x d)
A	3,000	1,000	1,100	100	3,00,000
B	2,400	800	700	(100)	(2,40,000)
C	500	4,000	3,900	(100)	(50,000)
D	100	30,000	31,500	1,500	1,50,000
Material Escalation Claim					1,60,000
Labour	Standard Hours	Standard Rate ₹	Actual Rate ₹	Difference in Rate ₹	Escalation Claims ₹
L1	60,000	15	18	3	1,80,000
L2	40,000	30	35	5	2,00,000
Labour Escalation Claim					3,80,000

Total Escalation Claim : Materials – ₹ 1,60,000 + Labour – ₹ 3,80,000 = ₹ **5,40,000** (Total)

Calculation of Final Contract Price Payable

Particulars	₹
Agreed Contract Price	1,50,00,000
Add: Total Escalation Claim	5,40,000
Total	1,55,40,000

Dr. Contract Account		Cr.	
Particulars	₹	Particulars	₹
To Material (Note 1)	1,05,25,000	By Contractee A/c	1,55,40,000
To Labour (Note 2)	23,38,000		
To Other Expenses	13,45,000		
To Profit and Loss A/c	13,32,000		
	1,55,40,000		1,55,40,000

8.38 Contract Costing

Working Notes :

(1) Calculation of Material Costs

	₹
A : 3,400 tonnes @ ₹ 1,100	37,40,000
B : 2,300 tonnes @ ₹ 700	16,10,000
C : 600 tonnes @ ₹ 3,900	23,40,000
D : 90 tonnes @ ₹ 31,500	28,35,000
	<u>1,05,25,000</u>

(2) Calculation of Labour Cost

	₹
L1 : 56,000 hours @ ₹ 18	10,08,000
L2 : 38,000 hours @ ₹ 35	13,30,000
	<u>23,38,000</u>

Illustration 29

Deluxe Ltd. undertook a contract for ₹ 5,00,000 on 1.7.2016. On 30.6.2017 when the accounts were closed, the following details about the contract were gathered (figures in ₹):

Materials purchased	1,00,000	Materials in hand (30.6.2017)	25,000
Wages paid	45,000	Wages accrued (30.6.2017)	5,000
General expenses	10,000	Work certified	2,00,000
Plant purchased	50,000	Cash received	1,50,000
Depreciation of plant	5,000	Works uncertified	15,000

The above contract contained an escalation clause which read as follows:

"In the event of prices of materials and rates of wages increase by more than 5%, the contract price would be increased accordingly by 25% of the rise in the cost of materials and wages beyond 5% in each case.

It was found that since the date of signing the agreement, the prices of materials and wage rates increased by 25%. The value of the work certified does not take into account the effect of the above clause.

Prepare the Contract Account. Workings should form part of the answer.

[C.A. (Inter) – Adapted]

Solution

Deluxe Limited

Dr.

Contract Account

Cr.

[Period: July 1, 2016 to June 30, 2017]

Particulars	₹	Particulars	₹
To Direct Materials –Purchased	1,00,000	By Direct Materials : In Hand, c/d	25,000
To Wages (₹ 45,000 + 5,000)	50,000	By Plant, at valuation c/d (₹ 50,000 – ₹ 5,000)	45,000
To General Expenses	10,000	By Cost of Contract c/d (Balancing figure)	1,40,000
To Plant – Purchased	50,000		
	<u>2,10,000</u>		<u>2,10,000</u>
To Cost of Contract b/d	1,40,000	By Contractee A/c :	
To Notional Profit c/d	80,000	Value of Work Certified	2,00,000
	<u>2,20,000</u>	Escalation Claim (Note 1)	5,000
		By Work Uncertified c/d	15,000
			<u>2,20,000</u>
To Profit and Loss A/c	20,000	By Notional Profit b/d	80,000
To Reserve Profit c/d	60,000		
	<u>80,000</u>		<u>80,000</u>
To Direct Materials b/d	25,000	By Reserve Profit b/d	60,000
To Plant, at Valuation b/d	45,000	By Accrued Wages b/d	5,000
To Work Uncertified b/d	15,000		

Working Notes:

(1) Calculation of Escalation Claim

Particulars	Total (₹)	Increase	
		Upto 5% (₹)	Beyond 5% (₹)
Materials (Increase in materials price) (₹ 1,00,000 – ₹ 25,000) x (25/125)	15,000	3,000	12,000
Wages (Increase in Wages rate) (₹ 50,000 x 25/125)	10,000	2,000	8,000
TOTAL	25,000	5,000	20,000

Escalation is 25% of the rise in the cost of materials and wages beyond 5% in each case. Therefore, escalation claim = 25% of ₹ 20,000 = ₹ 5,000.

(2) Calculation of Notional Profit		₹		(3) Calculation of Percentage of Completion	
Value of Work Certified	2,00,000			$\frac{\text{Value of Work Certified + Work Uncertified}}{\text{Contract Price}} \times 100$	
Add: Work Uncertified	15,000				
Add: Escalation Claim	5,000			= ₹ 2,00,000 + ₹ 15,000	
	2,20,000			₹ 5,00,000	
				$\times 100 = 43\%$	
Less: Cost of Contract	1,40,000			(Note: Escalation factor has not been taken into consideration for calculating percentage of completion.)	
	80,000				

(4) Profit to be transferred to Profit and Loss Account

Since the contract is 43% complete, we can follow one of the following formula for calculating the profit to be transferred to Profit and Loss Account.

$$(i) \frac{1}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{1}{3} \times 80,000 \times \frac{1,50,000}{2,00,000} = ₹ 20,000.$$

Alternatively,

$$(ii) \frac{1}{3} \times \text{Notional Profit} = \frac{1}{3} \times ₹ 80,000 = ₹ 26,667.$$

Observing the concept of conservatism, we should credit ₹ 20,000 to Profit and Loss Account.

Illustration 30

A contractor, who prepares his account on 31st December each year, commenced a contract on 1.4.2017. The costing records concerning the said contract reveal the following information on 31.12.2017:

Materials charged to site ₹ 2,58,100; Labour engaged ₹ 5,60,500; Foreman's salary ₹ 79,300.

Plants costing ₹ 2,60,000 had been on site for 146 days. Their working life is estimated at 7 years and their final scrap value at ₹ 15,000. A supervisor, who is paid ₹ 4,000 p.m. has devoted approximately three-fourths of his time to this contract.

The administrative and other expenses amount to ₹ 1,40,000. Materials in hand at site on 31.12.2017 cost ₹ 25,400. Some of the material costing ₹ 4,500 was found unsuitable and was sold for ₹ 4,000 and a part of the plant costing ₹ 5,500 (on 31.12.2017) unsuited to the contract was sold at a profit of ₹ 1,000.

The contract price was ₹ 22,00,000 but it was accepted by the contractor for ₹ 20,00,000. On 31.12.2017, two-thirds of the contract was completed. Architect's certificate had been issued covering 50% of the contract price and ₹ 7,50,000 had so far been paid on account.

Prepare Contract Account and state how much profit or loss should be included in the financial accounts to 31.12.2017. Workings should be clearly given. Depreciation is charged on time basis.

Also prepare the Contractee's Account and show how these accounts would appear in the Balance Sheet as on 31.12.2017.

[C.A. (Inter) – Adapted]

Solution

Dr.

Contract Account [Period: April 1, 2017 to December 31, 2017]

Cr.

Particulars	₹	Particulars	₹
To Direct Materials	2,58,100	By Materials in hand c/d	25,400
To Direct Labour	5,60,500	By Bank (Materials sold)	4,000
To Supervisor's Salary (Note 1)	27,000	By Profit and Loss A/c (Loss on sale of materials)	500
To Foreman's Salary	79,300	By Cost of Contract (Balancing figure) c/d	10,49,000
To Depreciation (Note 2)	14,000		
To Administrative and Other Expenses	1,40,000		
	10,78,900		10,78,900
To Cost of Contract b/d	10,49,000	By Contractee A/c (value of work certified)	10,00,000
To Notional Profit c/d	2,13,250	By Cost of Work Uncertified c/d (Note 3)	2,62,250
	12,62,250		12,62,250

8.40 Contract Costing

To Profit and Loss A/c (Note 6)	1,06,625	By Notional Profit b/d	2,13,250
To Reserve Profit c/d	1,06,625		
	2,13,250		2,13,250
To Materials b/d	25,400	By Reserve Profit b/d	1,06,625
To Cost of Work Uncertified	2,62,250		

Dr. Contractee Account		Cr.	
Particulars	₹	Particulars	₹
To Contract A/c	10,00,000	By Bank A/c	7,50,000
		By Balance c/d	2,50,000
	10,00,000		10,00,000

Balance Sheet as at December 31, 2017

Liabilities	₹	Assets	₹
Profit and Loss A/c (Note 8)	1,07,125	Plant (Note 7)	2,40,000
		Materials in Hand	25,400
		Work-in-Progress (Note 5)	4,05,625

Working Notes:

(1) Supervisor's Salary = $\frac{3}{4}$ of ₹ 36,000 = ₹ 27,000.

(2) Depreciation = $\frac{[(\text{₹ } 2,60,000 - \text{₹ } 15,000) / 7 \text{ years}]}{146 / 365} = \text{₹ } 14,000$.

(3) Cost of Work Uncertified

$\frac{2}{3}$ of cost of contract is ₹ 10,49,000. Therefore, the total cost of the contract is ₹ 10,49,000 $\times \frac{3}{2}$ = ₹ 15,73,500. The cost of work certified by the architect is equal to 50% of the cost of the contract, i.e., ₹ 7,86,750 ($\frac{1}{2}$ of ₹ 15,73,500).

The cost of work not yet certified = Cost of contract less Cost of work certified.

= (₹ 10,49,000 – ₹ 7,86,750) = ₹ 2,62,250.

(4) Calculation of Notional Profit		₹	(5) Valuation of Work-in-Progress		₹
Value of Work Certified	10,00,000		Cost of Contract		10,49,000
Add: Work Uncertified	2,62,250		Add: Profit credited to Profit and Loss A/c		1,06,625
	12,62,250				11,55,625
Less: Cost of Contract	10,49,000		Less: Cash Received		7,50,000
	2,13,250				4,05,625

(6) Profit to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 2,13,250 \times \frac{7,50,000}{10,00,000} = \text{₹ } 1,06,625.$$

Dr. (7) Plant Account		Cr.	
Particulars	₹	Particulars	₹
To Balance b/d	2,60,000	By Contract A/c (Depreciation)	14,000
To Profit and Loss A/c	1,000	By Bank A/c	6,500
		By Balance c/d	2,40,500
	2,61,000		2,61,000

Dr. (8) Profit and Loss Account		Cr.	
Particulars	₹	Particulars	₹
To Contract A/c (Loss on sale of materials)	500	By Contract A/c (Profit transferred)	1,06,625
To Balance c/d	1,07,125	By Plant A/c (Profit on Sale)	1,000
	1,07,625		1,07,625

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 31

From the following information, determine the amount of profit from the contract that can be credited to Profit and Loss Account and also the valuation of work-in-progress.

	₹
Contract Price	12,00,000
Cost of Date	7,00,000
Work Certified	8,00,000
Cost of Work not Certified	20,000
Cash Received from Contractee	7,20,000

[C.U.B.Com. (General) - 2008]

Solution

(a) Calculation of Notional Profit

	₹
Value of work certified	8,00,000
Add: Cost of work uncertified	<u>20,000</u>
	8,20,000
Less: Total cost of contract upto date	<u>7,00,000</u>
Notional Profit	<u>1,20,000</u>

(b) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{8,00,000 + 20,000}{12,00,000} \times 100 = 68.37\%$$

(c) Profits to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 1,20,000 \times \frac{7,20,000}{8,00,000} = ₹ 72,000.$$

(d) Value of Work-in-Progress

Cost of contract to date	7,00,000
Add: Profit transferred to Profit and Loss Account	<u>72,000</u>
	7,72,000
Less: Cash received	<u>7,20,000</u>
Value of Work-in-Progress	<u>52,000</u>

Illustration 32

How much profit, if any, would you allow to be credited in the following cases ?

Contract Cost	₹ 2,80,000 up to date
Contract Value	₹ 5,00,000
Cash Received	₹ 2,70,000
Uncertified Work	₹ 30,000
Deduction from bills by way of security — 10%.	

[C.U.B.Com. (General) - 2009]

8.42 Contract Costing

Solution

(a) Calculation of Notional Profit	₹
Value of work certified (Note 1)	3,00,000
Add: Cost of work uncertified	<u>30,000</u>
	3,30,000
Less: Total cost of contract upto date	<u>2,80,000</u>
Notional Profit	<u>50,000</u>

(b) Calculation of Percentage of Completion

$$\begin{aligned}\text{Percentage of Completion} &= \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100 \\ &= \frac{3,00,000 + 30,000}{5,00,000} \times 100 = 66\%\end{aligned}$$

(c) Profits to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 50,000 \times \frac{2,70,000}{3,00,000} = ₹ 30,000.$$

Working Notes :

$$\text{Value of Work Certified} = \frac{\text{Cash Received}}{100\% - \text{Retention Percentage}} = \frac{2,70,000}{100\% - 10\%} = ₹ 3,00,000$$

Illustration 33

Following amounts have been spent on an unfinished contract till 31.12.2010 :

Materials ₹ 1,60,000; Wages paid ₹ 1,40,000; Direct charges ₹ 1,00,000.

₹ 4,00,000 have been received from the Contractee being 80% of the work certified. Calculate profit to be credited to Profit and Loss Account, uncertified work-in-progress being ₹ 20,000.

Total value of the contract is ₹ 8,00,000.

[C.U.B.Com. (General) - 2011]

Solution

(a) Calculation of Notional Profit	₹
Value of work certified (Note 1)	5,00,000
Add: Cost of work uncertified	<u>20,000</u>
	5,20,000
Less: Total cost of contract upto date	<u>4,00,000</u> (Note 2)
Notional Profit	<u>1,20,000</u>

(b) Calculation of Percentage of Completion

$$\begin{aligned}\text{Percentage of Completion} &= \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100 \\ &= \frac{5,00,000 + 20,000}{8,00,000} \times 100 = 65\%\end{aligned}$$

(c) Profits to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 1,20,000 \times \frac{4,00,000}{5,00,000} = ₹ 64,000.$$

Working Notes :

$$(1) \text{ Value of Work Certified} = \frac{\text{Cash Received}}{100\% - \text{Retention Percentage}} = \frac{4,00,000}{100\% - 20\%} = ₹ 5,00,000$$

(2) Calculation of Cost of Contract Upto Date	₹
Materials consumed	1,60,000
Wages paid	1,40,000
Direct charge	<u>1,00,000</u>
Total Cost of Contract Upto date	<u>4,00,000</u>

Illustration 34

From the following particulars in respect of a particular contract for the year ended 31st December, 2011, prepare Contract Account :

Materials sent to contract ₹ 1,90,000; Wages paid ₹ 1,20,000; Wages outstanding ₹ 5,500; Direct expenses ₹ 60,000; Establishment charges ₹ 52,000; Special plant installed at cost ₹ 2,00,000; Cost of work uncertified ₹ 25,000; Value of special plant (31.12.2011) ₹ 1,70,000; Materials in hand (31.12.2011) ₹ 21,000; Total contract price ₹ 12,00,000; Cash received ₹ 5,94,000; Retention 10% of work certified; Sale of scrap ₹ 2,000; General plant costing ₹ 1,20,000 was used for three months. Annual depreciation rate p.a. 15%.

[C.U.B.Com. (General) - 2012]

Solution

Dr.

Contract Account

Cr.

[Period: January 1, 2011 to December 31, 2011]

Particulars	₹	Particulars	₹
To Direct Materials	1,90,000	By Sale of Scrap	2,000
To Direct Wages	1,20,000	By Direct Materials in Hand	21,000
Add: Outstanding Wages	<u>5,500</u>	By Plant at Valuation	1,70,000
To Direct Expenses	60,000	By Cost of Contract c/d	4,39,000
To Establishment Charges	52,000		
To Special Plant	2,00,000		
To Depreciation on General Plant (Note 1)	4,500		
	<u>6,32,000</u>		<u>6,32,000</u>
To Cost of Contract b/d	4,39,000	By Contractee A/c (Note 2)	6,60,000
To Notional Profit c/d	2,46,000	By Cost of Work Uncertified c/d	25,000
	<u>6,85,000</u>		<u>6,85,000</u>
To Profit and Loss A/c (Note 4)	1,47,600	By Notional Profit b/d	2,46,000
To Reserve Profit c/d	98,400		
	<u>2,46,000</u>		<u>2,46,000</u>
To Plant at Valuation	1,70,000	By Outstanding Wages	5,500
To Direct Materials	21,000		
To Work Uncertified	<u>25,000</u>		

Working Notes :

$$(1) \text{ Depreciation on General Plant} = [(15\% \times 1,20,000 \times 3) \div 12] = ₹ 4,500.$$

$$(2) \text{ Value of Work Certified} = \frac{\text{Cash Received}}{100\% - \text{Retention Percentage}} = \frac{5,94,000}{100\% - 10\%} = ₹ 6,60,000$$

8.44 Contract Costing

(3) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{6,60,000 + 25,000}{12,00,000} \times 100 = 57\%$$

(4) Calculation of Profit to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 2,46,000 \times \frac{5,94,000}{6,60,000} = ₹ 1,47,600.$$

Illustration 35

From the following particulars, prepare Contract Account for the year ended 31st March, 2013 :

	₹		₹
Materials Issued	85,000	Materials Returned to Stores	600
Wages Paid	74,000	Work Certified	1,95,000
Direct Expenses	4,000	Cost of Works not Certified	4,500
Establishment Charges	3,000	Cash Received	1,80,000
Plant Installed	15,000	Contract Price	2,80,000
Wages Unpaid	2,400		
Direct Expenses Unpaid	1,500		
Value of Plant (31.03.2013)	11,000		
Materials in Hand (31.03.2013)	2,000		

[C.U.B.Com. (General) - 2013]

Solution

Dr.

Contract Account

Cr.

[Period: April 1, 2012 to March 31, 2013]

Particulars	₹	Particulars	₹
To Direct Materials	85,000	By Material in Hand	2,000
To Direct Wages 74,000		By Plant at Valuation c/d	11,000
Add: Outstanding Wages 2,400	76,400	By Materials Returned to Stores	600
To Direct Expenses 4,000		By Cost of Contract c/d	1,71,300
Add: Outstanding Direct Expenses 1,500	5,500		
To Plant 15,000			
To Establishment Charges 3,000			
	1,84,900		1,84,900
To Cost of Contract b/d	1,71,300	By Contractee A/c	1,95,000
To Notional Profit c/d	28,200	By Cost of Work Uncertified c/d	4,500
	1,99,500		1,99,500
To Profit and Loss A/c (Note 2)	17,354	By Notional Profit b/d	28,200
To Reserve Profit c/d	10,846		
	28,200		28,200
To Plant at Valuation	11,000	By Outstanding Wages	2,400
To Direct Materials	2,000	By Outstanding Direct Expenses	1,500
To Cost of Work Uncertified	4,500		

Working Notes :

(1) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{1,95,000 + 4,500}{2,80,000} \times 100 = 71.25\%$$

(2) Calculation of Profit to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 28,200 \times \frac{1,80,000}{1,95,000} = ₹ 17,354.$$

Illustration 36

From the following particulars relating to a contract, prepare Contract Account for the year ended 31.3.2014 :

Materials issued ₹ 40,000; Wages paid ₹ 15,000; Direct expenses ₹ 3,000; Overhead expenses ₹ 5,000; Cost of Plant installed ₹ 25,000; Sale of scrap ₹ 1,000; Work certified ₹ 80,000; Work uncertified ₹ 5,000.

Materials at site on 31.3.2014 ₹ 2,000; Contract price ₹ 1,00,000.

Depreciation on Plant 20% p.a.

Cash received from contractee ₹ 60,000.

[C.U.B.Com. (General) - 2014]

Solution

Dr.

Contract Account

Cr.

[Period: April 1, 2013 to March 31, 2014]

Particulars	₹	Particulars	₹
To Direct Materials	40,000	By Sale of Scrap	1,000
To Direct Wages	15,000	By Materials in Hand c/d	2,000
To Direct Expenses	3,000	By Cost of Contract c/d	65,000
To Overhead Expenses	5,000		
To Depreciation on Plant (Note 1)	5,000		
	68,000		68,000
To Cost of Contract b/d	65,000	By Contractee A/c	80,000
To Notional Profit c/d	20,000	By Cost of Work Uncertified c/d	5,000
	85,000		85,000
To Profit and Loss A/c (Note 2)	10,000	By Notional Profit b/d	20,000
To Reserve Profit c/d	10,000		
	20,000		20,000
To Materials in Hand b/d	2,000	By Reserve Profit b/d	10,000
To Cost of Work Uncertified	5,000		

Working Notes :

(1) Depreciation on Plant = 20% of ₹ 25,000 = ₹ 5,000.

(2) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{80,000 + 5,000}{1,00,000} \times 100 = 85\%$$

8.46 Contract Costing

Tutorial Note :

As the percentage of completion is exceeding 75%, the profit to be credited to Profit and Loss Account should be based on '*Estimated Profit*'. The information is not sufficient for the calculation of '*Estimated Profit*'. Therefore, the following formula has been adopted :

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 20,000 \times \frac{60,000}{80,000} = ₹ 10,000.$$

Illustration 37

From the following particulars in respect of contract No. 111, prepare a Contract Account for the year ended 31.3.2015 :

	₹
Contract Price	40,000
Materials Issued	7,200
Wages Paid	11,000
General Charges	400
Plant Installed	2,000
Materials in Hand	400
Wages Accrued	4000
Work Certified	20,000
Cash Received in respect thereof	15,000
Cost of Work not yet certified	600

Plant were installed at the beginning of the year and Depreciation is chargeable @ 10% p.a.

[C.U.B.Com. (General) - 2015]

Solution

Dr.

Contract Account No. 111 [Period: April 1, 2014 to March 31, 2015]

Cr.

Particulars	₹	Particulars	₹
To Direct Materials	7,200	By Materials in Hand	400
To Wages 11,000		By Cost of Contract c/d	18,800
Add: Wages Accrued 400	11,400		
To General Charges	400		
To Depreciation on Plant	200		
	19,200		19,200
To Cost of Contract b/d	18,800	By Contractee A/c	20,000
To Notional Profit c/d	1,800	By Cost of Work Uncertified c/d	600
	20,600		20,600
To Profit and Loss A/c (Note 2)	900	By Notional Profit b/d	1,800
To Reserve Profit c/d	900		1,800
	1,800		
To Materials in Hand	400	By Wages Accrued	400
To Cost of Work Uncertified	600	By Reserve Profit b/d	900

Working Notes :

(1) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{20,000 + 600}{40,000} \times 100 = 51.5\%$$

(2) Calculation of Profit to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 1,800 \times \frac{15,000}{20,000} = ₹ 900.$$

Illustration 38

From the following particulars in respect of contract No. 205, prepare a Contract Account for the year ended 31.3.2016:

Contract Price — ₹ 5,00,000.

The Company incurred the following expenses up to 31st March, 2016 :

Materials Consumed — ₹ 1,10,000; Wages — ₹ 40,000; Direct Expenses — ₹ 20,000; Plant purchased on 01.10.2015 — ₹ 1,00,000; Materials in Hand — ₹ 5,000.

Depreciation 10% p.a. on Plant.

Charge other works expenses @ 20% of wages and office expenses @ 10% of works cost.

The amount certified by the Engineer was ₹ 3,00,000; retention money being 20% of the certified value.

[C.U.B.Com. (General) - 2016]

Solution

Dr.

Contract Account No. 205
[Period: April 1, 2015 to March 31, 2016]

Cr.

Particulars	₹	Particulars	₹
To Direct Materials (Consumed)	1,10,000	By Cost of Contract c/d	2,01,300
To Direct Wages	40,000		
To Direct Expenses	20,000		
To Depreciation on Plant (Note 1)	5,000		
To Other Works Expenses (20% of ₹ 40,000)	8,000		
To Office Expenses (10% of ₹ 1,83,000)	18,300		
	2,01,300		2,01,300
To Cost of Contract b/d	2,01,300	By Contractee A/c	3,00,000
To Notional Profit c/d	98,700		
	3,00,000		3,00,000
To Profit and Loss A/c	52,640	By Notional Profit b/d	98,700
To Reserve Profit c/d	46,060		
	98,700		98,700
To Materials in Hand	5,000	By Reserve Profit b/d	46,060
			46,060

Working Notes :

(1) Depreciation : ₹ 1,00,000 × (10 ÷ 100) × (6 ÷ 12) = ₹ 5,000.

(2) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{3,00,000}{5,00,000} \times 100 = 60\%$$

(3) Calculation of Profit to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 98,700 \times \frac{3,00,000 - 60,000}{3,00,000} = ₹ 52,640.$$

(4) Materials consumed has been given in the problem. Therefore, materials in hand will *not be credit to Contract Account*.

[For Honours Candidates Only]**Illustration 39**

The following particulars are available in respect of a contract as on 31st March, 2008 (all figures in rupees).

(i) Contract price	5,00,000	(ii) Total cost of contract upto date	2,87,500
(iii) Cost of uncertified work	12,500	(iv) Cash received	2,65,625
(v) Retention money	@ 15%		

Compute the amount of profit that may be credited to Profit and Loss Account and the value of work-in-progress. *[C.U.B.Com. (Hons.) – 2008]*

Solution

(a) Calculation of Notional Profit	₹
Value of work certified (Note 1)	3,12,500
Add: Cost of work uncertified	<u>12,500</u>
	3,25,000
Less: Total cost of contract upto date	<u>2,87,500</u>
Notional Profit	<u>37,500</u>

(b) Calculation of Percentage of Completion

$$\begin{aligned}\text{Percentage of Completion} &= \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100 \\ &= \frac{(3,12,500 + 12,500)}{5,00,000} \times 100 = 65\%\end{aligned}$$

(c) Profits to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 37,500 \times \frac{2,65,625}{3,12,500} = ₹ 21,250.$$

(d) Value of Work-in-Progress

Cost of contract to date	2,87,500
Add: Profit transferred to Profit and Loss Account	<u>21,250</u>
	3,08,750
Less: Cash received	<u>2,65,625</u>
Value of Work-in-Progress	<u>43,125</u>

Working Note :

$$(1) \text{ Value of Work Certified} = \frac{\text{Cash Received}}{100\% - \text{Retention Percentage}} = \frac{2,65,625}{100\% - 15\%} = ₹ 3,12,500$$

Illustration 40

Ambuja Construction Ltd. entered into a contract to construct a building. The contract value was ₹ 13,00,000 to be realised in instalment on the basis of value of work certified by the architect subject to a retention of 10%. The work commenced on 1.4.2008 but it remained incomplete on 31.12.2008 when the final accounts are to be prepared. The facts and figures of the contract are :

	₹		₹
Materials issued to contract	3,60,000	Wages paid	1,74,000
Expenses incurred on the contract	77,500	Plant sent to site on 1.4.2008	64,000
Wages unpaid	6,300		

Total establishment expenses amounted to ₹ 82,000 out of which 25% is attributable to the contract. Out of materials issued to the contract, materials costing ₹ 8,000 were sold for ₹ 12,000. A part of the plant (cost ₹ 4,000)

was damaged on 10.2008 and scrap realised only ₹ 600. Plant costing ₹ 6,000 was transferred to another contract on 31.12.2008.

Plant is to be depreciated @ 10% p.a. Material in hand on 31.12.2008 was ₹ 35,000. Cash received from the contractee was ₹ 6,12,000. Cost of work yet to be certified was ₹ 60,000.

Prepare Contract Account and Contractee Account in the books of Ambuja Construction Limited.

[C.U.B.Com. (Hons.) - 2009]

Solution

In the books of Ambuja Construction Ltd.

Dr.

Contract Account

Cr.

[Period: April 1, 2008 to December 31, 2008]

Particulars	₹	Particulars	₹
To Direct Materials	3,60,000	By Sale of Materials	12,000
To Direct Wages 1,74,000		By Materials in Hand	35,000
Add: Wages Unpaid 6,300	1,80,300	Cost of Contract c/d	6,00,000
To Expenses	77,500		
To Establishment Expenses (25% of ₹ 82,000)	20,500		
To Profit on Sale of Materials	4,000		
To Depreciation on Plant (Note 1)	4,700		
	6,00,000		6,00,000
To Cost of Contract b/d	6,00,000	By Contractee A/c (Note 2)	6,80,000
To Notional Profit c/d	1,40,000	By Cost of Work Uncertified	60,000
	7,40,000		7,40,000
To Profit and Loss A/c	84,000	By Notional Profit b/d	1,40,000
To Reserve Profit c/d	56,000		
	1,40,000		1,40,000
To Materials	35,000	By Reserve Profit b/d	56,000
		By Wages Unpaid	6,300

Dr.

Contractee Account

Cr.

Particulars	₹	Particulars	₹
To Contract A/c	6,80,000	By Bank A/c (Cash Received)	6,12,000
		By Balance c/d	68,000
	6,80,000		6,80,000

Working Notes :

(1) Calculation of Depreciation on Plant :

	₹
Cost of Plant sent to site (1.4.2008)	64,000
Less: Cost of Plant Damaged (1.10.2008)	4,000
	60,000

(a) Depreciation for 6 months on ₹ 64,000 @ 10% p.a. [₹ 64,000 × (10 ÷ 100) × (6 ÷ 12)] = ₹ 3,200.

(b) Depreciation for 3 months on ₹ 60,000 @ 10% p.a. [₹ 60,000 × (10 ÷ 100) × (3 ÷ 12)] = ₹ 1,500

Total ₹ 4,700

$$(2) \text{ Value of Work Certified} = \frac{\text{Cash Received}}{100\% - \text{Retention Percentage}} = \frac{6,12,000}{100\% - 10\%} = ₹ 6,80,000$$

(3) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{(6,80,000 + 60,000)}{13,00,000} \times 100 = \frac{7,40,000}{13,00,000} \times 100 = 56.92\%$$

8.50 Contract Costing

(3) Calculation of Profit to be credited to Profit and Loss Account

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 1,40,000 \times \frac{6,12,000}{6,80,000} = ₹ 84,000.$$

Illustration 41

A firm of building contractors undertook a contract for ₹ 3,50,000. The following particulars are furnished for the year ended 31st December, 2011 :

	₹		₹
Materials :		Wages for Labour	40,000
Direct Purchased	30,000	General Plant in use :	
Issued from Stores	10,000	Written-down value	90,000
Direct Expenses	2,500	Depreciation thereon	10,000
Subcontract Charges	6,000	Share of General Overhead	2,000
Materials in Hand on 31.12.2011	2,000	Material Lost by Fire	500
Outstanding Wages on 31.12.2011	6,000	Direct Expenses Accrued on 31.12.2011	1,000
Cash Received (90% of work certified)	1,62,000	Cost of uncertified work	5,000
Prepare Contract Account.			

[C.U.B.Com. (Hons.) - 2012]

Solution

Dr.

Contract Account

Cr.

[Period: January 1 to December 31, 2011]

Particulars	₹	Particulars	₹
To Direct Materials :		By Materials in Hand	2,000
Direct Purchase	30,000	By Materials lost by Fire	500
Issued from Stores	10,000	By Cost of Contract c/d	1,05,000
To Direct Wages	40,000		
Add: Outstanding Wages	6,000		
To Direct Expenses	2,500		
Add: Direct Expenses Accrued	1,000		
To Share of General Overhead	2,000		
To Depreciation	10,000		
To Sub-contract Charges	6,000		
	1,07,500		1,07,500
To Cost of Contract b/d	1,05,000	By Contractee A/c (Note 1)	1,80,000
To Notional Profit c/d (Note 2)	80,000	By Cost of Work Uncertified	5,000
	1,85,000		1,85,000
To Profit and Loss A/c (Note 4)	48,000	By Notional Profit b/d (Note 2)	80,000
To Reserve Profit c/d	32,000		
	80,000		80,000
To Materials in Hand	2,000	By Reserve Profit b/d	32,000
To Cost of Work Uncertified	5,000	By Outstanding Wages	6,000
		By Direct Expenses Accrued	1,000

Working Notes :

$$\begin{aligned} \text{(1) Calculation of Work Certified} &= \frac{\text{Cash Received}}{\text{Percentage of Work Certified}} \times 100 \\ &= \frac{1,62,000}{90} \times 100 = ₹ 1,80,000 \end{aligned}$$

(2) Calculation of Notional Profit

	₹
Value of Work Certified	1,80,000
Cost of Work Uncertified	<u>5,000</u>
	1,85,000
Less: Cost of Contract	<u>1,05,000</u>
	<u>80,000</u>

(2) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{(1,80,000 + 5,000)}{3,50,000} \times 100 = \frac{1,85,000}{3,50,000} \times 100 = 52.86\%$$

- (3) Since the contract is 52.86% complete, profit to be transferred to Profit and Loss Account is calculated as follows :

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 80,000 \times \frac{1,62,000}{1,80,000} = ₹ 48,000.$$

Illustration 42

S & Co. (2013) Ltd., a firm of building contractors, undertook a contract for ₹ 6,50,000 to realise on the basis of certified by the architect subject to a retention of 10%. The work commenced on 1.4.2012 but it remained incomplete on 31.12.2012 when the final accounts are to be prepared. The facts and figures of the contract are:

Materials charged to contract	1,80,000
Wages paid for Labour	87,000
Plant charged to contract at the commencement	32,000
Expenses incurred on contract	38,750

Total establishment expenses amounted to ₹ 41,000 out of which 25% is attributable to this contract. Out of the materials issued to the contract, materials costing ₹ 4,000 were sold for ₹ 5,000. A part of the plant cost (₹ 2,000) was damaged on 01.10.2012 and the scrap realised ₹ 300 only. Plant costing ₹ 3,000 was transferred to another contract site on 31.12.2012. Plant is to be depreciated @ 10% p.a. Materials on hand on 31.12.2011 ₹ 17,500. Cash received from the contractee ₹ 3,06,000. Cost of work not yet certified ₹ 30,000.

Prepare Contract Account showing therein the amount of profit or loss to be transferred to Profit and Loss Account.

[C.U.B.Com. (Hons.) - 2013]

Solution

In the books of S & Co. (2013) Ltd.

Dr.

Contract Account

Cr.

[Period: April 1, 2012 to December 31, 2012]

Particulars	₹	Particulars	₹
To Direct Materials	1,80,000	By Bank – Sale of Materials	5,000
To Direct Wages	87,000	By Direct Materials in Hand c/d	17,500
To Direct Expenses	38,750	By Plant :	
To Establishment Expenses (25% of ₹ 41,000)	10,250	Damaged (Note 1)	1,900
To Plant at Cost	32,000	Returned (Note 2)	2,775
To Profit on Sale of Materials (5,000 – 4,000)	1,000	At Site (Note 3)	24,975
		By Cost of Contract c/d	2,96,850
	<u>3,49,000</u>		<u>3,49,000</u>
To Cost of Contract b/d	2,96,850	By Contractee A/c (Note 4)	3,40,000
To Notional Profit c/d	73,150	By Cost of Work Uncertified	30,000
	<u>3,70,000</u>		<u>3,70,000</u>

8.52 Contract Costing

To Profit and Loss A/c (Note 7)	43,890	By Notional Profit b/d	73,150
To Reserve Profit c/d	29,260		
	<u>73,150</u>		<u>73,150</u>
To Direct Materials in Hand	17,500	By Reserve Profit b/d	29,260
To Plant at Valuation (Note 3)	24,975		
To Cost of Work Uncertified b/d	<u>30,000</u>		

Working Notes :

- (1) Cost of damaged plant = ₹ 2,000. Depreciation upto the date of damage : $(10\% \text{ of } ₹ 2,000) \times (6 \div 12) = ₹ 100$.

W.D.V. of the damaged Plant :

Cost	2,000
Less: Depreciation	<u>100</u>
	<u>1,900</u>

- (2) Cost of plant transferred = ₹ 3,000
Depreciation for 9 months = $₹ 3,000 \times (10 \div 100) \times (9 \div 12) = ₹ 225$.

W.D.V. of Plant Transferred

	₹
Cost	3,000
Less: Depreciation	<u>225</u>
	<u>2,775</u>

- (3) **Cost of Plant at Site**

	₹
Cost of Plant charged to Contract	32,000
Less: Cost of Damaged Plant	(2,000)
Less: Cost of Plant transferred	<u>(3,000)</u>
Cost of Plant at Site at present	<u>27,000</u>

Depreciation of Plant at Site = $10\% \text{ of } ₹ 27,000 \times (9 \div 12) = ₹ 2,025$.

W.D.V. of Plant at Site :

Cost	27,000
Less: Depreciation	<u>2,025</u>
	<u>24,975</u>

- (4) **Value of Work Certified**

Retention is 10%. Therefore, cash received = 90% of the work certified.

Cash received = ₹ 3,06,000. So the work certified = $(3,06,000 \div 90) \times 100 = ₹ 3,40,000$.

- (5) **Calculation of Notional Profit**

	₹
Value of Work Certified	3,40,000
Cost of Work Uncertified	<u>30,000</u>
	3,70,000
Less: Cost of Contract	<u>2,96,850</u>
	<u>73,150</u>

- (6) **Calculation of Percentage of Completion**

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{(3,40,000 + 30,000)}{6,50,000} \times 100 = \frac{3,70,000}{6,50,000} \times 100 = 56.92\%$$

- (7) **Profit to be transferred to Profit and Loss Account** : Since the contract is 56.92% complete, the profit to be transferred to Profit and Loss Account is to be calculated as follows :

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 73,150 \times \frac{3,06,000}{3,40,000} = ₹ 43,890.$$

Illustration 43

A firm of building contracts undertook a contract for ₹ 4,00,000. The following particulars are furnished for the year ended 31st December, 2013 :

Materials :	₹
Direct purchases	40,000
From stores	20,000
Wages for Labour	30,000
General Plant in use :	
Written-down value	80,000
Depreciation thereon	10,000
Direct expenses	2,500
Subcontract charges	6,000
Share of general overhead	2,000
Materials in hand on 31.12.2013	2,000
Outstanding wages on 31.12.2013	2,000
Direct expenses accrued on 31.12.2013	2,000
Cash received (80% of work certified)	1,60,000
Cost of uncertified work	50,000

Prepare Contract Account, Value of Work-in-Progress and show how the various items would appear in the Balance Sheet.

[C.U.B.Com. (Hons.) - 2014]

Solution

Dr.

Contract Account

Cr.

[Period: January 1 to December 31, 2013]

Particulars	₹	Particulars	₹
To Direct Materials :		By Materials in Hand	2,000
Direct Purchases	40,000	By Cost of Contract c/d	1,12,500
Issued from Stores	<u>20,000</u>		
To Direct Wages	30,000		
Add: Outstanding Wages	<u>2,000</u>		
To Direct Expenses	2,500		
Add: Direct Expenses Accrued	<u>2,000</u>		
To Sub-contract Charge	6,000		
To Share of General Overhead	2,000		
To Depreciation	10,000		
	<u>1,14,500</u>		<u>1,14,500</u>
To Cost of Contract b/d	1,12,500	By Contractee A/c (Note 1)	2,00,000
To Notional Profit c/d	1,37,500	By Cost of Work Uncertified c/d	50,000
	<u>2,50,000</u>		<u>2,50,000</u>
To Profit and Loss A/c (Note 3)	73,333	By Notional Profit b/d	1,37,500
To Reserve Profit c/d	64,167		
	<u>1,37,500</u>		<u>1,37,500</u>
To Direct Materials in Hand	2,000	By Reserve Profit	64,167
To Cost of Work Uncertified	50,000	By Outstanding Wages	2,000
		By Direct Expenses Accrued	1,000

8.54 Contract Costing

Valuation of Work-in-Progress

Method - I	₹	Method - II	₹
Cost of Contract to Date	1,12,500	Work Not Yet Certified	50,000
Add: Profit transferred to Profit and Loss Account	73,333	Add: Retention Money (2,00,000 – 1,60,000)	40,000
	1,85,833		90,000
Less: Cash Received	1,60,000	Less: Reserve Profit	64,167
	25,833		25,833

Balance Sheet as at 31st December, 2013

Liabilities	₹	Assets	₹
Profit and Loss Account (Profit from Contract)	73,333	Plant (W.D.V.)	80,000
Outstanding Wages	2,000	Less: Depreciation	10,000
Direct Expenses Accrued	1,000	Materials in Hand	2,000
		Work-in-Progress	25,833

Working Notes :

$$(1) \text{ Calculation of Work Certified} = \frac{\text{Cash Received}}{\text{Percentage of Work Certified}} \times 100$$

$$= \frac{1,60,000}{80} \times 100 = ₹ 2,00,000$$

(2) Calculation of Notional Profit

Value of Work Certified	2,00,000
Cost of Work Uncertified	50,000
	2,50,000
Less: Cost of Contract	1,12,500
	1,37,500

(6) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{2,00,000 + 50,000}{4,00,000} \times 100 = \frac{2,50,000}{4,00,000} \times 100 = 62.50\%$$

- (7) Since the contract is 62.5% complete, profit to be transferred to Profit and Loss Account is calculated as follows :

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 1,37,500 \times \frac{1,60,000}{2,00,000} = ₹ 73,333.$$

Illustration 44

M/s. Eastern Contractors undertook a contract for construction of a Highway on 1st April, 2014. The following expenses were incurred during the year ended on 31st March, 2015 : ₹

Materials issued	30,000
Stores purchased	8,000
Direct wages	25,000
Plant issued	40,000
Supervision expenses	10,000
Subcontract cost	20,000

Other Information :

- The contract price as per agreement was ₹ 1,00,000.
 - Depreciation to be charged on plant @ 20% p.a.
 - 25% of the plant was destroyed in an accident on 30.9.2014. However, a compensation of ₹ 5,000 was realised from the insurance company.
 - Materials transferred to another contract ₹ 8,000; returned to store ₹ 2,000.
 - Balance of materials and stores at site were ₹ 7,000 and ₹ 3,000 respectively besides the plants.
 - Cost of work completed but not certified ₹ 10,000 and cost of work not completed and not certified ₹ 3,000. Surveyor's fees due ₹ 4,000.
 - The architect had certified 4/5th of the contract. Cash was received 90% of work certified.
 - Charge for establishment expenses @ 10% of direct wages and office overhead @ 10% works cost.
- Prepare Contract Account and Contractee Account.

[C.U.B.Com. (Hons.) - 2015]

Solution
Dr.

In the books of M/s. Eastern Contractors
Contract Account
[Period: April 1, 2014 to March 31, 2015]

Cr.

Particulars	₹	Particulars	₹
To Direct Materials	30,000	By Direct Materials :	
To Stores Purchase	8,000	Transferred to other Site	8,000
To Direct Wages	25,000	Returned to Stores	2,000
To Supervision Expenses	10,000	In Hand	7,000
To Sub-Contract Cost	20,000	By Stores in Hand	3,000
To Outstanding Surveyor's Fees	4,000	By Cost of Contract c/d	97,900
To Depreciation on Plant (Note 1)	7,000		
To Establishment Expenses (20% of ₹ 25,000)	5,000		
To Office Overhead (10% of ₹ 89,000)	8,900		
	<u>1,17,900</u>		<u>1,17,900</u>
To Cost of Contract b/d	97,900	By Contractee A/c (4/5 of ₹ 1,00,000)	80,000
		By Cost of Work Completed but Not Certified	10,000
		By Profit and Loss A/c (Loss)	7,900
	<u>97,900</u>		<u>97,900</u>
To Materials in Hand	7,000	By Outstanding Surveyor's Fees	4,000
To Stores in Hand	3,000		

Dr.

Contractee Account

Cr.

Particulars	₹	Particulars	₹
To Contract A/c (4/5 of ₹ 1,00,000)	80,000	By Bank A/c (Cash Received)	72,000
		By Balance c/d	8,000
	<u>80,000</u>		<u>80,000</u>
To Balance b/d	8,000		

Working Notes :

(1) Calculation of Depreciation on Plant

Plant Issued	₹ 40,000
Less: Plant Destroyed	<u>10,000</u>
Plant in Use	<u>30,000</u>
(a) Depreciation of Destroyed Plant $[40,000 \times (6 \div 12) \times (20 \div 100)]$	4,000
(b) Depreciation of Plant in Use $[30,000 \times (6 \div 12) \times (20 \div 100)]$	<u>3,000</u>
	<u>7,000</u>

8.56 Contract Costing

(2) Office Overhead

10% of [(30,000 + 8,000 + 25,000 + 10,000 + 20,000 + 4,000 + 7,000 + 5,000) – (8,000 + 2,000 + 7,000 + 3,000)]
 = 10% of ₹ 89,000
 = ₹ 8,900.

(3) Loss on plant in an accident will be charged to Profit and Loss Account.

Illustration 45

Sinha & Co. undertook a contract to construct a building for which the following information are supplied on 31.12.2015:

Construction started on 1st January, 2015.

	₹		₹
Contract price	16,00,000	Materials sent to site	3,00,000
Wages paid	3,60,000	Wages unpaid	32,000
Other expenses	52,000	Plant sent to site	4,00,000
Cash received	7,20,000	Materials returned to stores	10,000
Materials lying unconsumed	16,000	Materials stolen from site	20,000
Insurance claim admitted for materials stolen	14,000	Work uncertified	22,000

Plant is subject to depreciation @ 7.5% p.a. and cash has been received for 90% of work certified. Prepare Contract Account and Direct Material Stolen Account in the books of Sinha & Co. for the year ended 31st December, 2015.

[C.U.B.Com. (Hons.) - 2016]

Solution

In the books of Sinha & Co.

Dr.

Contract Account

Cr.

[Period: January 1 to December 31, 2015]

Particulars	₹	Particulars	₹
To Direct Materials	3,00,000	By Direct Materials :	
To Direct Wages	3,60,000	Returned to Stores	10,000
Add: Outstanding Wages	2,000	In Hand	16,000
To Other Expenses	52,000	Stolen	20,000
To Depreciation on Plant (Note 1)	30,000	By Cost of Contract c/d	6,98,000
	7,44,000		7,44,000
To Cost of Contract b/d	6,98,000	By Contractee A/c (Note 2)	8,00,000
To Notional Profit c/d	1,24,000	By Cost of Work Uncertified c/d	22,000
	8,22,000		8,22,000
To Profit and Loss A/c	74,400	By Notional Profit b/d	1,24,000
To Reserve Profit c/d	49,600		1,24,000
	1,24,000		
To Direct Materials in Hand	16,000	By Reserve Profit b/d	49,600
To Cost of Work Uncertified	22,000	By Outstanding Wages	2,000

Dr.

Direct Materials Stolen Account

Cr.

Particulars	₹	Particulars	₹
To Contract A/c	20,000	By Insurance Claim A/c	14,000
	20,000	By Profit and Loss A/c	6,000
			20,000

Working Notes :

(1) Depreciation on Plant = ₹ 4,00,000 × (7.5 ÷ 100) = ₹ 30,000.

$$(2) \text{ Calculation of Work Certified} = \frac{\text{Cash Received}}{\text{Percentage of Work Certified}} \times 100$$

$$= \frac{7,20,000}{90} \times 100 = ₹ 8,00,000$$

(3) Calculation of Percentage of Completion

$$\text{Percentage of Completion} = \frac{\text{Value of Work Certified} + \text{Cost of Work Uncertified}}{\text{Contract Price}} \times 100$$

$$= \frac{8,00,000 + 22,000}{16,00,000} \times 100 = \frac{8,22,000}{16,00,000} \times 100 = 51.38\%$$

- (4) Since the contract is 51.38% complete, profit to be transferred to Profit and Loss Account is calculated as follows :

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}} = \frac{2}{3} \times 1,24,000 \times \frac{7,20,000}{8,00,000} = ₹ 74,400.$$

THEORETICAL QUESTIONS

- What do you mean by contract costing ? What are the features of a contract costing ? (Page 8.1)
- Indicate how you would deal with the following terms:
 - Plant and machinery purchased and used on contract work.
 - Amount received from contractee.
 - Materials lying unused at site.
- Discuss the implication of cost-plus contracts from the view point of (a) Manufacturers; and (b) Customers (Page 8.2).
 - What is the relevance of escalation clause provided in a contract ? (Page 8.36)

[C.A. (Inter) – Adapted]

PRACTICAL QUESTIONS

- 8.1 Contractors Ltd. obtained a contract for the construction of a barrage. The particulars in regard to the contract for the year ended 31st March, 2017 were as follows: (all figures in ₹)

Agreed value of the contract	2,00,00,000	Plant at cost	50,00,000
Materials issued to the contract	30,00,000	(to be depreciated @ 20% p.a.)	
Materials returned to stores	75,000	Direct expenditure	90,000
Materials in hand	1,80,000	General overhead	75,000
Wages	60,00,000	(allocated to the contract)	
Work was taken upon on 1.4.2016.		Cost of completed work yet to be certified	6,00,000

Upto the close of the period a total sum of ₹ 86,40,000 being 90% of the certified amount was received. From the above particulars, prepare the Contract Account for the year ending on 31st March, 2017.

- 8.2 A construction company has undertaken to construct a bridge. The following particulars relate to the construction for the year ended 31.3.2017:

	₹		₹
Materials: Direct purchases	50,000	Materials lost by fire	500
Materials Issued from stores	10,000	Salvage value thereof	150
Wages for Labour	45,000	Wages accrued as at 31.3.2017	5,000
General plant in use		Direct expenses accrued at 31.3.2017	500

8.58 Contract Costing

(depreciation to be charged @ 10%)	1,00,000	Value of work certified	1,59,000
Direct expenses	3,500	Cost of uncertified work	4,500
Share of general overhead	2,000	Materials in hand at 31.3.2017	1,000

The value of the contract is ₹ 2,50,000 and it is the practice of the contractee as per terms of the contract to retain 10% of work certified.

From the above particulars, prepare the Contract Account for the year ended 31.3.2017.

- 8.3 From the following particulars prepare (a) Contract Account, (b) Contractee Account, (c) Show calculations of profit which is to be credited to Profit and Loss Account, and (d) Value of work-in-progress.

	₹
Materials sent to sites	85,349
Work certified	1,95,000
Labour engaged to sites	74,375
Cost of works not yet certified	4,500
Plant installed at sites at cost	15,000
Materials in hand at 31st December	1,883
Direct expenditure	3,167
Wages accrued due at 31st December	2,400
Establishment charges	4,126
Direct expenditure accrued due at 31st December	240
Materials returned to stores	1,549
Value of plant at 31st December	11,000

The contract price has been agreed at ₹ 3,00,000 and cash has been received from the contractee amounting to ₹ 1,80,000.

[C.U.B.Com. (Hons.) – Adapted]

- 8.4 The following figures are available in respect of Contract No. 40/2017–18 of the Builders' Corporation Ltd.:

	₹
Materials purchased for the contract and delivered to work site	90,000
Materials issued from Central Stores	10,000
Materials transferred to other contract	15,000
Material returned to vendor	5,000
Materials lost by fire	10,000
Wages paid at site	25,000
Site office expenses	10,000
Plants issued / transferred to site	15,000
Plants returned from site	5,000
Consultancy fees etc. paid	4,000
Sub contract work	15,000

Central Office overhead to be charged @ 10% of site wages.

At the year end the following information was available:

(a) Material at site – ₹ 10,000; Plant at site – ₹ 5,000; Accrued wages at site – ₹ 5,000; Cost of work done but not certified – ₹ 27,000.

(b) Value of work certified by architect – ₹ 1,30,000 out of total contract value of ₹ 2,50,000.

(c) The party made an on account payment after withholding ₹ 10,000 as retention money.

You are required to prepare necessary accounts and show how the various items will appear in the Balance Sheet.

[C.U.M.Com. – Adapted]

- 8.5 The following are the particulars relating to a contract which had begun on 1st January, 2017:

	₹		₹
Contract price	5,00,000	Overheads	8,240
Machinery	30,000	Materials returned	1,600
Material	1,70,600	Materials on hand, 31.12.2017	3,700
Wages	1,48,750	Machinery on 31.12.2017	22,000
Direct expenses	6,330	Value of work certified	3,90,000
Outstanding wages	5,380	Cash received	3,51,000
Uncertified work	9,000		

Prepare the Contract Account for the year 2017 showing the amount of profit that may be taken to the credit of the Profit and Loss Account of the year.

Also show the amount of the work-in-progress as it would appear in the Balance Sheet of the year.

[B.Com. (Madurai) – Adapted]

- 8.6 Fabrication Company Limited undertook the construction of a large reservoir and started its work on January 1, 2017. The value of the contract is ₹ 20 lakhs and for the year to December 31, 2017 the expenses and other details were as under (all figures in rupees):

Materials purchased	3,00,000	General overhead chargeable	
Materials from stores	80,000	to the contract	10,000
Materials in hand on 31st December	40,000	Plant and machinery purchased	
Labour on site	2,75,000	on January 1, 2017 for use at site (effective	
Direct expenses	25,000	(life 5 years with no residual value)	2,00,000
Work certified	8,40,000	Wages accrued on 31st December	15,000
Direct expenses accrued	3,000	Cash received on account	
		(80% of the value of work certified)	6,72,000

Assuming that the company takes credit for two-thirds of the profit on the work certified, prepare a Contract Account from the above noted data and work out the profit in respect of the work done up to date that the company should take to its Profit and Loss Accounts.

[C.U.B.Com. (Hons.) – Adapted]

- 8.7 On 1 March, 2016, H Ltd. started contract 1509 – a dual carriageway bypass road for a contract price of ₹ 9,50,000 with completion schedule for 31st December 2017. The budgeted cost of the contract was ₹ 8,75,000. H Ltd. has a financial year end at 31st December. On 31 December, 2016 the figures in the company's books were (all figures in ₹):

Materials issued to site from stores	96,000	Paid to Sub-contractors	19,000
Materials bought direct at site	1,09,000	Wages due 31.12.2016	3,000
Materials returned to store from site	14,000	Due to sub-contractors	4,000
Wages paid at site	1,49,000	Value of work certified 31.12.2016	5,50,000
Plant at cost 1.3.2016	60,000	Cost of work completed	
Hire of plant 1.3.2016 to 31.12.2016	77,000	but not yet certified	35,000
Supervisory salaries	27,000	Cash received relating to work certified	4,95,000
Share of Head Office costs	42,000	Value of materials on site 31.12.2016	18,000
		Depreciation @ 20% p.a. on cost	

You are required to show the Contract Account in full with the amount you would recommend to be taken to the company's Profit and Loss Account for the year 31 December, 2016 and the work-in-progress figure.

[AAT – Adapted]

8.60 Contract Costing

- 8.8 A company undertook a contract for construction of a large building complex. The construction work commenced on 1 April, 2016 and the following data are available for the year ended 31 March, 2017:

	₹'000
Contract price	35,000
Work certified	20,000
Progress payments received	15,000
Materials issued to site	7,500
Planning & Estimating costs	1,000
Direct wages paid	4,000
Materials returned from site	250
Plant hire charges	1,750
Wage related costs	500
Site office costs	678
Head office expenses apportioned	375
Direct expenses incurred	902
Work not certified	149

The contractors own a plant which originally cost ₹ 20 lacs has been continuously in use in this contract throughout the year. The residual value of the plant after 5 years of life is expected to be ₹ 5 lacs. Straight line method of depreciation is in use. As on 31 March, 2017 the direct wages due and payable amounted to ₹ 2,70,000 and the materials at site were estimated at ₹ 2,00,000.

Required:

- (i) Prepare the Contract Account for the year ended 31 March, 2017.
(ii) Show the calculation of profit to be taken to the Profit and Loss Account of the year.
(iii) Show the relevant Balance Sheet entries.
- 8.9 From the following particulars in respect of a particular contract for the year ended 31st December, 2017, prepare Contract Account:

	₹
Materials	1,90,000
Wages paid	1,20,000
Wages outstanding	5,500
Direct expenses	60,000
Establishment charges	52,000
Special plant installed at cost	2,00,000
Cost of work not certified	25,000
Value of special plant as on 31.12.2017	1,70,000
Material at site as on 31.12.2017	21,000
Cash received	5,94,000
Total contract price	12,00,000
Sale of scrap	2,000

Retention 10% of work certified

General plant costing ₹ 1,20,000 was used for 3 months, depreciation on that is to be provided at 15% per annum.

[C.U.B.Com. (Hons.) – Adapted]

- 8.10 On 1.4.2006, Bright Ltd. undertook a contract to construct a building for ₹ 25,00,000 and furnishes the following details for the year ended 31.03.2007 :

Materials issued to Contract

	₹
Direct purchases	3,75,000
Issued from stores	1,25,000
Wages incurred	7,00,000
Apportioned H.O. expenses	40,000

Subcontract charge	30,000
Other works expenses (10% of wages)	—
Plant installed at cost	2,00,000
Materials returned to stores	7,000
Direct expenses	10,000
Cost of plant transferred to another contract on 1.7.2006	50,000
Materials stolen from site	10,000
Insurance claim received	3,000
Sale of unused materials (cost ₹ 8,375)	5,000
Materials in hand on 31.3.2007	21,000
Direct expenses accrued on 31.3.2007	2,000
Cash received	12,80,000
Retention money	20%
Cost of uncertified work	12,000

Depreciation to be charged on plant @ 15% p.a.

Prepare Contract Account in the books of Bright Ltd. showing therein the amount of profit / loss transferred to Profit and Loss Account. *[C.U.B.Com. (Hons.) – 2007]*

- 8.11 Mr. Bhagwandas undertook a contract for ₹ 15,00,000 on an arrangement that 80% of the value of the work done as certified by the architect of the contractee, should be paid immediately and that the remaining 20% be retained until the contract was completed.

In 2015 the amounts expended were:

Materials ₹ 1,80,000; Wages ₹ 1,70,000; Carriage ₹ 6,000; Cartage ₹ 1,000; Sundry Expenses ₹ 3,000. The work was certified for ₹ 3,75,000 and 80% of this was paid as agreed.

In 2016 the amounts expended were:

Materials ₹ 2,20,000; Wages ₹ 2,30,000; Carriage ₹ 23,000; Cartage ₹ 2,000; Sundry Expenses ₹ 4,000. Three-fourths of the contract was certified as done by 31st December and 80% of this was received accordingly. The value of unused stock and work-in-progress uncertified was ascertained at ₹ 20,000.

In 2017 the amounts expended were:

Materials ₹ 1,26,000; Wages ₹ 1,70,000; Cartage ₹ 6,000; Sundry Expenses ₹ 3,000 and on 30th June the whole contract was completed.

Show the contract account and the contractee's account in each of these years in the books of the contractor assuming that the balance due to him was paid on completion of the contract.

[B.Com. (Hons.), Madras – Adapted]

- 8.12 ABC Ltd. began to trade on 1st January, 2016. During 2016 the company was engaged on only one contract of which the contract price was ₹ 5,00,000. Of the plant and materials charged to the contract, plant which cost ₹ 5,000 and materials which cost ₹ 4,000 were lost in an accident. On 31st December, 2016 plant which cost ₹ 5,000 was returned to the store, the cost of work done but uncertified was ₹ 2,000 and materials costing ₹ 4,000 were in hand on site. Charge 10% depreciation on plant. Prepare Contract Account and the Balance Sheet from the following (all figures in ₹):

Trial balance as on 31st December, 2016	Dr.	Cr.
Share Capital	—	1,20,000
Creditors	—	10,000
Cash received (80% of work certified)	—	2,00,000
Land and Building	43,000	—
Bank Balance	25,000	—
Charged to Contract :		

8.62 Contract Costing

Materials	90,000	—
Plant	25,000	—
Wages	1,40,000	—
Expenses	7,000	—
	3,30,000	3,30,000

[D. U. B. Com. (Hons.) – Adapted]

- 8.13 The following is the Trial Balance of Premier Construction Company engaged on the execution of Contract No. 747 for the year ended 31st December, 2017:

	₹	₹
Contractee's Account – amount received	—	3,00,000
Buildings	1,60,000	—
Creditors	—	72,000
Bank Balance	35,000	—
Capital Account	—	5,00,000
Materials	2,00,000	—
Wages	1,80,000	—
Expenses	47,000	—
Plant	2,50,000	—
	8,72,000	8,72,000

The work on Contract No. 747 was commenced on 1st January, 2017. Materials costing ₹ 1,70,000 were sent to the site of the contract but those of ₹ 6,000 were destroyed in an accident. Wages of ₹ 1,80,000 were paid during the year. Plant costing ₹ 50,000 was used on the contract all through the year. Plant with a cost of ₹ 2 lakhs was used from 1st January to 30th September and was then returned to the stores. Materials of the cost of ₹ 4,000 were at site on 31st December, 2017.

The contract was for ₹ 6,00,000 and the contractee pays 75% of the work certified. Work certified was 80% of the total contract work at the end of 2017. Uncertified work was estimated at ₹ 15,000 on 31st December, 2017.

Expenses are charged to contract at 25% of wages. Plant is to be depreciated at 10% for the entire year. Prepare Contract No. 747 Account for the year 2017 and make out the Balance Sheet as on 31st December, 2017 in the books of Premier Construction Co.

[B. Com. (Hons.), Delhi – Adapted]

- 8.14 The following Trial Balance was extracted from the books of Appollo Contractors as on 31st December, 2017:

	Dr. (₹)	Cr. (₹)
Contractee's Account	—	3,00,000
Buildings	1,00,000	—
Creditors	—	62,000
Bank	35,000	—
Capital Account	—	3,00,000
Materials	1,00,000	—
Wages	70,000	—
Expenses	37,000	—
Plant	2,50,000	—
Work-in-progress (Contract No. 837 as on 1.1.2017)	1,00,000	—
Contract No. 837 Account (1.1.2017) (Unadjusted Profit)	—	30,000
	6,92,000	6,92,000

Contract No. 837 which was in progress on 1st January, 2017 was completed on 31st March, 2017. **Contract No. 838 commenced on 1st January, 2017.**

₹ 20,000 materials and ₹ 10,000 wages were paid for contract No. 837. ₹ 60,000 materials were sent to Contract No. 838 site but ₹ 3,000 worth was lost there by accident. ₹ 60,000 wages paid for contract No. 838, ₹ 50,000. Plant was used in Contract No. 838 all through, but plant costing ₹ 2,00,000 was used on Contract No. 838 from 1st April, 2017; prior to that above machine was used on Contract No. 837. ₹ 4,000 materials were at site on Contract No. 838 at the end of the year. Provide 10% depreciation on the Plant and 2% on Buildings.

Contract No. 837 was for ₹ 1,50,000 and certified work up to last year was ₹ 1,00,000. The work has been certified up to the full extent, but payment has been received up to 80% of the certified amount. The balance has not been paid yet nor any entry has been passed on completion of the contract.

Expenses are charged to contracts on the basis of 50% of direct wages. The new contract is for ₹ 4,00,000 and 90% is paid on certification. The uncertified work of contract as on 31st December, 2017 is estimated at ₹ 15,000.

You are required to prepare:

(a) Contract No. 837 Account; (b) Contract No. 838 Account; (c) Profit and Loss Account for 2017; (d) Contract No. 837 Contractee Account; (e) Contract No. 838 Contractee Account; and (f) Balance Sheet as on 31st December, 2017.

[B.Com. (Hons.), Bombay – Adapted]

- 8.15 The following Trial Balance was extracted on 31st December, 2017 from the books of Swastik Co. Ltd. — contractors:

	Dr. (₹)	Cr. (₹)
Share capital – Shares of ₹ 10 each	—	3,51,800
Profit and Loss Account on 1st January, 2017	—	25,000
Provision for depreciation of machinery	—	63,000
Cash received on account: Contract 70	—	12,80,000
Creditors	—	81,200
Land and Building (cost)	74,000	—
Machinery (cost)	52,000	—
Bank	45,000	—
Contract 70:		
Materials	6,00,000	—
Direct labour	8,30,000	—
Expenses	40,000	—
Machinery at site (cost)	1,60,000	—
	18,01,000	18,01,000

Contract 70 was begun on 1st January, 2017. The contract price is ₹ 24,00,000 and the customer has so far paid ₹ 12,80,000 being 80% of the work certified. The cost of the work done since certification is estimated at ₹ 16,000. On 31st December, 2017 after the above Trial balance was extracted, machinery costing ₹ 32,000 was returned to stores and materials then at site were valued at ₹ 30,000. Provision is to be made for direct labour due ₹ 6,000 and for depreciation of all machinery at 12.5% on cost.

You are required to prepare :

- (a) the Contract Account;
(b) a Statement of Profit, if any, to be properly credited to Profit and Loss Account for 2017; and
(c) the Balance Sheet of Swastik Co. Ltd. as on 31st December, 2017.

[C.A. (Inter) – Adapted]

8.64 Contract Costing

- 8.16 Construction Ltd. is engaged on two contracts A and B during the year. The following particulars are obtained at the year end December 31.

	Contract A	Contract B
Date of commencement	April 1 ₹	September 1 ₹
Contract price	6,00,000	5,00,000
Direct expenses	66,000	35,000
Materials issued	1,60,000	60,000
Establishment expenses	25,000	7,000
Materials returned	4,000	2,000
Plant installed at site	80,000	70,000
Materials at site (December 31)	22,000	8,000
Value of plant (December 31)	65,000	64,000
Direct labour	1,50,000	42,000
Cost of contract not yet certified	23,000	10,000
Cash received from contractees' architect fees	3,78,000	1,25,000
Architect's fees	2,000	1,000

During the period materials amounting to ₹ 9,000 have been transferred from contract A to contract B.

You are required to show:

(a) Contract Account; (b) Contractee's Account; and (c) Extract from Balance Sheet as on December 31, clearly showing the calculation of work-in-progress. *[C.A. (Inter) – Adapted]*

- 8.17 A firm of contractors undertook a contract for ₹ 6,00,000 on 1st July 2017. The following expenses were incurred up to December 31, 2016:

	₹		₹
Materials charged directly	7,500	Materials issued from stores	52,500
Wages	30,000	Direct charges	3,000

The amount of work certified was ₹ 1,20,000 of which the contractors received 75% in cash.

The transactions for the year 2017 were as under:

Materials issued from store – ₹ 1,35,000; Direct charges – ₹ 6,000; Wages – ₹ 60,000.

The cost of special plant issued on January 1, 2017, for the contract was ₹ 1,20,000. Further work certified during the year amounted to ₹ 3,30,000, 75% of which was received. Work done and not certified as on 31.12.2017 was valued at ₹ 22,500. Special plant is to be depreciated at 25% per annum on the original cost. Materials on site were valued at ₹ 15,000.

The contract was completed on 30.4.2018 up to which date the following further expenses were incurred: Materials charged directly ₹ 10,500; Materials issued from stores ₹ 60,000; Wages ₹ 22,500; Direct expenses ₹ 2,025.

The general overhead is to be taken at 5% of the materials consumed and wages paid during the year. On 30.4.2018 the plant was valued at ₹ 75,000. The materials at site were sold for ₹ 10,500 and those returned to stores amounted to ₹ 19,500.

You are to prepare Contract Accounts and Contractee's Account showing the results of the transactions, assuming that balance due from Contractee was duly received. *[C.A. (Inter) – Adapted]*

- 8.18 Mr X carrying on business as contractor undertook a contract for ₹ 1,50,000 from 1st January 2017 and his expenditure during the calendar year was : Plant purchased on the date of commencement – ₹ 15,000; Machinery – ₹ 10,000; Materials purchased – ₹ 45,600; Wages – ₹ 22,000; Direct expenses – ₹ 4,800. Charges for administration expenses – ₹ 8,000. Part of machinery costing ₹ 4,000 being unsuitable for the work was disposed of for ₹ 5,000. On 31st December, 2017 there were wages accrued ₹ 2,000 and the

values of machinery and materials in hand were ₹ 3,000 and ₹ 9,000 respectively. The plant had an effective life of three years.

Mr X received the progress payment of ₹ 88,650 being 90% of the certified value of the work completed up to 31st December, 2017.

To arrive at the figure of profit made on the contract for the first year, the contractor estimated the additional expenditure that would be required to complete the construction and took to credit of revenue for the year that portion of net estimated profit to be realised on the contract which the certified value of the work done bore to the contract price.

His estimates were:

- (i) The contract would take, in all, 18 months to complete.
- (ii) That additional machinery and materials to the value of ₹ 1,000 and ₹ 10,000 would be required to be purchased in the subsequent period and direct expenses and wages would be ₹ 2,000 and ₹ 12,000 respectively.
- (iii) Charges for administration would continue to be the same every month.
- (iv) Provision for contingencies in the subsequent period to be made at 2% of the total cost of the contract.

You are required to prepare a Contract Account.

[I.C.W.A. (Final) – Adapted]

- 8.19 Rex Limited commenced a contract on 1.7.2016. The total contract price was ₹ 5,00,000 but Rex Limited accepted the same for ₹ 4,50,000. It was decided to estimate the total profit and take to the credit of Profit and Loss Account that proportion of estimated profit on cash basis which the work completed bore to the total contract. Actual expenditure till 31.12.2016 and estimated expenditure in 2017 are given below:

Expenses	Actual till 31.12.2016 (₹)	Estimates for 2017 (₹)
Materials	75,000	1,30,000
Labour	55,000	60,000
Plant purchased (original cost)	40,000	
Miscellaneous expenses	20,000	35,500
Plant returned to stores at original cost on 31.12.2016	10,000	(on 30.9.2017) 25,000
Materials at site	5,000	Nil
Work certified	2,00,000	Full
Work uncertified	7,500	Nil
Cash received	1,80,000	Full

The plant is subject to annual depreciation @ 20% of original cost. The contract is likely to be completed on 30.9.2017.

You are required to prepare the Contract Account for the year ended 31.12.2016. Workings should be clearly given. It is the policy of the company to charge depreciation on time basis.

[C.A. (Inter) – Adapted]

- 8.20 A contract for construction of building is governed by an escalation clause in respect of prices of steel, cement and stone aggregate. The prices ruling on the date of tender for the building and the actual prices paid by the contractor were as follows:

	On the date of tender (₹)	Actual (₹)
Steel per ton	610	675
Cement per ton	100	105
Stone aggregate per 100 cft	40	38

3,00,000 cft. of reinforced cement concrete was laid in the building. If 100 lbs of steel, 2,400 lbs of cement and 90 cft of stone are the net quantities required to cast 100 cft. of RCC and the wastages are 5, 3 and 10 per cent respectively. Calculate the difference in selling price according to the escalation clause (1 ton = 2,240 lbs.) (Assume the wastage percentage based on the net quantity of material.)

[C.S. (Inter) – Adapted]

8.66 Contract Costing

- 8.21 AB contractors obtained a contract to build houses, the contract price being ₹ 4,00,000. Work commenced on 1st January, 2017 and the expenditure incurred during the year was – plant and tools ₹ 20,000; stores and materials ₹ 72,000; wages ₹ 65,000; sundry expenses ₹ 5,300; and establishment charges ₹ 11,700.

Certain materials costing ₹ 12,000 were unsuited to the contract and were sold for ₹ 14,500. A portion of the plant was scrapped and sold for ₹ 2,300.

The value of the plant and tools on the sites on 31 December, 2017 was ₹ 6,200 and the value of stores and materials on hand ₹ 3,400. Cash received on account was ₹ 1,40,000 representing 80% of the work certified. The cost of the work done but not certified was ₹ 21,900 and this was certified for ₹ 25,000.

AB decided (i) to estimate what further expenditure would be incurred in completing the contract; (ii) to compute from this estimate and expenditure already incurred, the total profit that would be made on the contract; and (iii) to take to the credit of the Profit and Loss Account for the year 2017 that proportion of the total which correspond to the work certified by 31 December. The estimate was as follows:

- (a) That the contract would be completed by 30 September, 2018.
- (b) That the wages on the contract in 2010 would amount to ₹ 71,500.
- (c) That the cost of stores and materials required in addition to those in stock on 31 December, 2017 would be ₹ 68,600 and that further expenses relating to contract would amount to ₹ 6,000.
- (d) That a further ₹ 25,000 would have to be laid out on plant and tools and that residual value of the plant and tools on 30 September, 2010 would be ₹ 3,000.
- (e) That the establishment charges would cost the same per month as in 2017.
- (f) That 2.5% of the total cost of the contract would be due to defects, temporary maintenance and contingencies.

Prepare Contract Account for the year ended 31 December, 2017 and show your calculations of the amount credited to the Profit and Loss Account for the year.

[C.S. (Inter) – Adapted]

- 8.22 M/s. New Century Builders have entered into a contract to build an office building complex for ₹ 480 lakhs. The work started in April 2017 and it is estimated that the contract will take 15 months to be completed. Work has progressed as per schedule and the actual costs charged till March 2010 are as follows:

	(₹ in lakhs)
Materials	112.20
Labour	162.00
Hire charges for equipments and other expenses	36.00
Establishment charges	32.40
	<u>342.60</u>

The following information are available:

	(₹ in lakhs)
Materials in hand (March 31, 2018)	6.60
Work certified (of which ₹ 324 lakhs have been paid) at March 31, 2018	400.00
Work not yet certified at March 31, 2018 at cost	7.50

As per management estimates, the following further expenditure will be incurred to complete the work:

	(₹ in lakhs)
Materials	10.50
Labour	16.00
Sub-contractors	20.00
Equipments hire and other charges	3.00
Establishment charges	6.90

You are required to compute the value of work-in-progress as on March 31, 2010 after considering a reasonable margin of profit and show the appropriate accounts. Make a provision for contingencies amounting to 5% of total costs.

[I.C.W.A. (Stage 1) – Adapted]

- 8.23 One of the building contracts currently engaged in by a construction company commenced 15 months ago and remain unfinished. The following information relating to the work on the contract has been prepared for the year just ended:

	₹ '000
Contract price	2,500
Value of work certified at the end of year	2,200
Cost of work not yet certified at the end of year	40
Opening balances:	
Cost of work completed	300
Materials on site (physical stock)	10
Costs incurred during the year:	
Materials delivered to site	610
Wages	580
Hire of plant	110
Other expenses	90
Closing balance:	
Materials on site (physical stock)	20

As soon as materials are delivered to the site, they are charged to the contract account. A record is also kept of materials as they are actually used on the contract. Periodically a stock check is made and any discrepancy between book stock and physical stock is transferred to a general contract material discrepancy account. This is absorbed back to each contract, currently at the rate of 0.5% of materials booked. The stock check at the year end revealed a stock shortage of ₹ 5,000.

In addition to the direct charges listed above, general overheads are charged to contracts at 5% of the value of work certified. General overheads of ₹ 15,000 had been absorbed into the cost of work completed at the beginning of the year. It has been estimated that further costs to complete the contract will be ₹ 2,20,000. This estimate includes the cost of materials on site at the end of the year just finished and also a provision for rectification.

Required:

- Explain briefly the distinguishing features of contract costing.
- Determine the profitability of the above contract and recommend how much profit (to the nearest ₹ '000) should be taken for the year just ended. (Provide a detailed schedule of costs).
- State how your recommendation in (b) would be affected if the contract price was ₹ 40,00,000 (rather than ₹ 25,00,000) and if no estimate has been made of costs to completion. (If required, suitable assumption should be made by the candidate.)

[C.A. (Inter) – Adapted]

Guide to Answer

Practical Questions

- Value of work certified ₹ 96,00,000; Notional Profit ₹ 2,90,000; Profit to be credited to Profit and Loss Account ₹ 1,74,000.
- Notional Profit ₹ 39,000; Profit to be credited to Profit and Loss Account ₹ 23,400.
- Notional Profit ₹ 29,275; Profit credited to Profit and Loss Account ₹ 18,015.
- Notional Profit ₹ 30,000; Central office overhead ₹ 3,000 (10% of wages including accrued wages); Profit credited to Profit and Loss Account ₹ 18,462 (approx.).
- Notional Profit ₹ 57,000; Profit credited to Profit and Loss Account ₹ 34,200; Value of work-in-progress ₹ 25,200.
- Notional Profit ₹ 1,32,000; Profit credited to Profit and Loss Account ₹ 70,400.
- Notional Profit ₹ 79,000; Profit credited to Profit and Loss Account ₹ 71,100.
- Notional Profit ₹ 33,24,000; Profit credited to Profit and Loss Account ₹ 16,62,000.

8.68 Contract Costing

- 8.9. Notional Profit ₹ 2,46,000; Profit credited to Profit and Loss Account ₹ 1,47,600.
- 8.10. Notional Profit ₹ 3,12,000; Profit credited to Profit and Loss Account ₹ 1,66,400.
- 8.11. Notional Profit – 2016 : ₹ 15,000; Profit credited to Profit and Loss Account $(1/3 \times 15,000 \times 80\%) = ₹ 4,000$.
- 8.12. Notional Profit ₹ 21,000; Profit credited to Profit and Loss Account ₹ 11,200. Balance Sheet total ₹ 1,32,200.
- 8.13. Notional Profit ₹ 90,000; Profit credited to Profit and Loss Account ₹ 37,500; Depreciation charged to contract ₹ 20,000 $(15,000 + 5,000)$. Balance Sheet total ₹ 6,04,000 / ₹ 5,96,500.
- 8.14. Profit credited to Profit and Loss Account for Contract No. 837—₹ 40,000; Notional Profit of Contract No. 838—₹ 52,000; Profit credited to Profit and Loss Account ₹ 31,200.
- 8.15. Notional Profit ₹ 1,50,000; Profit credited to Profit and Loss Account ₹ 80,000; Balance Sheet total ₹ 6,97,000.
- 8.16. Contract A : Notional Profit ₹ 60,000; Profit credited to Profit and Loss Account ₹ 36,000; W.I.P. ₹ 41,000. Contract B : Loss ₹ 5,000; W.I.P. ₹ 20,000.
- 8.17. For 2017 : No profit shall be taken to Profit and Loss Account.
For 2010 : Profit to be taken to Profit and Loss Account ₹ 75,000.
Profit on completion of the construction ₹ 1,04,325.
- 8.18. Value of work certified ₹ 98,500; Estimated profit ₹ 22,551.
Profit credited to Profit and Loss Account ₹ 13,328.
- 8.19. Estimated profit (taking into consideration the cost to be incurred in 2017) = ₹ 66,000.
Profit to be transferred to Profit and Loss Account :
Estimated Profit $\times$ (Cash Received / Work Certified) $\times$ (Work Certified / Contract Price)
 $= 66,000 \times (1,80,000 / 2,00,000) \times (2,00,000 / 4,50,000) = ₹ 26,400$.
- 8.20. According to escalation clause, the increase in selling price will be ₹ 19,755.
- 8.21. Total estimated cost ₹ 3,44,989. Total estimated profit ₹ 55,011.
Profit to be transferred to Profit and Loss Account :
Total Estimated Profit $\times$ Work Certified / Construction Price $= ₹ 55,011 \times (1,75,000 / 4,00,000) = ₹ 24,067$.
[Note : Other methods can be used for calculating profit to be credited to Profit and Loss Account.]
- 8.22. Estimated total cost = ₹ 4,20,00,000; Total estimated profit ₹ 60,00,000.
Profit to be taken to Profit and Loss Account :
Total Estimated Profit $\times$ (Work Certified) / (Contract price) $= 60,00,000 \times (4,00,00,000 / 4,80,00,000) = ₹ 50,00,000$.
[Note: Other methods can be also be used for calculating profit to be taken to costing Profit and Loss Account.]

Value of Work-in-Progress :	₹
Cost of Contract upto Date	3,86,00,000
Add: Profit to be credited	<u>50,00,000</u>
	3,66,00,000
Less: Cash received	<u>3,24,00,000</u>
	<u>62,00,000</u>

- 8.23 (a) See Page 8.1.
- (b) Cost of contract to date ₹ 17,73,000. Estimated total cost ₹ 19,93,000; Estimated profit ₹ 5,07,000;
Profit to be taken to Profit and Loss Account :
[Estimated Profit $\times$ (Cost of contract to date / Estimated total cost)]
 $[5,07,000 \times (17,73,000 / 19,93,000)] = ₹ 4,51,034$.
[Note: Other methods can also be used for calculating profit to be taken to Costing Profit and Loss Account.]
- (c) When contract value becomes ₹ 40,00,000, the profit to be taken to Profit and Loss Account
 $= 2/3 \times 4,67,000 \times 80/100 = ₹ 2,49,067$; (say) ₹ 2,49,000.

Operating/Service Costing

Introduction

There are many organisations which are not manufacturing any product but providing service to different consumers. **For example**, Calcutta State Transport Corporation, Indian Railways, Taj Group of Hotels, these organisations are not manufacturing any product but providing services. Similarly, many schools and other organisations are operating their own fleet of buses for pick up and drop of their students/employees. For the purpose of control of cost and determination of cost of service, these organisations are using operating / service costing method.

Even in manufacturing organisations, there are some service departments which are providing services to different manufacturing departments. **For example**, Canteen, Boiler House, Maintenance Department are providing services to different production departments. The costs of these various service departments are to be controlled and determined for the purpose of allocation. This is usually achieved by adopting operating / service costing method.

Meaning of Operating / Service Costing

Operating / Service Costing is a method of costing which is used for the purpose of determining the cost of **service output**. It is to be noted that service output possesses certain unique characteristics. These are :

1. **Intangibility** : Services do not have a physical form – that allows them to be seen or stored or touched.
2. **Heterogeneity** : Service output is heterogeneous. Service provided to one patient may widely differ from service provided to another patient.
3. **Perishability** : Service output cannot be produced in advance and it cannot be stored like tangible items.
4. **Simultaneity** : Service output is consumed at the time when it is provided. There is no time lag between production of service and supply of service.

Characteristics of Operating / Service Costing

1. This method of costing is suitable for determining the cost of service output.
2. This method of costing is mainly adopted by those organisations which are not manufacturing any tangible items, e.g., a transport company. However, many manufacturing and non-profit organisations also use this method of costing.
3. Generally, a 'single cost unit' is not used for determination of cost of service output. 'Composite cost unit' (to be discussed later) is used in many cases for determination of cost of service output. Some organisations, e.g., hospitals, hotels, etc., use both single cost unit as well as composite cost unit for determination of cost of service output. **For example**, in a hospital, cost of outdoor patient is determined by using 'single cost unit' but for indoor patients, 'cost per day per bed' is calculated by using 'composite cost unit'.
4. Calculation of cost of service output is easier as there are no stocks or work-in-progress to be valued.
5. Determination of cost of service output is very subjective as everything is intangible.
6. Fixed cost is the major component of cost of service output. In many organisations, e.g., hotels and restaurants, hospitals, etc., labour forms a very significant input, with the associated costs representing a high proportion of total cost.
7. Implementation of Activity-Based Costing is very difficult.

9.2 Operating / Service Costing

Users of Operating / Service Costing Method

The following organisations use the operating / service costing method for calculating cost of service output as well as for controlling cost :

1. Transport company such as State Transport Corporations, Indian Railways, etc.
2. Hotels
3. Hospitals
4. Service departments of manufacturing organisations
5. Educational institutions
6. Public libraries
7. Large public–utility undertakings, such as gas supply companies and electricity boards, etc.
8. Sports clubs / Recreation clubs
9. Theatres and cinemas
10. Laundries

The Cost Unit

We introduced the concept of 'cost unit' in Chapter 2. Cost unit may be defined as a unit of product or service in respect of which cost is ascertained. **For example**, MT (Metric Ton) is the cost unit for calculating cost of iron and steel, and similarly, MW (Mega Watt) is the cost unit for calculating cost of electricity. MT and MW are called 'single cost unit'. Single cost unit is suitable for cost calculation when output is homogeneous and tangible.

In general, service outputs are heterogeneous and intangible in nature. Because of this, 'single cost unit' may create difficulties for many service organisations. **For example**, carrying one ton of goods for 5 km and carrying one ton of goods for 10 km are not same. The cost will differ to a great extent with the distance. In this situation, **composite cost unit** is used for calculating cost of service output.

A composite cost unit reflects the key variables (here weight and distance) involved in providing the service. In simple words, composite cost unit is the product of two cost units. **For example**, a bus with seating capacity of 50 passengers covering 50 km per day and operating cost per day is ₹ 5,000. In this case, we need to consider both passenger and distance covered, so an appropriate cost unit might be passenger–km (50 × 50 = 2,500 passenger km). The cost per passenger–km will be calculated as follows :

$$\text{Cost per Passenger–km} = \frac{\text{Total Cost per Day}}{\text{Passenger–km per Day}} = \frac{5,000}{2,500} = ₹ 2.00$$

Transport Costing

The main purpose of transport costing is to determine the cost of operating each vehicle and apply this cost to particular units, e.g., per ton, per kilometer, per ton-km, passenger-km, etc.

The cost determination is important for the following purposes :

- (i) to calculate the fare to be charged for carrying a passenger for certain distance;
- (ii) to calculate the freight to be charged for carrying goods to different places.
- (iii) to evaluate the alternative mode of transport;
- (iv) to determine what should be charged to different departments who are using the services;
- (v) to compare cost of maintaining own fleet of vehicles with the cost of hiring the vehicles from outside agency.

Collection of Data

Collection of data is required mainly for the following purposes :

- (i) Control of cost and proper utilisation of vehicles; and
- (ii) Ascertainment of cost.

Efficient data capturing system will help to get desired information. Generally, log sheet, performance statement and cost sheet are used for obtaining different information.

Log Sheet

Log sheet is prepared by the driver or foreman on daily basis. The main purpose of maintaining this log sheet is to control the operation of the vehicles and related costs. The log sheet contains the information about each journey, e.g., time of leaving from Garage, time of returning to Garage, total distance covered, etc. It also contains information about fuel, oil consumption, etc. during the journey.

A specimen of log sheet is given below :

Log Sheet							
Vehicle No. : Driver's Name : Route :				Date : Leaving time from Garage : Returning time to Garage			
Trip Details							
Trip No.	From	To	Ton or Packages		KM Travelled	Time	
			Out	Enroute Loaded		Out	In
1.							
2.							
3.							
4.							
	Total						
Supplies (i) Diesel litres (ii) Oil litres (iii) Grease kg (iv) Miscellaneous			Workers' Time Driver : Helper : Cleaner : Mechanics :			Delay (if any) Traffic Delay : Loading Delay : Unloading Delay :	

Fig. 12.1

Operating Cost Sheet

Operating cost sheet is prepared to accumulate costs of operating vehicles for a certain period. Generally, costs are classified into two categories :

- (i) Standing Charges / Fixed Costs;
- (ii) Running and Maintenance Costs

(i) **Standing Charges / Fixed Charges** : All costs which are incurred irrespective of running of the vehicles are included under this head. **Examples** are insurance, depreciation, licence fees, road tax, salary of permanent staff (like manager, accountant, drivers, etc.), interest on loan taken for purchasing the vehicles, etc.

(ii) **Running and Maintenance Charges** : All variable costs which are incurred for running of the vehicles are included under this head. **Examples** are fuel cost, oil cost, toll tax, driver's salary (if paid on daily basis or commission basis), helper's salary (if paid on daily basis or commission basis).

Cost incurred for maintaining the vehicles in good running condition are also included under this head. **Examples** are tyre, repairs, overhauling, painting, garage charges, etc.

It is to be noted that many organisations classify costs into three categories : e.g., Running cost, Maintenance cost and Standing charges / fixed cost.

9.4 Operating / Service Costing

Treatment of Some Items

(i) **Driver's salary / conductor's salary / cleaner's salary** : Salary or wages paid to drivers, conductors and cleaners will be treated as 'Running and Maintenance Cost' on the assumption that no payment to be made when there is no work. However, salary or wages paid to permanent drivers, conductors or cleaners will be treated as fixed cost. **For example**, salary paid by State Transport Corporation to its permanent staff will be treated as fixed cost.

In the examination student should give necessary assumptions in this respect.

(ii) **Depreciation** : Generally depreciation will be treated as fixed cost / standing charges. When depreciation is charged on the basis of kilometers run, then depreciation is treated as running cost.

In the examination, it should be included under fixed cost / standing charges if nothing is mentioned.

A specimen of Operating Cost Sheet is given below :

Operating Cost Sheet for the Month of ...

Particulars	₹	₹
Standing Charges / Fixed Cost :		
(i) Insurance		
(ii) Depreciation		
(iii) Salary of Permanent Staff		
(iv) Licence Fees		
(v) Permit Fees		
(vi) Interest		
Running and Maintenance Costs :		
(i) Cost of Diesel		
(ii) Cost of Oils, Grease, etc.		
(iii) Driver's Salary		
(iv) Conductor's Salary		
(v) Tyre, Tube, etc.		

Performance Statement

Nowadays control of cost is the most important job of the management. For controlling cost of operating vehicles, at the end of the month, a performance statement is prepared. This statement contains different information relating to current month, previous month and average of last year.

A specimen of Performance Statement is given below :

Performance Statement for the Month of ...

Particulars	Current Month	Previous Month	Average of Last Year
1. Performance Data :			
(i) Days maintained			
(ii) Days operated			
(iii) Days idle			
(iv) Total hours operated			
(v) Total km covered			
(vi) Total trip			
(vii) Total commercial ton-km			
2. Cost Efficiency :			
(i) Cost per day maintained			
(ii) Cost per day operated			
(iii) Cost per km			
(iv) Cost per hour			
(v) Cost per commercial ton-km			

Illustration 1

A truck carried 45 tons during a six-day week and travelled a total distance of 135 miles as given below :

Day	Distance travelled (Miles)	Tons carried
Monday	10	5
Tuesday	20	10
Wednesday	30	5
Thursday	40	10
Friday	25	10
Saturday	10	5
	135	45

Calculate ton-miles for the week.

[C.U.B.Com. (Hons.) – 2002]

Solution

Calculation of Ton-Miles for the Week

Day	Distance Travelled (Miles)	Tons Carried	Ton-Miles (Distance × Tons)
Monday	10	5	50
Tuesday	20	10	200
Wednesday	30	5	150
Thursday	40	10	400
Friday	25	10	250
Saturday	10	5	50
Total	135	45	1,000

Illustration 2

A truck carries goods covering a distance of 60 km each way. On upward journey, freight is available for its full capacity but on downward journey only 25% of its capacity is filled up. The truck runs on an average 20 days a month. Compute ton-km per month for the truck if the capacity of the truck is 10 tons.

[C.U.B.Com. (Hons.) – 2004]

Solution

Calculation of Ton-km per Month

Journey	Distance (km)	Capacity (Ton)	Utilisation	No. of Days	Ton-km
Upward	60	10	100%	20	$60 \times 10 \times 100\% \times 20$ 12,000
Downward	60	10	25%	20	$60 \times 10 \times 25\% \times 20$ 3,000
Total					15,000

Illustration 3

A truck starts with a load of 10 tons of goods from station P. It unloads 4 tons at station Q and rest of the goods at station R. It reaches back directly to station P after getting reloaded with 8 tons of goods at station R. The distances between P to Q, Q to R and then from R to P are 40 kms, 60 kms and 80 kms respectively.

Compute absolute ton-km and commercial ton-km.

[D.U.B.Com. (Hons.) – Adapted]

Solution

Distance between P and Q = 40 kms

Distance between Q and R = 60 kms

Distance between R and P = 80 kms

9.6 Operating / Service Costing

Calculation of Absolute Ton-km

Places	Distance	Tons carried	Ton-km (Distance × Ton)
Station P to Station Q	40	10	400
Station Q to Station R	60	6	360
Station R to Station P	80	8	640
Total Ton-km			1,400

Calculation of Commercial Ton-km

$$\begin{aligned}
 \text{Commercial ton-km} &= \text{Average load} \times \text{Total distance covered} \\
 &= [(10 + 6 + 8) / 3] \text{ tones} \times 180 \text{ kms} \\
 &= 8 \text{ tons} \times 180 \text{ kms} = 1,440 \text{ ton-kms}
 \end{aligned}$$

Tutorial Note : It is to be noted that while calculating the absolute ton-km, the distance between any two stations is considered individually. However, at the time of calculating commercial ton-km, the trip is considered as a whole.

Illustration 4

A bus started from Delhi for Mussoorie with 50 passengers on board. 20 passengers got off at Dehradun and the bus proceeded with the remaining passengers. In the evening the same bus left Mussoorie with 50 passengers, 10 passengers got off at Dehradun and the bus resumed its journey with remaining passengers for Delhi. The distance between Delhi and Dehradun is 280 kms and between Dehradun to Mussoorie is 20 kms.

Compute the cost per passenger-km, if the total cost of running the bus comes out to ₹ 8,040.

Solution

Calculation of Passenger-km

Particulars	Passenger Km
(i) From Delhi to Dehradun (50 × 280)	14,000
(ii) From Dehradun to Mussoorie (30 × 20)	600
(iii) From Mussoorie to Dehradun (50 × 20)	1,000
(iv) From Dehradun to Delhi (40 × 280)	11,200
Total Passenger-km	26,800

$$\text{Cost per Passenger-km} = \frac{\text{Total Cost}}{\text{Passenger-km}} = \frac{8,040}{26,800} = ₹ 0.30$$

Illustration 5

A transport company maintains a fleet of 20 trucks for carrying goods from Delhi to Jaipur which are 300 kms apart. Each truck, which operates 25 days on an average in a month, starts everyday from Delhi with a load of 5 tonnes and returns from Jaipur with a load of 3 tonnes. You are required to calculate cost per commercial tonne-km. when the total monthly operating expenses for a truck are ₹ 96,000. [D.U.B.Com. (Hons.) — 2016]

Solution

- (i) Average load = $[(5 + 3) \div 2] = 4 \text{ tonnes}$.
- (ii) Distance covered per round trip = $300 \times 2 = 600 \text{ kms}$.
- (iii) Number of days operated = **25 days**.
- (iv) Total distance covered in a month = $600 \text{ km} \times 25 = 15,000 \text{ kms}$.
- (v) Monthly Operating Expenses = ₹ **96,000**.

$$\begin{aligned}
 \text{Commercial Tonne-Km} &= \text{Average Load} \times \text{Total Distance Covered} \\
 &= 4 \times 15,000 \\
 &= \mathbf{60,000 \text{ Tonne-km}}.
 \end{aligned}$$

$$\text{Cost per Commercial Tonne – Km} = \frac{\text{Total Cost}}{\text{Commercial Tonne – Km}} = \frac{96,000}{60,000} = ₹ 1.60$$

Illustration 6

Kuldeep Singh owns a taxi and a bus. The bus is a 50 seater. The taxi runs on an average 3,000 km in a month out of which 20% is normal running without fare. Variable cost of running the taxi is ₹ 8 per km.

The bus runs between Delhi and Jaipur which are 300 km apart. It makes 25 round trips in a month and is generally 90% occupied. The variable cost of running a bus is ₹ 22.50 per km.,

You are required to calculate total variable cost per month and variable cost per effective km for the taxi and the bus.

[D.U.B.Com. (Hons.) — 2015]

Solution

(i) Calculation of Total Variable Cost Per Month for the Taxi

(a) Variable cost of running taxi = ₹ 8 per km.

(b) Taxi runs per month = 3,000 km.

Total Variable Cost per Month = 3,000 km × 8 = ₹ 24,000.

(ii) Calculation of Variable Cost per Effective Km.

(a) Total variable cost per month = ₹ 24,000.

(b) Effective km. (3,000 – 20% of 3,000) = 3,000 – 600 = 2,400 Km..

$$\text{Variable Cost per Effective Km} = \frac{\text{Total Variable Cost}}{\text{Effective Km}} = \frac{24,000}{2,400 \text{ Km}} = ₹ 10 \text{ per Km.}$$

Calculation of Total Variable Cost Per Month for the Bus

(i) Variable cost of running bus = ₹ 22.50 per km.

(ii) Bus runs per month = 300 × 2 × 25 = 15,000 km.

Total Variable Cost per Month = 15,000 km × 22.50 = ₹ 3,37,500.

Calculation of Variable Cost per Effective Km.

(a) Total variable cost per month = ₹ 3,37,500.

(b) Effective km. (15,000 Km × 90%) = 13,500 Km..

$$\text{Variable Cost per Effective Km} = \frac{\text{Total Variable Cost}}{\text{Effective Km}} = \frac{3,37,500}{13,500 \text{ Km}} = ₹ 25 \text{ per Km.}$$

Illustration 7

A transport company is running 4 buses between Delhi and Meerut covering a distance of 100 kms. The seating capacity of each bus is 40 passengers. The following particulars are obtained from the books for the month of March, 2010 :

	₹
Wages of drivers and conductors	19,200
Salaries of office staff	6,000
Honorarium to accountant	2,000
Diesel, oil, etc.	32,000
Repairs and maintenance	6,400
Road tax and Insurance	12,800
Depreciation	20,800
Interest and other charges	16,000

Actual passengers carried were 75% of the seating capacity. All the buses ran for 30 days. Each bus made one round trip per day. Find out the cost per passenger-km.

[D.U.B.Com. (Hons.) — 2010]

9.8 Operating / Service Costing

Solution

Operating Cost Sheet for the Month of March, 2010

Particulars	₹	₹
Standing Charges :		
Wages of Drivers and Conductors (Noe 1)	19,200	
Depreciation	20,800	
Road Taxes and Insurance	12,800	
Interest and other Charges	16,000	
Salaries of Office Staff	6,000	
Honorarium to Accountant	2,000	76,800
Running and Maintenance Charges :		
Diesel, Oil, etc.	32,000	
Repairs and Maintenance	6,400	38,400
Total Operating Cost for the month		1,15,200

Note : (1) It is assumed that all drivers and conductors are permanent staff. Payment to be made even when there is no duty.

$$\text{Cost per Passenger-km} = \frac{\text{Total Cost}}{\text{Passenger-km}} = \frac{1,15,200}{7,20,000} = ₹ 0.16 \text{ per passenger-km.}$$

Working Notes :

Calculation of Passenger-Km

- Distance between Delhi and Meerut = 100 km.
- Distance covered in one round trip = 200 km.
- Total distance covered by 4 buses per month = 200 km. $\times 4 \times 30$ days = **24,000 km.**
- Seating capacity = 40 passengers.
- Occupancy rate = 75% of seating capacity = $40 \times 75\%$ = **30 passengers.**
- Total passenger-km for the month = $24,000 \times 30$ = **7,20,000 passenger-km.**

Illustration 8

Keerti Transport Ltd. operates a fleet of lorries. The records for Lorry : L-14 reveal the following information for September, 2011 :

Days maintained	30
Days operated	25
Days idle	5
Total hours operated	300
Total kms covered	2,500
Total tonnage carried	
(4 tonne-load per trip, return journey empty)	200
Total cost for the month	₹ 2,70,000

Prepare a performance statement showing :

- Cost per day operated
- Cost per kilometre
- Cost per hour
- Cost per round-trip
- Cost per commercial tonne-km.

Solution

**Keerti Transport Ltd.
Performance Statement for September, 2011**

Particulars	This Month (₹)	Last Month	Average of Last Year
(i) Cost per day operated (Note 4)	10,800	?	?
(ii) Cost per kilometre (Note 5)	108	?	?
(iii) Cost per hour (Note 6)	900	?	?
(iv) Cost per round-trip (Note 7)	5,400	?	?
(iv) Cost per commercial tonne-km (Note 8)	54	?	?

Working Notes :

- (1) Number of trips = $\frac{200 \text{ Tonnes}}{4 \text{ Tonnes}} = \mathbf{50 \text{ trips per month.}}$
- (2) Distance covered per trip = $\frac{\text{Total Km. Covered}}{\text{Number of Trips}} = \frac{2,500}{50} = \mathbf{50 \text{ Km.}}$
- (3) Total tonne-km. for the month = $50 \times 4 \times 25 = \mathbf{5,000 \text{ Tonne-km.}}$
- (4) Cost per day operated = $\frac{\text{Total Cost}}{\text{No. of days operated}} = \frac{2,70,000}{25} = \mathbf{₹ 10,800.}$
- (5) Cost per Km. = $\frac{\text{Total Cost}}{\text{Total Km. Covered}} = \frac{2,70,000}{2,500} = \mathbf{₹ 108.}$
- (6) Cost pre Hour = $\frac{\text{Total Cost}}{\text{No. of Hours}} = \frac{2,70,000}{300} = \mathbf{₹ 900.}$
- (7) Cost per Round Trip = $\frac{\text{Total Cost}}{\text{No. of Round Trip}} = \frac{2,70,000}{50} = \mathbf{₹ 5,400.}$
- (8) Cost per Commercial Tonne-Km. = $\frac{\text{Total Cost}}{\text{Total Tonne - Km.}} = \frac{2,70,000}{5,000} = \mathbf{₹ 54.}$

Illustration 9

SR Airlines has been permitted to operate three flights per week between A and B cities (both sides). The Airline operates a single aircraft of 160 seating capacity. The normal occupancy is estimated at 60% throughout the year of 52 weeks. The one way fare is ₹ 7,200. The cost of operation of flights are :

Variable Cost :

Fuel cost	₹ 76,000 per flight
Crew charges	₹ 24,000 per flight
Food served on board (on non-chargeable basis)	₹ 125 per passenger
Commission	5% of the fare applicable for all bookings

Fixed Costs :

Aircraft lease	₹ 3,50,000 per flight
Landing charges	₹ 72,000 per flight

Required :

- (i) Calculate Operating Cost per passenger per flight.
- (ii) Calculate Net Operating Income per flight.
- (iii) The airlines expects that its occupancy will increase to 120 passengers per flight if the fare is reduced to ₹ 6,500. Find operating cost per passenger per flight and net operatin income per flight if this proposal is implemented.

9.10 Operating / Service Costing

Solution

SR Airlines

Operating Cost Sheet of Each Flight at 60% Capacity Utilisation

Particulars	₹	₹
Fixed Cost :		
Aircraft Lease	3,50,000	
Landing Charges	72,000	4,22,000
Variable Cost :		
Fuel Cost	76,000	
Crew Charges	24,000	
Food Cost (Note 1)	12,000	
Commission (Note 2)	34,560	1,46,560
Total Cost per Flight (A)		5,68,560
Total Revenue per Flight (₹ 7,200 x 96) (B)		6,91,200

Working Notes :

(1) Calculation of Food Cost per Flight :

(a) Seating capacity = 160 passengers.

(b) Normal occupancy = 60%.

Average Number of Passengers per flight = $160 \times 60\% = 96$ passengers.

Food Cost = ₹ 125 × 96 = ₹ 12,000.

(2) Calculation of Commission :

Commission = ₹ 7,200 × 5% × 96 = ₹ 34,560.

(i) Operating Cost per Flight = $\frac{\text{Total Cost per Flight}}{\text{No. of Passengers per Flight}} = \frac{5,68,560}{96} = ₹ 5,922.50$.

(ii) Net Operating Income per Flight :

Total revenue per flight	₹ 6,91,200
Less: Cost per flight	<u>5,66,560</u>
	<u>1,24,640</u>

Operating Cost Sheet of Each Flight at 75% Capacity Utilisation

Particulars	₹	₹
Fixed Cost :		
Aircraft Lease	3,50,000	
Landing Charges	72,000	4,22,000
Variable Cost :		
Fuel Cost	76,000	
Crew Charges	24,000	
Food Cost (₹ 125 x 120)	15,000	
Commission (5% of ₹ 6,500) x 120	39,000	1,54,000
Total Cost per Flight		5,76,000
Total Revenue per Flight (₹ 6,500 x 120)		7,80,000

(i) Operating Cost per Flight = $\frac{\text{Total Cost per Flight}}{\text{No. of Passengers per Flight}} = \frac{5,76,000}{120} = ₹ 4,800$.

(ii) Operating Income per Flight :

Total revenue per flight	₹ 7,80,000
Less: Cost per flight	<u>5,76,000</u>
	<u>2,04,000</u>

Illustration 10

Mr. S owns a fleet of taxis and the following information are available from the records maintained by him :

Number of taxis : 10

	₹		₹
Cost of each Taxi	5,46,000	Garage Rent	6,000 p.m.
Salary of Manager	7,000 p.m.	Insurance Premium	5% p.a.
Salary of Accountant	5,000 p.m.	Annual Tax	9,000 per taxi
Salary of Cleaner	2,000 p.m.	Drivers' Salary	3,500 p.m. per taxi
Salary of Mechanic	4,000 p.m.	Annual Repairs	10,000 per taxi

Total life of a taxi is about 2,00,000 kms. A taxi runs, in all, 3,000 km. in a month and 30% of this distance has to be run without any passenger. Diesel consumption is one litre for every 10 km @ ₹ 44.10 per litre. Oil and other sundries are ₹ 105 per 100 kms.

Calculate the cost of running a taxi per km.

[I.C.W.A. (Inter) – Adapted]

Solution Operating Cost Statement for running a Taxi for a Month

Particulars	₹	₹
Standing Charges / Fixed Cost :		
Salary of Manager (7,000 ÷ 10)	700	
Salary of Accountant (5,000 ÷ 10)	500	
Salary of Cleaner (2,000 ÷ 10)	200	
Salary of Mechanic (4,000 ÷ 10)	400	
Garage Rent (6,000 ÷ 10)	600	
Insurance (5% of ₹ 5,46,000) = ₹ 27,300 ÷ 12	2,275	
Annual Tax (9,000 ÷ 12)	750	
Annual Repairs (10,000 ÷ 12)	833	6,258
Running and Maintenance Cost :		
Depreciation for 3,000 km [(5,46,000 ÷ 2,00,000) × 3,000]	8,190	
Driver's Salary (Note 1)	3,500	
Diesel Cost for 3000 km [(₹ 44.10 / 10) × 3,000]	13,230	
Oil and Sundries [(105 / 100) × 3000]	3,150	28,070
Total Operating Cost per Month per Taxi		34,328

Note : (1) It is assumed that no payment is made when there is no work. (See Page 9.4)

Effective Running per Month

Total running per month = 3,000 kms

Less: 30% Empty run = 900 kms

Effective Running = 2,100 kms

Cost per effective km = (34,328 / 2,100) = ₹ 16.35.

Illustration 11

The 'Kangaroo Transport Ltd' operates a fleet of lorries. The records for lorry L-14 reveal the following information for September, 2017 :

Days maintained	30	
Days operated	25	
Days idle	5	
Total hours operated	300	
Total kms covered	2,500	
Total tonnage carried	200	(4 ton-load per trip, return journey empty)

9.12 Operating / Service Costing

The following further information is made available :

A. Operating Costs for the month :

Diesel ₹ 4,000; Oil ₹ 1,700; Grease ₹ 900; Wages to Driver ₹ 5,500; Wages to Khalasi ₹ 3,500.

B. Maintenance Costs for the month :

Repairs ₹ 1,700; Overhaul ₹ 600; Tyres ₹ 1,500; Garage charges ₹ 1,000.

C. Fixed Costs for the month based on the estimates for the year :

Insurance ₹ 500; Licence, Tax etc ₹ 800; Interest ₹ 400; Other overheads ₹ 1,900.

D. Capital Costs :

Cost of acquisition is ₹ 5,40,000.

Residual value at the end of 5 years life is ₹ 3,60,000.

Prepare a Cost Sheet and Performance Statement showing :

- Cost per day maintained;
- Cost per day operated;
- Cost per kilometer;
- Cost per hour; and,
- Cost per commercial ton–km.

[I.C.W.A. (Inter) – Adapted]

Solution

Vehicle Cost Sheet for the Month of September, 2017

Particulars	₹	₹
Fixed Costs :		
Depreciation $[(5,40,000 - 3,60,000) / 5] = 36,000 \div 12$	3,000	
Insurance	500	
Licence, Taxes, etc.	800	
Interest	400	
Other overheads	1,900	6,600
Maintenance Costs:		
Repairs	1,700	
Overhaul	600	
Tyres	1,500	
Garage Charges	1,000	4,800
Operating Costs :		
Diesel	4,000	
Oil	1,700	
Grease	900	
Wages to Driver	5,500	
Wages to Khalasi	3,500	15,600
Total Cost for the month of September, 2017		27,000

Performance Statement for September, 2017

Particulars	This Month	Last Month	Average of Last Year
1. Performance Data :			
(i) Days maintained	30		
(ii) Days operated	25		
(iii) Days idle	5		
(iv) Total hours operated	300		
(v) Total kms covered	2,500		
(vi) Total trips	50		
(vii) Total commercial ton–km (Note 1)	5,000		

2. Cost Efficiency :

- (a) Cost per day maintained (27,000 ÷ 30)
- (b) Cost per day operated (27,000 ÷ 25)
- (c) Cost per km (27,000 ÷ 2,500)
- (d) Cost per hour (27,000 ÷ 300)
- (e) Cost per commercial ton-km (27,000 ÷ 5,000)

₹
900.00
1,080.00
10.80
90.00
5.40

Illustration 12

Fast Roadways runs 10 buses between two suburban routes which are 25 kilometres apart. Seating capacity of each bus is 30 passengers. The expenses for the month of November, 2017 were as under :

	₹
Salaries of drivers and conductors	60,000
Salaries of mechanical staff	6,000
Diesel oil and lubricants	2,03,800
Taxes, insurance, etc.	5,200
Repairs and maintenance	8,000
Depreciation	32,000

Seating capacity utilized was 60%.

All the buses ran 25 days of the month.

Each bus made four round trips daily.

- Find out the cost per passenger-kilometer and the cost per round trip per passenger.
- What would have been the cost per round trip per passenger, if the seating capacity utilization were to go up to 80% ?
- What would have been the cost per round trip per passenger, if all the expenses (other than depreciation), were to go up by 20% at a seating capacity utilization of 80% ?

[I.C.W.A. (Inter) – Adapted]

Solution

Fast Roadways

Operating Cost Sheet for the Month of November, 2017

Particulars	₹	₹
Standing Charges :		
Depreciation	32,000	
Taxes and Insurance	5,200	37,200
Running and Maintenance Charges :		
Repairs and Maintenance	8,000	
Salaries of Drivers and Conductors (Note 1)	60,000	
Salaries of Mechanical Staff (Note 1)	6,000	
Diesel and Lubricants	2,03,800	2,77,800
Total Operating Cost for the month		3,15,000

Note : (1) It is assumed that no payment is made when there is no work.

Calculation of Passenger-km

- (a) Distance between two suburban centres = 25 kms.
- (b) Distance covered in one round trip = 50 kms.
- (c) **Total distance covered by 10 buses per month** = 50 kms × 4 round trips × 10 buses × 25 days
= **50,000 kms.**
- (d) Seating capacity = 30 passengers.
- (e) Occupancy rate = 60%. Seating capacity utilized = 30 × 60% = **18 passengers.**
- (f) Total passenger-km for the month = 50,000 km × 18 passengers = **9,00,000 passenger-km.**

9.14 Operating / Service Costing

$$1. \quad \text{Cost per Passenger-km} = \frac{\text{Total Cost}}{\text{Passenger-km}} = \frac{3,15,000}{9,00,000} = ₹ 0.35 \text{ per passenger-km.}$$

$$\text{Cost per round trip per passenger} = 50 \text{ km} \times ₹ 0.35 = ₹ 17.50.$$

2. **Cost per round trip per passenger if the seating capacity utilized were 80%.**

$$\begin{aligned} \text{Cost per Passenger-km} &= \frac{\text{Total Cost}}{\text{Passenger-km}} = \frac{3,15,000}{50,000 \times 30 \times 0.8} \\ &= \frac{3,15,000}{12,00,000} = ₹ 0.2625 \end{aligned}$$

$$\text{Cost per round trip per passenger} = 50 \text{ km} \times ₹ 0.2625 = ₹ 13.125.$$

3. **Cost per round trip, if all expenses (other than depreciation) were to go up by 20% at a seating capacity utilization of 80%**

$$\text{Expected cost} = (3,15,000 - 32,000) \times 1.20 = ₹ 3,39,600$$

$$\text{Total cost} = 3,39,600 + 32,000 = ₹ 3,71,600$$

$$\text{Cost per passenger-km} = (3,71,600 / 12,00,000) = ₹ 0.310 \text{ (approx.)}$$

$$\text{Cost per round trip} = 50 \times ₹ 0.30967 = ₹ 15.48 \text{ per passenger.}$$

Illustration 13

Bharat Transport Ltd. charges ₹ 90 per ton for its 6 tons truck lorry load from city 'A' to city 'B'. The charges for the return journey are ₹ 84 per ton. No concession or reduction in these rates is made for any delivery of goods at intermediate station 'C'. In January, 2008 the truck made 12 outward journeys for city 'B' with full load out of which 2 tons were unloaded twice in the way at city 'C'. The truck carried a load of 8 tons in its return journey for 5 times but once caught by police and ₹ 1,200 was paid as fine. For the remaining trips the truck carried full load out of which all the goods on load were unloaded once at city 'C'.

The distance from city 'A' to city 'C' and city 'B' are 140 kms and 300 kms respectively.

Annual fixed costs and maintenance charges are ₹ 60,000 and ₹ 12,000 respectively. Running charges spent during January, 2008 are ₹ 2,944.

You are required to find out the cost per absolute ton-kilometer and the profit for January, 2008.

[B.Com. (Hons.) – St. Xavier's College (Autonomous), Kolkata – 2008]

Solution

Bharat Transport Ltd. Operating Cost Sheet for the Month of January, 2008

Particulars	₹
Fixed Cost for the month (₹ 60,000 / 12)	5,000
Maintenance Charges per month (₹ 12,000 / 12)	1,000
Running Charges	2,944
Total Operating Cost for the month of January	8,944

$$\text{Cost per Absolute Ton-km} = \frac{\text{Total Cost}}{\text{Absolute ton-km}} = \frac{8,944}{44,720 \text{ (Note 3)}} = ₹ 0.20$$

Statement Showing Profit for the Month of January, 2008

Particulars	₹
Net Revenue earned (Note 4)	12,168
Total Operating Cost (see above table)	8,944
Profit	3,224

Working Notes :

1. Calculation of Ton-km on Outward Journey

(i) From city 'A' to city 'B'	ton-km
10 Journeys × 300 kms × 6 tons	18,000
(ii) From city 'A' to city 'C'	
2 Journeys × 140 kms × 6 tons	1,680
(iii) From city 'C' to city 'B'	
2 Journeys × 160 kms × 4 tons	<u>1,280</u>
Total	<u>20,960</u>

2. Calculation of Ton-km on Return Journey

(i) From city 'B' to city 'A'	
5 Journeys × 300 kms × 8 tons	12,000
6 Journeys × 300 kms × 6 tons	10,800
(ii) From city 'B' to city 'C'	
1 Journey × 160 kms × 6 tons	<u>960</u>
Total	<u>23,760</u>

3. Absolute ton-km of Outward and Return Journeys = 20,960 + 23,760 (see Note 1 & 2) = **44,720 ton-kms.**

4. Calculation of Net Revenue Earned during January, 2008 :

(i) From city 'A' to city 'B'	₹
12 trucks × 6 tons × ₹ 90	6,480
(ii) From city 'B' to city 'A'	
5 trucks × 8 tons × ₹ 84	3,360
6 trucks × 6 tons × ₹ 84	3,024
(iii) From city 'B' to city 'C'	
1 truck × 6 tons × ₹ 84	<u>504</u>
Total Revenue	<u>13,368</u>
Less: Fine paid	<u>1,200</u>
Net Revenue Earned	<u>12,168</u>

Fare Calculation

Illustration 14

A transport company runs 5 buses between two places covering a distance of 25 kms. Seating capacity of each bus is 50 passengers. Generally 80% seating capacity is utilized in each bus. All buses run 25 days a month, each making 4 round trips daily. If total operating cost during a month for all the five buses is ₹ 16 lakhs and profit on takings is assumed to be 20%, calculate the bus fare to be charged for each passenger-km.

[C.U.B.Com. (Hons.) – 2006]

Solution

Calculation of Passenger-km

Passenger-km = Distance × Seating capacity × Occupancy rate × No. of days × No. of trips × No. of buses
 = 25 kms × 50 × 80% × 25 × (4 × 2) × 5 = **10,00,000 passenger-km**

* 1 round trip is equal to 2 one-way trips.

$$\text{Cost per Passenger-km} = \frac{\text{Total Operating Cost}}{\text{Total Passenger-km}} = \frac{16,00,000}{10,00,000} = ₹ 1.60 \text{ per passenger-km}$$

9.16 Operating / Service Costing

Let, fare per passenger-km = x

$$x = ₹ 1.6 + 20\% \text{ of } x$$

$$\text{or, } x - 0.2x = ₹ 1.60$$

$$\text{or, } x = ₹ 2.00$$

Bus fare to be charged = ₹ 2.00 for each passenger.

Illustration 15

X & Company runs a bus between two places covering a distance of 30 kms. Seating capacity of the bus is 30 passengers. The expenses for the month of May 2006 were as follows : ₹

Salaries of driver, conductor and other staff :	10,000
Diesel, oil and lubricants	6,000
Repairs and maintenance	1,600
Depreciation	4,000

The bus ran 25 days in May, 2006 making two round trips per day, 60% of the capacity was utilized.

(a) Find cost per passenger-km.

(b) What will be the fare per passenger if the company wants to maintain a profit @ 20% on sales.

[C.U.B.Com. (Hons.) – 2008]

Solution

Calculation of Passenger-km

$$\begin{aligned}\text{Passenger-km} &= \text{Distance} \times \text{Seating capacity} \times \text{Occupancy rate} \times \text{No. of days} \times \text{No. of trips} \\ &= 30 \times 30 \times 60\% \times 25 \times 4^* \\ &= \mathbf{54,000 \text{ passenger-km}}\end{aligned}$$

*Two round trips means 4 onward trips

Operating Cost Sheet for the period ...

Particulars	₹	₹
Standing Charges :		
Depreciation		4,000
Running and Maintenance Charges :		
Salaries of driver, conductor and other staff	10,000	
Diesel, oil and lubricants	6,000	
Repairs and maintenance	1,600	17,600
Total Operating Costs		21,600

$$\text{Cost per Passenger-km} = \frac{\text{Total Operating Cost}}{\text{Total Passenger-km}} = \frac{21,600}{54,000} = ₹ 0.4 \text{ per passenger-km.}$$

Let, fare per passenger-km = x

$$x = ₹ 0.40 + 20\% \text{ of } x$$

$$\text{or, } x - 0.20x = ₹ 0.40$$

$$\text{or, } x = ₹ 0.5$$

Fare per passenger for travelling one way = ₹ 0.5 × 30 = ₹ 15

Illustration 16

A transport company is running four buses between Delhi and Alwar, covering a distance of 100 kms. The seating capacity of each bus is 40 passengers. The following particulars are obtained from its books for the month of October, 2017 :

	₹
Wages of drivers, conductors	48,000
Salaries of office staff	15,000

Honorarium of accountant	5,000
Diesel, oil, etc.	80,000
Repairs and maintenance	16,000
Road tax and insurance	32,000
Depreciation	52,000
Interest and other charges	40,000

Actual passengers carried were 75% of the seating capacity. All the buses ran for 30 days. Each bus made one round trip per day. Find out the fare the company should charge per passenger/km if it wants a profit of 20% on the takings.

[D.U.B.Com. (Hons.) – Adapted]

Solution

Calculation of Passenger-km

$$\begin{aligned}\text{Passenger-km} &= \text{Distance} \times \text{Seating capacity} \times \text{Occupancy rate} \times \text{No. of days} \times \text{No. of trips} \times \text{No. of buses} \\ &= 100 \text{ kms} \times 40 \text{ passengers} \times 75\% \times 30 \text{ days} \times 2^* \times 4 \\ &= \mathbf{7,20,000 \text{ passenger-km}}\end{aligned}$$

* One round trip = 2 one way trips

Operating Cost Sheet for the Month of October, 2017

Particulars	₹	₹
Standing Charges :		
Wages of drivers, conductors (Note 1)	48,000	
Salaries of office staff	15,000	
Honorarium of accountant	5,000	
Road tax and insurance	32,000	
Depreciation	52,000	
Interest and other charges	40,000	1,92,000
Running and Maintenance Charges :		
Diesel, oil, etc.	80,000	
Repairs and maintenance	16,000	96,000
Total Operating Cost for the month of October		2,88,000

$$\text{Cost per Passenger-km} = \frac{\text{Total Operating Cost}}{\text{Total Passenger-km}} = \frac{2,88,000}{7,20,000} = \mathbf{₹ 0.40 \text{ per passenger-km}}$$

Let fare per passenger-km = x

$$x = ₹ 0.40 + 20\% \text{ of } x$$

$$\text{or, } x - 0.2x = ₹ 0.4$$

$$\text{or, } x = \mathbf{₹ 0.50}$$

Bus fare to be charged per passenger-km = ₹ 0.50.

Note : (1) It is assumed that all staff are permanent. So, payment is to be made even when there is no duty.

Illustration 17

From the following information, calculate the bus fare to be charged from each passenger for the journeys :

- (1) Delhi to Agra;
- (2) Delhi to Bhiwani;
- (3) Delhi to Chandigarh.

(i) Distance :

Delhi to Agra	200 kms
Delhi to Bhiwani	120 kms
Delhi to Chandigarh	250 kms

9.18 Operating / Service Costing

(ii) Effective passenger-km	3,72,000
(iii) Total operating cost (excluding conductor's commission @ 15% and passenger tax @ 5% of total takings)	₹ 1,48,800
(iv) Desired profit – 30% on total takings.	

Solution

Total operating cost = ₹ 1,48,800 (given)

Let total takings = x

$$x = ₹ 1,48,800 + 15\% \text{ of } x + 5\% \text{ of } x + 30\% \text{ of } x$$

$$\text{or, } x = ₹ 1,48,800 + 0.50x$$

$$\text{or, } x - 0.50x = ₹ 1,48,800$$

$$\text{or, } x = ₹ 2,97,600$$

Check :	₹
Total cost	1,48,800
Commission @ 15% on ₹ 2,97,600	44,640
Passenger tax @ 5% on ₹ 2,97,600	14,880
Profit @ 30% on ₹ 2,97,600	<u>89,280</u>
	2,97,600

$$\text{Fare per Passenger-km} = \frac{\text{Total Takings}}{\text{Total Passenger-km}} = \frac{2,97,600}{3,72,000} = ₹ 0.80 \text{ per passenger-km}$$

Bus fare to be charged from passengers : ₹

$$(i) \text{ Delhi to Agra (200 kms} \times ₹ 0.80) = 160$$

$$(ii) \text{ Delhi to Bhiwani (120 kms} \times ₹ 0.80) = 96$$

$$(iii) \text{ Delhi to Chandigarh (250 kms} \times ₹ 0.80) = 200$$

Illustration 18

Sai Travels owns a bus and operates a tourist service on daily basis. The bus starts from Newcity to Restvillage and returns back to Newcity the same day. Distance between Newcity and Restvillage is 250 kms. This trip operates for 10 days in a month. The bus also plies for another 10 days between Newcity and Shivapur and returns back to Newcity the same day; distance between these two places is 200 kms. The bus makes local sight seeing trips for 5 days in a month, covering a total distance of 60 kms per day.

The following data are given :

Cost of bus	₹ 17,50,000
Depreciation	25%
Driver's salary	₹ 6,000 p.m.
Conductor's salary	₹ 5,000 p.m.
Part-time clerk's salary	₹ 2,000 p.m.
Insurance	₹ 9,000 p.a.
Diesel consumption 4 kms per litre @	₹ 40 per litre
Token tax	₹ 12,000 p.a.
Permit fee	₹ 5,000 p.m.
Lubricant oil	₹ 500 for every 200 kms.
Repairs and maintenance	₹ 7,500 p.m.
Normal capacity	50 persons

While plying to and fro Restvillage the bus occupies 90% of the capacity and 80% when it plies between Newcity to Shivapur (both ways). In the city the bus runs full capacity. Passenger tax is 20% of net takings of the 'Travels' firm. Calculate the rate to be charged to Restvillage and Shivapur from Newcity per passenger if the profit required to be earned is 33% of net takings of firm.

[I.C.W.A. (Stage – 1) – Adapted]

Solution

Sai Travels
Operating Cost Sheet for the month ...

Particulars	₹	₹
Standing Charges :		
Driver's salary	6,000	
Conductor's salary (Note 5)	5,000	
Part-time clerk's salary (Note 5)	2,000	
Insurance (9,000 / 12)	750	
Token tax (12,000 / 12)	1,000	
Permit fee	5,000	
Depreciation [(25% of 17,50,000) ÷ 12]	36,458	56,208
Running and Maintenance Charges :		
Diesel consumed (Note 2)	93,000	
Lubricant oil (Note 3)	23,250	
Repairs and maintenance (assumed variable)	7,500	1,23,750
Total Operating Cost per Month		1,79,958

Calculation of Charges per Passenger-km

Particulars	₹
Total Cost (see above table)	1,79,958
Add: Profit @ 33% on net taking or 49.25% on cost (approx.)	88,629
Net takings	2,68,587
Add: Passenger tax @ 20% of ₹ 2,68,594	53,717
Total	3,22,304

$$\text{Rate per Passenger-km} = \frac{3,22,304}{4,00,000} = ₹ 0.80576$$

Charges for Passenger :

- (a) Newcity to Restvillage = $250 \times 0.80576 = ₹ 202$ (approx.)
 (b) Newcity to Shivapur = $200 \times 0.80576 = ₹ 161$ (approx.)

Working Notes :

- (1) **Calculation of Distance Covered per Month**
- | | |
|---|--------------|
| | Kms. |
| (i) Newcity to Restvillage (up and down) [250 × 2 × 10] | 5,000 |
| (ii) Newcity to Shivapur (up and down) [200 × 2 × 10] | 4,000 |
| (iii) Local trip @ 60 km for 5 days [60 × 5] | 300 |
| | <u>9,300</u> |
- (2) **Cost of Diesel Consumed :** $(9,300 \text{ km} / 4) \times ₹ 40 = ₹ 93,000$.
 (3) **Cost of Lubricant Consumed :** $(9,300 / 200) \times ₹ 500 = ₹ 23,250$.
 (4) **Calculation of Passenger-km**
- | | |
|---|-----------------|
| | Passenger-km |
| (i) Newcity to Restvillage [5,000 × 50 × 90%] | 2,25,000 |
| (ii) Newcity to Shivapur [4,000 × 50 × 80%] | 1,60,000 |
| (iii) Local trips [300 × 50] | 15,000 |
| Total Passenger-km | <u>4,00,000</u> |

- (5) It is assumed that all staff are permanent. So payment is to be made even when there is no work.

Illustration 19

SMC is a public school having five buses each plying in different directions for the transport of its school students. In view of a large number of students availing of the bus service, the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the school. The work-load of the students has been so arranged that in the morning the first trip picks up the senior students and the second trip plying an

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hour later picks up the junior students. Similarly in the afternoon the first trip drops the junior students and an hour later the second trip takes the senior students home.

The distance travelled by each bus one way is 8 kms. The school works 25 days in a month and remains closed for vacation in May, June and December. Bus fee, however, is payable by the students for all the 12 months of the year.

The details of expenses for a year are as under :

Driver's salary	₹ 4,500 per month per driver
Cleaner's salary (Salary payable for 12 months) (One cleaner employed for all the five buses)	₹ 3,500 per month
Licence fee, taxes, etc.	₹ 8,600 per bus per annum
Insurance	₹ 10,000 per bus per annum
Repairs and maintenance	₹ 35,000 per bus per annum
Purchase price of bus (Life 12 years)	₹ 15,00,000 each
Scrap value	₹ 3,00,000
Diesel cost	₹ 44.00 per litre

Each bus gives an average mileage of 4 km per litre of diesel.

Seating capacity of each bus is 50 students. The seating capacity is fully occupied during the whole year.

Students picked up and dropped within a range upto 4 km of distance from the school are charged half fare and fifty percent of the students travelling in each trip in this category. Ignore interest. Since the charges are to be based on average cost, **you are required to :**

- Prepare a statement showing the expenses of operating a single bus and the fleet of the buses for a year.
- Work out the average cost per student per month in respect of :
 - Students coming from a distance of upto 4 km from the school; and
 - Students coming from a distance beyond 4 km from the school.

[C.A. (Inter) – Adapted]

Solution

SMC Public School Operating Cost Sheet for one year

Particulars	Rate (₹)	Single Bus		Fleet of 5 Buses	
		No.	(₹)	No.	(₹)
Driver's Salary	4,500 p.m.	1	54,000	5	2,70,000
Cleaner's Salary	3,500 p.m.	1/5	8,400	1	42,000
Licence Fees, Taxes, etc.	8,600 p.a.	1	8,600	5	43,000
Insurance	10,000 p.a.	1	10,000	5	50,000
Repairs and Maintenance	35,000 p.a.	1	35,000	5	1,75,000
Depreciation	1,00,000 p.a.	1	1,00,000	5	5,00,000
Diesel (Note 1)		1	1,58,400	5	7,92,000
Total Cost for one year			3,74,400		18,72,000
Cost per Month			31,200		1,56,000
Number of Students on Half-fee basis (Note 2)			150		750
Cost per Student (Half-fee) per month			208*		208
Cost per Student (full fees) per month			416		416

*₹ 31,200 ÷ 150 = ₹ 208.

Working Notes :

(1) Calculation of Diesel Cost per Bus

- No. of trips of 8 km per day = 8
- Distance travelled per day by a bus = 8 km × 8 = **64 kms**
- Distance travelled in each month = 64 km × 25 days = **1,600 kms**

(d) Distance travelled during 9 months of school = $1,600 \times 9 = 14,400$ kms
(May, June and December being vacation)

(e) Oil consumption per bus per annum = $14,400 \text{ litres} / 4 = 3,600 \text{ litres}$.

(f) Cost of diesel p.a. per bus = $3,600 \text{ litres} \times ₹ 44 = ₹ 1,58,400$.

(2) Calculation of Number of Students per Bus

(a) Bus capacity = 50 students

(b) Half-fee (50%) = 25 students

(c) Full fee (50%) = 25 students

(d) Full fee students are equivalent to half-fee students, i.e., **50 students**

(e) Total number of students equivalent to half-fee students = 75 students per trip

(f) Total number of half-fee students in two trips = 150 students

(g) Total number of full fee students in two trips = 75 students

Decision Making

Illustration 20

A chemical factory runs its boiler on furnace oil obtained from Indian Oil and Bharat Petroleum, whose depots are situated at a distance of 12 and 8 miles from the factory site. Transportation of furnace oil is made by the company's own tank-lorries of 5 tones capacity each. Onward trips are made only on full load and the lorries return empty. The filling-in time takes an average 40 minutes for Indian Oil and 30 minutes for Bharat Petroleum. But the emptying time in the factory is only 40 minutes for both. From the records available it is seen that the average speed of the company's lorries works out to 24 miles per hour. The varying operating charges average ₹ 6 per mile covered and fixed charges give an incidence of ₹ 75 per hour of operation. Calculate the cost per ton-mile for each source.

Assuming that the quality and price are same both for Indian Oil and Bharat Petroleum. Advise the company for sourcing furnace oil.

Solution Statement Showing Cost per Ton-mile of Carrying Furnace Oil

Particulars	Indian Oil ₹	Bharat Petroleum ₹
Fixed Charges (Note 2)	175	137.50
Variable Operating Cost (Note 1)	144	96.00
Total Cost per Round Trip	319	233.50
Cost per Ton-mile (Note 3)	5.32	5.84

The chemical company should purchase furnace oil from Bharat Petroleum because cost of carrying 5 ton from Bharat Petroleum is ₹ 233.50 whereas cost of carrying 5 ton from Indian Oil is ₹ 319. It is to be noted that cost per ton-mile is not taken into consideration for making the decision for buying furnace oil.

Working Notes :

- Distance between oil depots and factory site
Total distance covered in one round trip
Variable operating cost @ ₹ 6 per mile

- Running time of lorries at a speed of 24 miles per hour
 - Filling-in time
 - Emptying time

Fixed Charges @ ₹ 75 per hour

Indian Oil

12 miles
24 miles
₹ 144
60 minutes
40 minutes
40 minutes
140 minutes

₹ 175

Bharat Petroleum

8 miles
16 miles
₹ 96
40 minutes
30 minutes
40 minutes
110 minutes

₹ 137.50

9.22 Operating / Service Costing

$$3. \text{ Cost per ton-miles} = \frac{\text{Total Cost}}{\text{Ton-miles}} = \frac{₹ 319}{60} = ₹ 5.32 \quad \frac{₹ 233.50}{40} = ₹ 5.84$$

Ton-miles of Indian Oil

$$\begin{aligned} 12 \times 5 &= 60 \\ 12 \times 0 &= \underline{0} \\ \hline 60 &\text{ ton-miles} \end{aligned}$$

Ton-miles of Bharat Petroleum

$$\begin{aligned} 8 \times 5 &= 40 \\ 8 \times 0 &= \underline{0} \\ \hline 40 &\text{ ton-miles} \end{aligned}$$

Illustration 21

A Ltd. is considering three alternative proposals for conveyance facilities for its sales personnel who have to do considerable travelling, approximately, 20,000 km per annum.

The proposals are as follows :

- Purchase and maintain its own fleet of cars. The average cost of a car is ₹ 5,00,000.
- Allow the employee to use his own car and re-imburse expenses at the rate of ₹ 8.00 per km and also bear insurance costs.
- Hire cars from a travel agency at ₹ 1,00,000 per annum per car. The company will have to bear costs of petrol, taxes and tyres.

The following further details are available :

- Petrol ₹ 3.00 per km.
- Repairs and maintenance ₹ 1.00 per km.
- Tyre ₹ 0.60 per km.
- Insurance ₹ 6,000 per car p.a.
- Taxes ₹ 4,000 per car p.a.
- Life of the car : 5 years with annual mileage of 20,000 km.
- Resale value ₹ 1,00,000 at the end of the 5th year.

You are required to work out the relative costs of the three proposals and rank them.

[D.U. B.com. (Hons.) – Adapted]

Solution

Statement Showing Operating Cost per KM

Proposal	Company Car	Employee Car	Hired Car
	(₹)	(₹)	(₹)
Fixed Cost per KM (Note 1)	4.50	0.30	0.20
Re-imbursement	—	8.00	—
Hire Charges (₹ 1,00,000 ÷ 20,000)	—	—	5.00
Variable Costs :			
Petrol	3.00	—	3.00
Repairs	1.00	—	—
Tyre	0.60	—	0.60
Total Cost per KM	9.10	8.30	8.80
Ranking	III	I	II

Working Notes :

(1a) Calculation of Fixed Cost per KM when the Car is Purchased and Maintained by the Company

	₹
Taxes	4,000
Depreciation [(₹ 5,00,000 – ₹ 1,00,000) / 5]	80,000
Insurance	6,000
Total Fixed Cost per Annum	90,000
Cost per KM = (₹ 90,000 / 20,000 km) = ₹ 4.50	

(1b) Insurance Cost per km for Employee's Car : (6,000 / 20,000) = ₹ 0.30.

(1c) Taxes per km for Hired Car = (4,000 / 20,000) = ₹ 0.20

Illustration 22

A practicing Chartered Accountant now spends ₹ 14 per kilometer on rental of a car for his clients work. He is considering two other alternatives, the purchase of new 'Maruti Alto' car or an old 'Ambassador' car. The estimated cost figures are :

Particulars	Alto (₹)	Ambassador (₹)
Purchase price	3,50,000	2,00,000
Sale price after 5 years	1,90,000	1,20,000
Repairs and servicing per annum	10,000	12,000
Taxes and insurance per annum	17,000	7,000
Petrol consumption per litre	10 km	7 km
Petrol price per litre	75.00	75.00

He estimates that he does 10,000 km per annum. Which of the three alternatives will be cheaper ? If his practice expands and he has to do 19,000 km per annum, what should be his decision ? At how many km per annum, will the cost of the two cars break-even and why ? Ignore interest and income-tax.

[C.A. (Inter) – Adapted]

Solution

Statement Showing Comparative Cost of Alternative Modes of Conveyance

Particulars	Alto (₹)	Ambassador (₹)	Car Rental (₹)
(A) Fixed Costs (per annum) :			
Depreciation	32,000	16,000	–
Repairs and servicing	10,000	12,000	–
Taxes and insurance	17,000	7,000	–
	59,000	35,000	
(B) Variable Costs (per annum) :			
(a) Petrol : 10,000 km	75,000	1,07,143	–
(b) Petrol : 19,000 km	1,42,500	2,03,571	
Total Costs :			
(a) 10,000 km (Note 1a) / (Note 2a)	1,34,000	1,42,143	1,40,000
(b) 19,000 km (Note 1b) / (Note 2b)	2,01,500	2,38,571	2,66,000

For his present practice, the new 'Maruti Alto' car is the cheapest. If his practice expands, then also new 'Maruti Alto' car will be the cheapest.

The difference in the variable costs of running two cars is ₹ 3.2143 (₹ 10.7143 – ₹ 7.50). The difference of fixed cost is ₹ 24,000 (₹ 59,000 – ₹ 35,000). The break-even point between the two cars is as follows :

$$= \frac{24,000}{3.2143} = 7,466.67 \text{ km}$$

At 7,466.67 km per annum cost of running two cars will be same as has been calculated below :

	Alto	Ambassador
Fixed cost	59,000	35,000
Petrol (₹ 7.5 × 7,466.67 km)	56,000	(₹ 10.714 × 7,466.67 km) 80,000
Total Cost	1,15,000	1,15,000

Working Notes :

(1) (a) Total Cost of 'Alto' for 10,000 km per annum:		(b) Total Cost of 'Alto' for 19,000 km per annum:	
Fixed costs	59,000	Fixed costs	59,000
Variable cost	75,000	Variable cost	1,42,500
	<u>1,34,000</u>		<u>2,01,500</u>

9.24 Operating / Service Costing

(2) (a) Total Cost of 'Ambassador' for 10,000 km per annum :

Fixed costs = ₹ 35,000 + Variable cost ₹ 1,07,143 = ₹ 1,42,143.

(b) Total Cost of 'Ambassador' for 19,000 km per annum :

Fixed costs = ₹ 35,000 + Variable cost ₹ 2,03,571 = ₹ 2,38,571.

Previous Years' C.U. Question Paper (with Solution)

[For Honours Candidates Only]

Illustration 23

Volvo Corp. owns a bus which runs according to the following schedule :

Route	Distance one-way	No. of days run each month	Seating occupancy
Delhi to Chandigarh	150 kms.	8	90%
Delhi to Agra	120 kms.	10	85%
Delhi to Jaipur	270 kms.	6	100%

Other details :

Cost of the bus ₹ 6,00,000

Driver's salary ₹ 6,800 p.m.

Conductor's salary ₹ 6,200 p.m.

Administrative expenses ₹ 2,000 p.m.

Insurance of the bus ₹ 12,000 p.a.

Diesel and oil consumption — 4 kms per litre at ₹ 36 per litre.

Road Tax : ₹ 15,000 p.a.; Permit fee : ₹ 1,000 p.m.

Lubricant oil (other than diesel and oil) ₹ 40 per 100 kms.

Repair and maintenance ₹ 5,000 p.m.

Depreciation of the bus 20% p.a.

Seating capacity of the bus : 50 passengers

Passenger Tax is 20% of the total takings.

Calculate the bus fare to be charged from each passenger to earn a profit of 30% on total takings.

The fares are to be charged per passenger for the journeys —

(1) Delhi to Chandigarh;

(2) Delhi to Agra; and

(3) Delhi to Jaipur.

[C.U. B.Com. (Hons.) – 2010]

Solution

Calculation of Total Passenger-Km for a Month

Route	Distance (One way)	Distance (Both ways) (a)	No. of Days (b)	Total Km Run (a x b) = c	Seating Capacity (d)	Occupancy Rate (e)	Passenger-km (c x d x e)
Delhi to Chandigarh	150	300	8	2,400	50	90%	1,08,000
Delhi to Agra	120	240	10	2,400	50	85%	1,02,000
Delhi to Jaipur	270	540	6	3,240	50	100%	1,62,000
Total				8,040			3,72,000

Operating Cost Sheet for the Month ...

Particulars	₹	₹
Standing Charges :		
Driver's Salary (Note 1)	6,800	
Conductor's Salary (Note 1)	6,200	
Depreciation of the Bus (20% of ₹ 6,00,000) ÷ 12	10,000	
Administrative Expenses	2,000	
Insurance for the Bus (₹ 12,000 ÷ 12)	1,000	
Road Tax (₹ 15,000 ÷ 12)	1,250	
Permit Fees	1,000	28,250
Running and Maintenance Charges :		
Diesel (8,040 ÷ 4) x ₹ 36	72,360	
Lubricant Oil (8,040 ÷ 100) x ₹ 40	3,216	
Repairs and Maintenance	5,000	80,576
Total Operating Cost for the month		1,08,826

Note (1) : It is assumed that all staff are permanent. Payment to be made even when there is no duty.

$$\begin{aligned}
 \text{Cost per Passenger - km} &= \frac{\text{Total Operating Cost}}{\text{Total Passenger - km}} \\
 &= \frac{1,08,826}{3,72,000} \\
 &= \mathbf{0.2925}
 \end{aligned}$$

Let the fare per passenger-km = x

$$x = ₹ 0.2925 + 20\%x + 30\%x$$

$$\text{or, } x - 0.2x - 0.3x = ₹ 0.2925$$

$$\text{or } x = ₹ 0.5850$$

Bus fare to be charged per passenger-km = ₹ **0.5850**.

Bus fare to be charged from passengers :

(1) Delhi to Chandigarh (150 km × ₹ 0.585) = ₹ 87.75

(2) Delhi to Agra (120 km × ₹ 0.585) = ₹ 70.20

(3) Delhi to Jaipur (270 km × ₹ 0.585) = ₹ 157.95

Illustration 24

Roy & Co. runs a bus between two places covering a distance of 60 kms. Seating capacity of the bus is 60 passengers. The expenses for the month of March 2011 were as follows : ₹

Salaries of driver, conductor and other staff	20,000
Diesel, oil and lubricants	12,000
Repairs and maintenance	3,200
Depreciation	8,000

The bus runs 25 days in March 2011 making two round trips per day, 60% of the capacity was utilised.

(a) Find cost per passenger-km.

(b) What will be the fare per passenger if the Company wants to maintain a profit @ 20% on Sales ?

[C.U. B.Com. (Hons.) – 2011]

Solution

Calculation of Passenger-km

$$\begin{aligned}
 \text{Passenger-km} &= \text{Distance} \times \text{Seating Capacity} \times \text{Occupancy Rate} \times \text{No. of Days} \times \text{No. of Trips} \\
 &= 60 \times 60 \times 60\% \times 25\% \times 4^* \\
 &= \mathbf{2,16,000 \text{ Passenger-km}}
 \end{aligned}$$

* One round trip = 2 one-way trips

9.26 Operating / Service Costing

Operating Cost Sheet for the Month of March, 2011

Particulars	₹	₹
Standing Charges :		
Depreciation	8,000	
Salary of Driver, Conductor and other Staff (Note 1)	20,000	28,000
Running and Maintenance Charges :		
Diesel, oil and lubricants	12,000	
Repairs and Maintenance	3,200	15,200
Total Operating Cost for the month		43,200

Note : (1) It is assumed that all staff are permanent. Payment to be made even when there is no duty.

$$\begin{aligned}
 \text{Cost per Passenger-Km} &= \frac{\text{Total Operating Cost}}{\text{Total Passenger - km}} \\
 &= \frac{43,200}{2,16,000} \\
 &= \mathbf{0.20}
 \end{aligned}$$

Let the fare per passenger-km = x

$$x = ₹ 0.20 + 20\% \text{ of } x$$

$$\text{or, } x - 0.2x = ₹ 0.20$$

$$\text{or } x = ₹ 0.25$$

Bus fare to be charged per passenger-km = ₹ 0.25.

Fare per passenger travelling 60 km = $60 \times ₹ 0.25 = ₹ 15$.

Illustration 25

Valvo Company runs 10 buses between Airport and Tollygunge covering a distance of 25 kms. Seating capacity of each bus is 60 passengers. The expenses for the month of December 2012 were as follows :

Salaries of drivers and conductors	3,60,000
Salaries of mechanical staff	36,000
Diesel, oil and lubricants	2,40,000
Taxes, Insurance etc.	31,200
Repairs and Maintenance	48,000
Depreciation of the buses	1,92,000

80% seating capacity was utilised in each cases.

All buses run 25 days during the month.

Each bus runs 4 round (up down) trips daily.

Calculate the cost per passenger-kilometre and passenger-fare for one-way journey if company makes a profit of 25% on cost.

[C.U. B.Com. (Hons.) – 2013]

Solution

Calculation of Passenger-km

$$\begin{aligned}
 \text{Passenger-km} &= \text{Distance} \times \text{Seating Capacity} \times \text{Occupancy Rate} \times \text{No. of Days} \\
 &\quad \times \text{No. of Trips} \times \text{No. of Buses} \\
 &= 25 \text{ Km} \times 60 \times 80\% \times 25 \times 8^* \times 10 \\
 &= \mathbf{24,00,000 \text{ Passenger-km}}
 \end{aligned}$$

* One round trip = 2 one-way trips

Operating Cost Sheet for the Month of December, 2012

Particulars	₹	₹
Standing Charges :		
Depreciation of the buses	1,92,000	
Salaries of Drivers and Conductors (Note 1)	3,60,000	
Salaries of Mechanical Staff (Note 1)	36,000	
Taxes and Insurance	31,200	6,19,200
Running and Maintenance Charges :		
Diesel, oil and lubricants	2,40,000	
Repairs and Maintenance	48,000	2,88,000
Total Operating Cost for the month		9,07,200

$$(a) \text{ Cost per Passenger-Km} = \frac{\text{Total Operating Cost}}{\text{Total Passenger - km}} = \frac{9,07,200}{24,00,000} = 0.378$$

(b) Passenger Fare for One Way Journey	₹
Cost for 25 km (25 × 0.378)	9.4500
Add: Profit 25% of 9.45	2.3625
	<u>11.8125</u>

Note : (1) It is assumed that all staff are permanent. Payment to be made even when there is no duty.

Illustration 26

Mr. Tribed Saha has started a transport business with a fleet of 10 taxis. The various expenses incurred by him are given below :

Cost of each taxi	₹ 3,00,000
Salary of office staff	₹ 6,000 p.m.
Salary of Drivers	₹ 8,000 p.m. per taxi
Salary of Garage staff	₹ 1,600
Garage Rent	₹ 4,000 p.m.
Road tax and repairs	₹ 8,640 per taxi p.a.
Insurance premium @ 5% of cost of each taxi p.a.	

The life of each taxi 3,00,000 kms and at the end of which it is estimated to be sold at ₹ 60,000. A taxi runs on an average 4,000 km. per month, 20% of which it runs empty. Petrol consumption is one litre per 10 km. Cost of petrol is ₹ 50 per litre. Other sundry expenses amounted to ₹ 40,000 per 100 km.

Calculate the effective cost of running a taxi per kilometre.

[C.U. B.Com. (Hons.) – 2014]

Solution

Operating Cost Sheet for Running a Taxi for a Month

Particulars	₹	₹
Standing Charges / Fixed Cost :		
Salary of Office Staff (6,000 ÷ 10)	600	
Salary of Garage Staff (1,600 ÷ 10)	160	
Garage Rent (4,000 ÷ 10)	400	
Road Tax & Repairs (8,640 ÷ 12)	720	
Insurance Premium [(5% of ₹ 3,00,000) ÷ 12]	1,250	3,130
Running and Maintenance Charges :		
Depreciation (Note 1)	3,200	
salary of Driver (Note 2)	8,000	
Petrol Cost for 4,000 km (50 ÷ 10 × 4,000)	20,000	
Other Sundry Expenses (40 ÷ 100 × 4,000)	1,600	32,800
Total Operating Cost for the month per Taxi		35,930

9.28 Operating / Service Costing

Effective Running per Month

Total Running per Month	4,000 kms
Less: 20% Empty	<u>800 kms</u>
Effective Running	<u>3,200 kms</u>

Cost per Effective km = $35,930 \div 3,200 = ₹ 11.23$

Working Notes :

(1) Depreciation for 4,000 km

	₹
Cost of the Taxi	3,00,000
Less: Scrap Value	<u>60,000</u>
Depreciable Value	<u>2,40,000</u>

Depreciation for the Month = $(₹ 2,40,000 \div 3,00,000) \times 4,000 = ₹ 3,200$.

(2) It is assumed that all drivers are temporary. No payment to be made when there is no work.

Illustration 27

Dr. J. Kundu spends ₹ 11.80 per km. taxi fare. He is considering two other alternatives : (i) the purchase of new small car; or (ii) purchase of big old car. The estimated expenses for these two alternatives are as follows :

	New small car (₹)	Old big car (₹)
Purchase price	70,000	40,000
Scrap value after 10 years	30,000	20,000
Servicing and other fixed expenses per annum	1,500	2,400
Tax and insurance per annum	3,500	1,500
Km. run per litre of petrol	10	7

Petrol price per litre is ₹ 56. His estimated annual requirement to travel is 10,000 km. Which of three options will be most economical for him ?

[C.U. B.Com. (Hons.) – 2015]

Solution Statement Showing Comparative Cost of Alternative Modes of Conveyance

Particulars	New Small Car (₹)	Old Big Car (₹)	Taxi Fare (₹)
(A) Fixed Cost (per annum)			
Depreciation	4,000	2,000	
Repairs and Servicing	1,500	2,400	
Taxes and Insurance	3,500	1,500	
	<u>9,000</u>	<u>5,900</u>	
(B) Variable Cost (per annum)			
Petrol	56,000	80,000	1,18,000
Total Cost (A + B)	<u>65,000</u>	<u>85,900</u>	<u>1,18,000</u>

Illustration 28

Basu Transport Enterprise runs 10 buses between two places which are 25 kms apart. Seating capacity of each bus is 30. the expenses for the month of March, 2017 were as under :

Salaries — ₹ 1,32,000; Lubricant — ₹ 18,000; Taxes and Insurance — ₹ 10,000; Repairs and maintenance — ₹ 16,000; Depreciation — ₹ 64,000 and Diesel consumption — 2 litres for 20 kms @ ₹ 60 per litre.

Seating capacity utilised was 60%. All the buses run 25 days of the month. Each bus made four round trips daily.

- Find out the cost per passenger-kilometer and cost per round trip per passenger.
- What would be the cost per round trip per passenger, if the seating capacity utilisation were to go up to 80% ?

[C.U.B.Com. (Hons.) – 2017]

Solution

Calculation of Passenger-Km

$$\begin{aligned}\text{Passenger-Km} &= \text{Distance} \times \text{Seating Capacity} \times \text{Occupancy Rate} \times \text{No. of Days} \\ &\quad \times \text{No. of Trips} \times \text{No. of Buses} \\ &= 25 \text{ Km} \times 30 \times 60\% \times 25 \times 8^* \times 10 = 9,00,000 \text{ Passenger-Km}\end{aligned}$$

* One round trip = 2 one-way trips

Operating Cost Sheet for the month of March, 2017

Particulars	(₹)	(₹)
Standing Charges :		
Depreciation of the buses	64,000	
Salaries	1,32,000	
Taxes and Insurance	10,000	2,06,000
Running and Maintenance Charges :		
Diesel (Note 1)	3,00,000	
Lubricant	18,000	
Repairs and Maintenance	16,000	3,34,000
Total Cost (A + B)		5,40,000

$$(a) \text{ Cost per Passenger-Km} = \frac{\text{Total Operating Cost}}{\text{Total Passenger - km}} = \frac{5,40,000}{9,00,000} = ₹ 0.60$$

$$\text{Cost per round trip} = 50 \text{ Km} \times ₹ 0.60 = ₹ 30.$$

$$(b) \text{ When the seating capacity utilisation is 80\% then the passenger-km will be : } \\ 25 \times 30 \times 80\% \times 25 \times 8 \times 10 = \mathbf{12,00,000 \text{ Passenger-Km.}}$$

$$\text{Cost per Passenger-Km} = = \frac{5,40,000}{12,00,000} = ₹ 0.45$$

$$\text{Cost per round trip} = 50 \text{ Km} \times ₹ 0.45 = ₹ 22.50$$

Working Note :

(1) Calculation of Diesel Consumption

$$\text{Total Distance covered in a month} = 25 \text{ Km} \times 8 \times 25 \times 10 = \mathbf{50,000 \text{ Km.}}$$

$$\text{Diesel Cost} = 50,000 \times [(2 \times 60) \div 20] = ₹ \mathbf{3,00,000.}$$

THEORETICAL QUESTIONS

1. What do you mean by operating / service costing ? (Page 9.1) What are the unique characteristics of service output ? (Page 9.1)
2. What is composite unit ? Give three examples. (Page 9.2)
3. What are the characteristics of operating / service costing ? (Page 9.1)
4. What are the different organisations which uses operating / service costing ? (Page 9.2)
5. Define the term 'cost unit' and discuss appropriate cost unit(s) for the transport business. (Page 9.2)
6. Distinguish between absolute ton-km and commercial ton-km. (Page 9.6)
7. What is a log sheet ? Why is it prepared ? (Page 9.3)
8. What is performance statement ? What are the purposes of preparing performance statement ? (Page 9.4)

PRACTICAL QUESTIONS

- 9.1 A truck starts with a load of 10 tons of goods from station D. It unloads 3 tons at station E and rest of goods at station F. It reaches back directly to station D after getting reloaded with 8 tons of goods at station F. The distance from D to E, E to F and then from F to D are 80 km, 120 km and 160 km respectively. Compute ton-km for the truck service. *[C.U.B.Com. (Hons.) – Adapted]*

9.30 Operating / Service Costing

- 9.2 A transport service company is running 4 buses between two towns which are 50 kms apart. Seating capacity of each bus is 40 passengers. The following particulars are obtained from the records for the month of April, 2017 :

	₹
i) Wages of drivers, conductors and cleaners	60,000
ii) Salaries of office and supervisory staff	25,000
iii) Diesel oil and other oil	1,00,000
iv) Repairs and maintenance	20,000
v) Taxes, insurance, etc.	40,000
vi) Depreciation	65,000
vii) Interest and other charges	50,000
Total	3,60,000

The seating capacity utilised was 75%. All the four buses ran on all days of the month. Each bus had made one round trip daily.

You are required to find out the cost per passenger-km.

[I.C.W.A. (Inter) – Adapted]

- 9.3 Raju, the owner of a taxi, supplies the following information :

- (i) Cost of taxi ₹ 7,50,000 with total life of 2,50,000 kms.
- (ii) Driver's salary per month ₹ 3,500.
- (iii) Cleaner's salary per month ₹ 1,500.
- (iv) Repairs per annum ₹ 18,000.
- (v) Garage rent ₹ 12,000 per annum.
- (vi) Tax per annum ₹ 6,000.
- (vii) Diesel consumption 8 kms per litre.
- (viii) Cost of diesel per litre ₹ 40.
- (ix) Oil and other sundries ₹ 100 per 125 kms.

The taxi runs, 25 days a month. On an average, taxi runs for 100 kms per day and 20% of this distance has to be run without any passenger. You are required to calculate the cost of running taxi per km.

- 9.4 Prakash Automobiles distributes its goods to a regional dealer using a single lorry. The dealer's premises is 40 km away by road. The lorry has a capacity of 10 tons and makes the journey twice a day fully loaded on the outward journeys and empty on return journeys. The following information is available for a four-weekly period during the year 2017 :

Diesel consumption	8 kilometres per litre
Diesel cost	₹ 44 per litre
Oil	₹ 500 per week
Driver's wages	₹ 2,000 per week
Repairs	₹ 500 per week
Garage rent	₹ 750 per week
Cost of lorry (excluding tyres)	₹ 9,00,000
Life of lorry	80,000 kilometres
Insurance	₹ 26,000 per annum
Cost of tyres	₹ 25,000
Life of tyres	25,000 kilometres
Estimated sale value of lorry at the end of its life	₹ 1,00,000
Vehicle licence cost	₹ 7,800 per annum
Other overhead cost	₹ 41,600 per annum

The lorry operates on a 5-day week.

Required :

- (a) A statement to show the total cost of operating the vehicle for the four-weekly period analysed into running costs and fixed costs.
- (b) Calculate the vehicle cost per kilometer and per ton kilometer.

[C.A. (Inter) – Adapted]

- 9.5 Janata Transport Company supplies the following details in respect of a truck of 5-ton capacity :

Cost of Truck	₹ 4,50,000
Estimated life	10 years
Scrap value	5% of cost
Diesel, oil, grease	₹ 75 per trip each way
Repairs and maintenance	₹ 2,500 per month
Driver's salary	₹ 2,500 per month
Cleaner's wages	₹ 1,250 per month
Insurance	₹ 24,000 per year
Tax	₹ 12,000 per year
General supervision charges	₹ 24,000 per year

The truck carries goods to and from the city covering a distance of 50 km each way. The truck makes only one round trip per day.

On onward trip freight is available to the extent of full capacity and on return 20% of capacity.

Assuming that the truck runs on an average for 25 days a month, work out :

- (a) Operating cost per ton-km;
- (b) Rate per ton per trip that the company should charge if a profit of 50% on freightage is to be earned.

- 9.6 Anami Transport Company has been given a route 40 km long to run a bus. The bus costs the company a sum of ₹ 10,00,000. It has been insured at 3% p.a. and the annual tax will amount to ₹ 20,000. Garage rent is ₹ 2,000 p.m. Annual repairs will be ₹ 20,000 and the bus is likely to last for 5 years.

The driver's salary will be ₹ 3,000 p.m. and the conductor's salary will be ₹ 2,000 p.m. in addition to 10% of taking as commission (to be shared by the driver and the conductor equally).

Cost of stationery will be ₹ 1,000 p.m. Manager-cum-Accountant's salary is ₹ 7,000 p.m.

Diesel and oil will be ₹ 500 per 100 km. The bus will make 3 up and down trips carrying, on an average, 40 passengers on each trip. Assuming 15% profit on takings, calculate the bus fare to be charged from each passenger. The bus will run on an average 25 days in a month.

[I.C.W.A. (Stage-1) - Adapted]

- 9.7 Carryall Enterprise has been permitted to run a minibus on a route covering 20 km. The minibus has been purchased at a cost of ₹ 5 lakh, part of which was financed through bank loan and balance by loan from other sources.

The annual charges for the minibus are insurance ₹ 20,000, road tax ₹ 10,000 and garage rent ₹ 6,000. Cost of repairs and maintenance is estimated at ₹ 30,000 per annum while replacement of tyre and tubes will cost ₹ 2,400 per month. Office expenses are estimated at ₹ 3,000 per month. Diesel and oil will cost ₹ 2.25 per km.

Two drivers and two conductors are engaged at a monthly salary of ₹ 2,500 and ₹ 1,750 respectively. In addition drivers and conductors are entitled to 5% of the sale of tickets.

The effective life of the vehicle is estimated at 5 years at the end of which the vehicle will have scrap value of ₹ 50,000.

The minibus is 24-seater and is expected to run 6 two-way trips during the day for 25 days in a month. You are required to submit passenger fare structure for approval by the transport authority which allows 20% profit on net sales. Interest on loan is allowed as cost, if instalments are paid regularly, assume the amount of interest to be ₹ 33,600 p.a.

[I.C.W.A. (Stage-1) – Adapted]

9.32 Operating / Service Costing

9.8 Mr. X owns a bus which runs according to the following schedule :

(i) Delhi to Chandigarh and back, the same day.

Distance covered : 150 kms, one way

Number of days run each month : 8

Seating capacity occupied : 90%

(ii) Delhi to Agra and back, the same day.

Distance covered : 120 kms, one way

Number of days run each month : 10

Seating capacity occupied : 85%

(iii) Delhi to Jaipur and back, the same day.

Distance covered : 270 kms, one way

Number of days run each month : 6

Seating capacity occupied : 100%

(iv) Following are the other details :

₹

Cost of the bus 12,00,000

Salary of the driver 5,600 p.m.

Salary of the conductor 4,400 p.m.

Salary of the part-time Accountant 1,000 p.m.

Insurance of the bus 30,000 p.a.

Diesel consumption 4 kms per litre 44 per litre

Road tax 6,000 p.a.

Lubricant oil ₹ 50 per 100 km.

Permit fee 2,000 p.m.

Repairs and maintenance 5,000 p.m.

Depreciation of the bus @ 20% p.a.

Seating capacity of the bus 50 persons

Passenger tax is 20% of the total takings. Calculate the bus fare to be charged from each passenger to earn a profit of 20% on total takings. The fares are to be indicated per passenger for the journeys :

(i) Delhi to Chandigarh

(ii) Delhi to Agra

(iii) Delhi to Jaipur

9.9 A mineral is transported from two mines — A and B and unloaded in plots in a Railway Station. Mine A is at a distance of 10 kms, and B is at a distance of 15 kms from railhead plots. A fleet of lorries of 5 ton carrying capacity is used for the transport of mineral from the mines. Records reveal that the lorries average speed is 30 kms per hour, when running and regularly take 10 minutes to unload at the railhead. At mine A loading time averages 30 minutes per load while at mine B loading time averages 20 minutes per load.

Drivers' wages, depreciation, insurance and taxes are found to cost ₹ 45 per hour operated. Fuel, oil, tyres, repairs and maintenance cost ₹ 6 per km.

Draw up a statement, showing cost per ton-km of carrying mineral from each mine.

[C.A. (Inter) – Adapted]

9.10 Shankar has been promised a contract to run a tourist car on a 20 km long route for the chief executive of a multinational firm. He buys a car costing ₹ 7,50,000. The annual cost of insurance and taxes are ₹ 22,500 and ₹ 4,500 respectively. He has to pay ₹ 2,500 per month for a garage where he keeps the car when it is not in use. The annual repair costs are estimated at ₹ 20,000. The car is estimated to have a life of 10 years at the end of which the scrap value is likely to be ₹ 2,50,000.

He hires a driver who is to be paid ₹ 1,500 per month plus 10% of the takings as commission. Other incidental expenses are estimated at ₹ 1,000 per month.

Petrol and oil will cost ₹ 500 per 100 km. The car will make 4 round-trips each day. Assuming that a profit of 15% on takings is desired and that the car will be on the road for 25 days on an average per month, what should be the charge per round-trip ? *[C.A. (Inter) – Adapted]*

- 9.11 The Union Transport Company has been given a twenty kilometer long route to ply a bus. The bus costs the company ₹ 10,00,000. It has been insured at 3% per annum. The annual road tax amounts to ₹ 20,000. Garage rent is ₹ 4,000 per month. Annual repair is estimated to cost ₹ 23,600 and the bus is likely to last for five years.

The salary of the driver and the conductor is ₹ 6,000 and ₹ 2,000 per month respectively, in addition to 10% of takings as commission to be shared equally by them. The manager's salary is ₹ 14,000 per month and stationery will cost ₹ 1,000 per month. Petrol and oil cost ₹ 500 per 100 kilometers. The bus will make three round trips per day carrying on an average 40 passengers in each trip. Assuming 15% profit on taking and that the bus will ply on an average 25 days in a month, prepare operating cost statement on a full year basis and also calculate the bus fare to be charged from each passenger per kilometer.

[C.A. (Inter) – Adapted]

- 9.12 A transport company has a fleet of three trucks of 10 tonnes capacity each plying in different directions for transport of customer's goods. The trucks run loaded with goods and return empty. The distance travelled, number of trips made and the load carried per day by each truck are as under :

Truck No.	One way Distance (Km)	No. of trips per day	Load carried per trip / day (Tonnes)
1	16	4	6
2	40	2	9
3	30	3	8

The analysis of maintenance cost and the total distance travelled during the last two years is as under :

Year	Total distance travelled	Maintenance Cost (₹)
1	1,60,200	1,84,200
2	1,56,700	1,80,700

The following are the details of expenses for the year under review :

Diesel	₹ 40 per litre. Each litre gives 4 km per litre of diesel on an average
Driver's salary	₹ 8,000 per month
Licence and taxes	₹ 20,000 per annum per truck
Insurance	₹ 20,000 per annum for all the three vehicles.
Purchase Price per truck	₹ 12,00,000 life 10 years. Scrap value at the end of life is ₹ 40,000
Oil and sundries	100 per 100 km run
General overhead	₹ 44,336 per annum

The vehicles operate 24 days per month on an average,

Required :

- Prepare an Annual Cost Statement covering the fleet of three vehicles.
 - Calculate the cost per km run.
 - Determine the freight rate per tonne km to yield a profit of 10% on freight.
- 9.13 DPR School is a public school having five buses, each plying in different directions for the transportation of its students. There are two shifts for each bus, one shift is for senior students and other is for junior students. The distance travelled by each bus one way is 8 kms. The school works on an average 25 days in a month and remains closed for vacations for three months in a year. Bus fee, however, is payable by the students for 10 months in a year. The details of expenses for a year are as under :

9.34 Operating / Service Costing

Driver's salary	₹ 12,000 per month per driver
Cleaner's salary	8,000 per month
(Salary payable for all 12 months, one cleaner employed for all five buses)	
Licence fee, taxes etc.	₹ 17,600 per bus per annum
Insurance	₹ 20,400 per bus per annum
Repair and maintenance	₹ 70,000 per bus per annum
Purchase price of the bus	₹ 21,00,000 each
Life	12 years
Scrap value	₹ 3,00,000
Diesel cost	₹ 48 per litre

Each bus gives an average of 4 kms per litre of diesel. The seating capacity of each bus is 50 students. Students picked up and dropped within a range of 4 kms of distance from the school are charged half the fare and 50% of students travelling in each trip are in this category. Ignore interest. Since the charges are to be based on average cost, you are required to :

(i) Prepare a Statement showing the expenses of operating a single bus.

(ii) Work out the average cost per student per month in respect of

(a) Students coming from a distance of upto 4 kms from the school

(b) Students coming from a distance of beyond 4 kms from the school.

- 9.14 A transport company is running five buses between Delhi and Tilliar (a picnic spot in Haryana), covering a distance of 125 kms. The seating capacity of each bus is 50 passengers. The following particulars are obtained from the books for the month of October, 2017 :

	₹
Wages of drivers, conductors	1,60,000
Salaries and office staff	70,000
Honorarium of accountant	25,000
Diesel, oil etc.	7,50,000
Repairs and Maintenance	32,500
Road Tax and Insurance	50,000
Depreciation	1,50,000
Interest and other charges	1,12,500

Actual passengers carried were 80% of the seating capacity. All the buses ran for 30 days. Each bus made one round trip per day. Find out the fare the company should charge per passenger-km if it wants a profit of 25% on the takings.

- 9.15 A transport company has been given a 40 kilometre long route to run 5 buses. The cost of each bus is ₹ 6,50,000. The buses will make 3 round trips per day carrying on an average 80% passengers of their seating capacity. The seating capacity of each bus is 40 passengers. The buses will run on average 25 days in a month. The other information for the year 2017-18 is given below :

Garage rent	₹ 4,000 per month
Annual repairs and maintenance	₹ 22,500 per bus
Salary of 5 drivers	₹ 3,000 each per month
Wages of 5 conductors	₹ 1,200 each per month
Manager's salary	₹ 7,500 per month
Road tax, permit fee etc.	₹ 1,000 per bus per quarter
Office expenses	₹ 2,000 per month
Cost of diesel per litre	₹ 33
Kilometres run per litre for each bus	6 kms
Annual Depreciation	15% of cost
Annual Insurance	3% of cost

Required :

- (a) Operating Cost Sheet.
- (b) Calculate the bus fare to be charged from each passenger per km, if the company wants to earn profits of 33 1/3% on takings (total receipts from passengers).

Guide to Answer

Practical Questions

- 9.1. 2,920 ton-km.
- 9.2. Km. run during April, 2012 = $4 \times 50 \times 2 \times 30 = 12,000$ km.
 Passenger-km = 3,60,000.
 Total service cost = 3,60,000
 Passenger-km = 3,60,000.
 Cost per passenger-km = ₹ 1.00.
- 9.3. Cost of running the taxi per km = ₹ 15.15 [Note calculation has been done on the basis of effective km ($100 \text{ km} \times 25 \text{ days} \times 80\%$) = 2,000.]
- 9.4. (i) Running cost : ₹ 64,800 (depreciation included)
 (ii) Fixed cost : ₹ 8,800.
 (iii) Cost per km ($73,600 \div 3,200$) = ₹ 23.
 (iv) Cost per ton-km ($73,600 \div 16,000$) = ₹ 4.60.
- 9.5. (i) Ton-km per month :
 $5 \times 50 \times 25 = 6,250$
 $1 \times 50 \times 25 = \underline{1,250}$
 $\underline{7,500}$
 (ii) Cost per ton-km = ₹ $37,120 \div 7,500 = ₹ 4.95$
 (iii) Profit per ton-km = ₹ 4.95.
 (iv) Freight per trip - both ways = ₹ 2,970 ($300 \text{ kms} \times ₹ 9.90$)
- 9.6. (i) Total passenger-km = 2,40,000.
 (ii) Total cost without commission 67,500
 Commission 9,000
 Profit 13,500
 Total takings 90,000
 Cost per passenger-km = ($90,000 \div 2,40,000$) = ₹ 0.375.
 Cost per passenger for 40 km travel = $40 \times 0.375 = ₹ 15.00$
- 9.7. (i) Total km covered = 6,000 kms.
 (ii) Total passenger-km ($6,000 \times 24 \text{ seats}$) = 1,44,000.
 (iii) Rate per passenger-km = ₹ 0.40.
 (iv) Total operating cost 43,200
 Commission 2,880
 Profit 11,520
 Total sales proceeds 57,600
- 9.8. (i) Total passenger-km = 3,72,000.
 (ii) Total cost per month ₹ 1,33,460.
 (iii) Total takings ₹ 2,66,920.
 (iv) Passenger-km ₹ 53,384.
 (v) Profit ₹ 80,076.
 (vi) Cost per passenger-km = 0.72 paise (rounded off)

9.36 Operating / Service Costing

Fare to be charged :

Delhi to Chandigarh per passenger = ₹ 108.00

Delhi to Agra per passenger = ₹ 86.90

Delhi to Jaipur per passenger = ₹ 194.40

		Mine A	Mine B
9.9.	(i) Effective ton-km	50	75
	(ii) Total operating time	80 minutes	90 minutes
	(iii) Total cost per trip	₹ 180	₹ 247.50
	(iv) Cost per ton-km	₹ 3.60	₹ 3.29
9.10	(i) Total standing charges	13,083	
	Variable expenses	<u>20,000</u>	
	Total cost (without commission)	<u>33,083</u>	
	(ii) Total number of round trips per month = 100.		
	(iii) Charges per round trip = ₹ 441.		
9.11	(i) Distance covered per annum = 36,000 kms.		
	(ii) Passenger-km = 14,40,000.		
	(iii) Total cost = ₹ 7,77,600.		
	(iv) Charges per km from each passenger = 72 paise.		
9.12	(i) Total annual cost : ₹ 24,01,744.		
	(ii) Total kms travelled by three trucks in one year : 1,34,784		
	(iii) Total ton-km : 5,25,312		
	(iv) Cost per km run : ₹ 17.8192		
	(v) Cost per ton-km : ₹ 4.572		
	(vi) Freight per ton-km : ₹ 5.08		
9.13	Total cost per month = ₹ 59,400.		
	Operating cost of half-fare students ₹ 396.		
	Operating cost of full-fare students ₹ 792.		
9.14	Total Passenger-Km = 15,00,000.		
	Total cost = ₹ 13,50,000.		
	Fare to be charged per passenger-km = ₹ 1.20.		
9.15	Total cost = ₹ 25,80,000.		
	Passenger-km = 1,15,20,000.		
	Fare to be charged per passenger-km = ₹ 0.405.		

Process Costing

Meaning of Process Costing

Process Costing is a type of costing procedure which is used for calculating cost of the product in continuous or mass production industries (e.g., food processing, cement, sugar or potato chips).

In process costing, costs are accumulated according to processes or departments. It is done *period by period* and not batch by batch or per job basis. Cost of each unit is calculated at the end of the *period* (commonly one month or after one week as the case may be). Cost per unit (average) is obtained by dividing the total cost applicable to a production department during a particular period by the total number of units produced during that period.

If the product is processed in more than one process, the output of the first process is transferred to the second process. The *output* of the first process becomes the *input* of the second process. The output of second process is transferred to third process and so on. The output of the last process is transferred to *Finished Stock Account*.

The Chartered Institute of Management Accounts (CIMA) defines process costing as “*The costing method applicable where goods and services result from a sequence of continuous or repetitive operations or processes. Costs are averaged over the units produced during the period.*”

Illustrating Process Costing

An example of a manufacturing process of rice is given in Fig. 10.1 (below) :

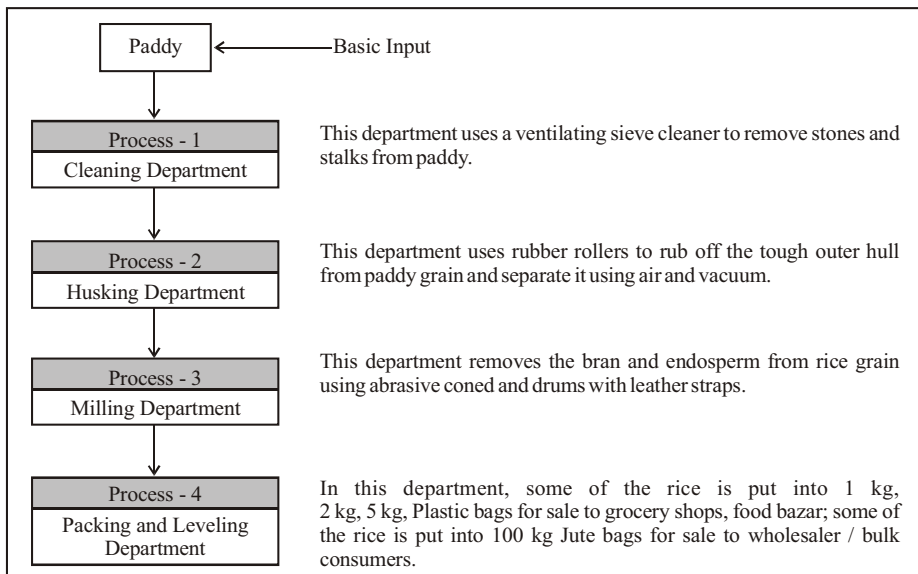


Fig. 10.1

10.2 Process Costing

Features of Process Costing

1. In process costing, costs are accumulated **period by period** and not batch by batch or per job basis.
2. The manufacturing cost (both direct or indirect) are accumulated in each process / department.
3. Process costing is used in repetitive production environment (e.g., tins of paints, shampoos).
4. At the end of a costing period (generally a month) a document known as the **Production report** is prepared for each process, showing the number of units produced during that period.
5. In process costing, the manufacturing cost of one product cannot be identified individually. However, the average cost of one product is calculated as follows :

$$\text{Cost per Unit} = \frac{\text{Cost of Production for the period}}{\text{Number of Equivalent Units Produced during the period}}$$

6. If there is **normal loss**, the loss is borne by the good units completed, thus **increasing the average cost per unit**.
7. If there is **abnormal loss** (actual loss is more than the normal loss), the abnormal loss is valued just like a 'good' unit and debited to the "**Abnormal Loss Account**".
8. The output of one process becomes the input to the next process until the finished product is made in the final process. The output from the **final process** is transferred to the **Finished Stock Account**.
9. If the product is processed in more than one process or department, cost of one process is transferred to the next process. Total cost per unit is computed after the final process.
10. Product and processes are completely standardised (it means same quantity and quality of materials are used and all products are processed in the similar manner).
11. The factory is divided into departments / processes. Each department / process performs specific job regularly.

Some Industries where Process Costing is Used

Process costing is most commonly used in industries that produce essentially **homogeneous products on a continuous basis**. Name of some industries are given below:

1. Cement	5. Paper Manufacturing
2. Chemical	6. Bricks Manufacturing
3. Sugar	7. Oil Refinery
4. Iron and Steel	8. Food Processing

In addition to the above, process costing is often employed in companies that use a form of process costing in their assembly operations. Examples are: Tata Motors (cars and trucks), Sony (T.V. and Video monitors) Compaq (personal computers), Nokia (mobile phones), etc.

Process Costing Vs. Job Costing

There are many similarities between the job costing system and process costing system. But at the same time these two most commonly used costing methods have some differences.

Similarities Between Process Costing and Job Costing

1. The main aim of both the systems are to assign material, labour and overhead cost to products and to provide a mechanism for **computing cost per unit and control of cost**.
2. Both systems maintain and use same basic accounts such as, raw materials control account, wages control account, production overhead account and finished stock account.
3. In both the systems, flow of cost is **basically the same**

Raw materials → Work-in-progress → finished goods

Illustrating Process Costing

An example of manufacturing process of cement is given in Fig. 10.2 (below) :

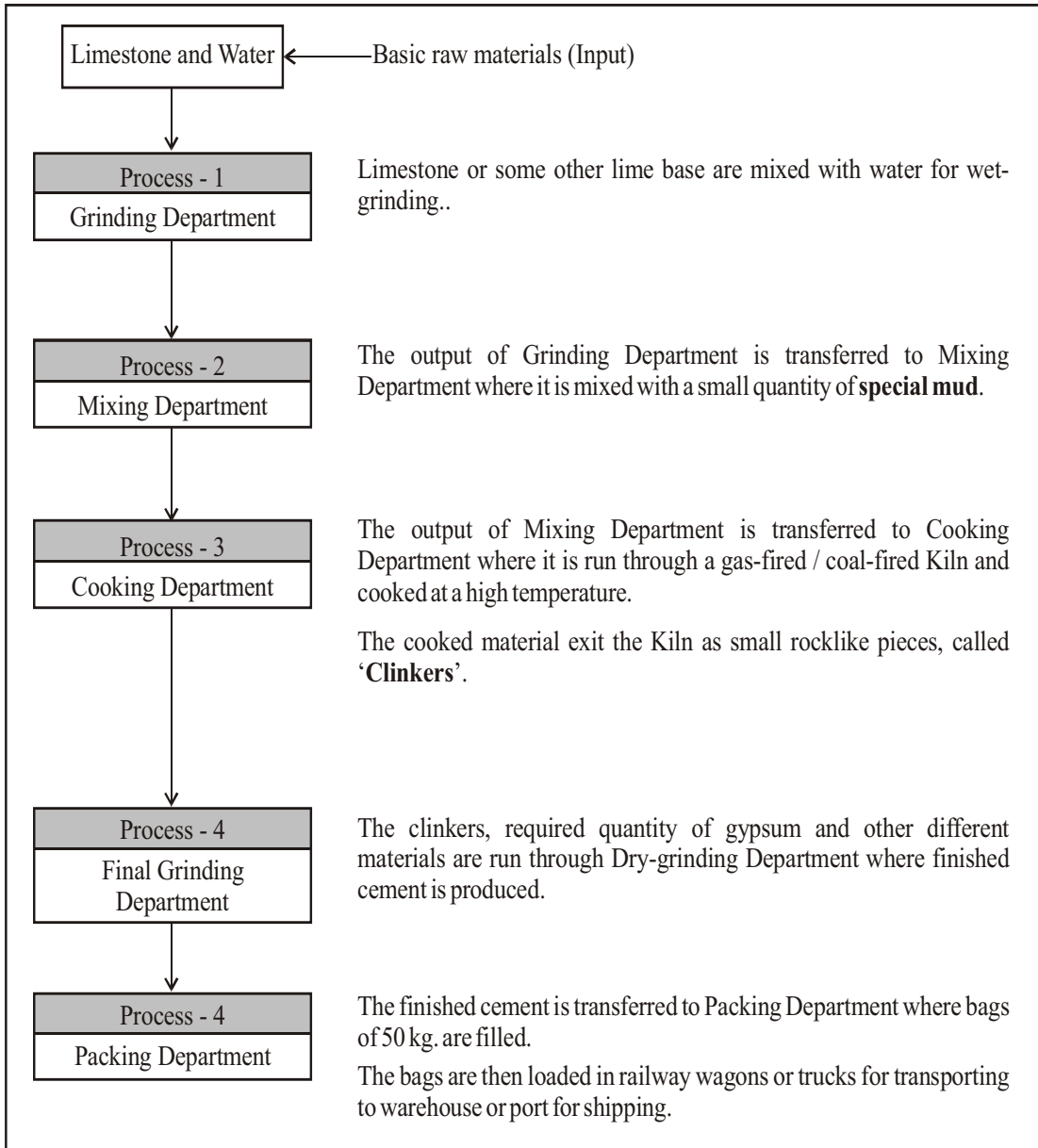


Fig. 10.2

10.4 Process Costing

Differences between Process Costing and Job Costing

	Process Costing		Job Costing
1.	Products are produced continuously for <i>stock</i> , e.g., <i>oil refinery</i> .	1.	Products are produced as per <i>customer's requirement specification</i> .
2.	All products are essentially <i>homogeneous</i> in nature.	2.	Each job / product is <i>different</i> from another.
3.	Costs are accumulated by process / department for the <i>cost period</i> .	3.	Costs are accumulated by <i>individual job</i> .
4.	Costs are calculated for <i>each process</i> and it <i>average cost per unit</i> is calculated at the final process.	4.	Costs are computed when job is <i>finished</i> . is transferred to next process. Ultimately
5.	The <i>process production report</i> is the main document.	5.	The <i>job cost sheet</i> is the main document for the accumulation of different costs for a job.
6.	Average cost per unit is computed by department / process on the <i>Department / Process Report</i> .	6.	Cost is computed for each job separately on the <i>Job Cost Sheet</i> .
7.	Process and products are <i>standardised</i> .	7.	Job / products are <i>not standardised</i>

Advantages of Process Costing

Main advantages of the process costing are as follows:

1. Process costing allows accountants to determine unit cost needed for valuing inventory and cost of goods sold.
2. The process costing is suitable for those industries where it is not possible to identify separate units of production or jobs, usually because of the continuous nature of the production processes involved.
3. Cost of each process is computed at the end of the costing period (usually at the end of each month) which helps to control cost – *process-wise* and *period-wise*.
4. Computation of average cost per unit is easier because the process and products are standardized.
5. Less clerical job and expenses are involved than that in job order costing.
6. The cost of operating this system is much less than that required in job order costing system. It is more economical to classify and summarise cost by processes than for each job.

Limitations of Process Costing

1. Costs are reported on historical basis. The management cannot exercise control in time.
2. Computation of average cost per unit is not always accurate because the units are not fully homogeneous. *For example*, computation of cost of casting in a foundry on a weight basis may not be correct because the weight factor may not reflect the complexity of making different castings.
3. Where different products are manufactured from the same facility, the computation of average cost is made more inaccurate.
4. Inaccuracies in unit cost may lead to improper inventory valuation and profit calculation.
5. The inefficiencies of one process is automatically transferred to the next process when sequential processing is done to manufacture a product.

Methods of Processing

There are *three* major processing methods:

- (i) Sequential processing;
- (ii) Parallel processing; and
- (iii) Selective processing.

Sequential Processing

In sequential processing system, products flow in sequence from one processing department to another processing department. The costs are transferred from one process account to another as the product is transferred. An example of *sequential processing* is provided below. Following is a hypothetical potato chips manufacturing company.

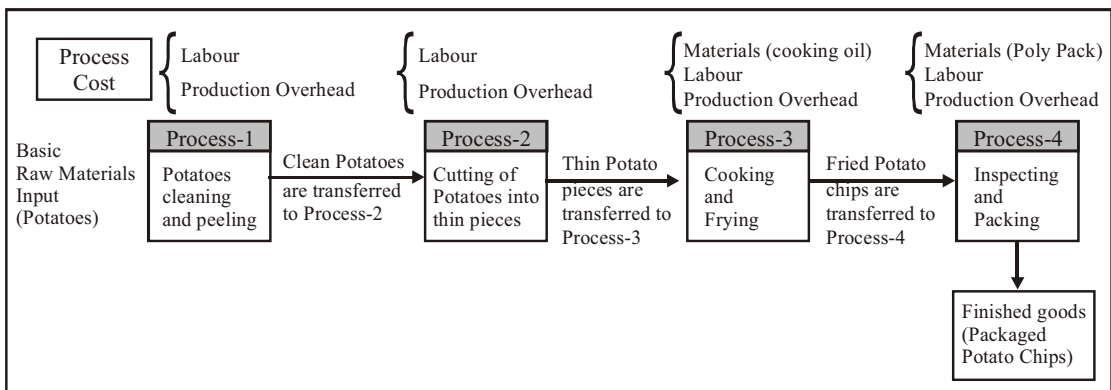


Fig. 10.3

Parallel Processing

In parallel processing system, after a certain point, two or more products go through two or more separate sets of processes simultaneously. Let us take the example of Reliance Industries Ltd. In their petroleum refining operations, crude oil is processed initially in one processing department and then the refined output is further processed by different processes simultaneously to get different end products. An example of *parallel processing* is provided below. Following is a hypothetical cold drink manufacturing company.

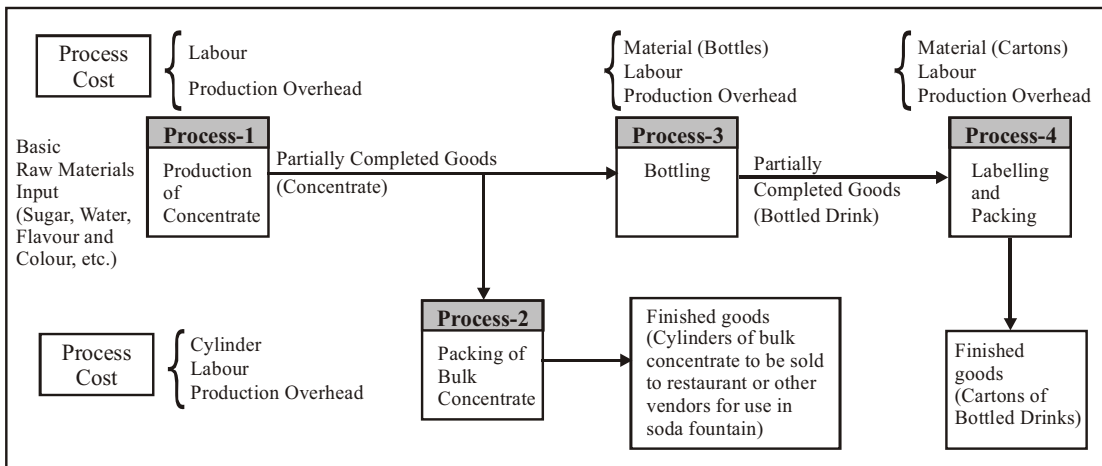


Fig. 10.4

10.6 Process Costing

Selective Processing

In selective processing system, products go through some but not each processing departments. According to the requirement, some portion of the output is processed further.

For example, in a Chicken processing plant, all products start at the cutting process. Some of the dressed chickens are directly transferred to packaging department and then to finished goods department.

Some part of the dressed chickens are transferred to the grinding department and then to the packaging department and finally to the finished goods department.

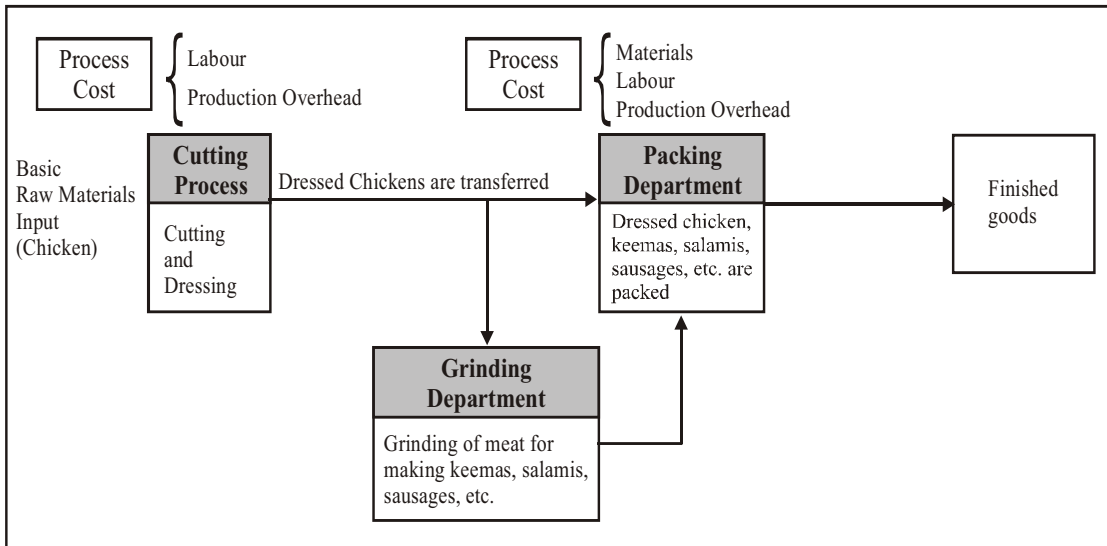


Fig. 10.5

Process Cost Accounting Procedures

Cost accumulation in process costing system is easier than in a job costing system. In process costing system, separate Process Accounts are maintained for each process. Direct materials cost, Direct labour cost and Production overheads are debited to the respective process account. The completed units of the first process is transferred to the second process where it undergoes further processing. The output of the second process is transferred to the third process and the output of the last process is transferred to the **Finished Stock Account**.

In process costing, as production moves from process to process, cost of that particular process is also transferred with it.

It should be noted that materials, labour and overhead costs can be added in any process – not just in the first process.

Cost of the second process consists of cost of partially finished goods transferred from the first process *plus* materials, labour and overhead costs incurred in the second process itself. Cost becomes **cumulative** as production proceeds and the costs accumulated plus the final process's cost determines the total cost. Cost accumulation in Process Costing System is shown below. Let us call the three processes as Process - 1, Process - 2 and Process - 3 respectively.

Dr. Process - 1 Account		Cr.	
Particulars	₹	Particulars	₹
To Direct Materials	1,00,000	By Process - 2 A/c	2,00,000
To Direct Labour	80,000	(Transferred to Process - 2)	
To Production Overhead	20,000		
	2,00,000		2,00,000

Dr. Process - 2 Account		Cr.	
Particulars	₹	Particulars	₹
To Process - 1 A/c	2,00,000	By Process - 3 A/c	3,00,000
(Transferred from Process - 1)		(Transferred to Process - 3)	
To Direct Materials	50,000		
To Direct Labour	30,000		
To Production Overhead	20,000		
	3,00,000		3,00,000

Dr. Process - 3 Account		Cr.	
Particulars	₹	Particulars	₹
To Process - 2 A/c	3,00,000	By Finished Stock A/c	4,00,000
(Transferred from Process - 2)			
To Direct Materials	20,000		
To Direct Labour	50,000		
To Production Overhead	30,000		
	4,00,000		4,00,000

Dr. Finished Stock Account		Cr.	
Particulars	₹	Particulars	₹
To Process - 3 A/c	4,00,000		
(Transferred from Process - 3)			

Elements of Cost

Materials

Accounting for materials under Process Costing System is similar to other costing systems. If the number of materials used in the processes is very large, a store ledger can be maintained. Materials are issued to processes on the basis of *stores requisitions* and *bills of materials*.

In many cases, all materials required for production are issued to the *first* process, where, after processing partially completed units are transferred to the *next* process, and so on. In the subsequent processes, some work is done on the materials.

In some cases *materials are added in the subsequent processes also*. Wherever the material is used, the stores requisitions must indicate the process number so that it can be easily accounted for. In some process industries, such as cement, flour mills, etc., consumption report is used in place of stores requisitions. In these industries, flow of materials into the process is uniform and continuous. *For example*, flow of clinkers into the clinker-grinding process is uniform and continuous as it is fed by conveyor belt.

Labour

In many industries like cement, chemical and iron and steel, the cost of direct labour is a very small part of the total cost of production. In these industries majority of work is done with the help of automatic machines and the direct labour element is less influential.

10.8 Process Costing

As the employees are engaged continuously on one process, the collection and allocation of labour cost is easier in process costing system. Generally, labour cost is analysed process-wise and charged to different processes. However, if employees are working in more than one process, it will be necessary to record time spent in each process and respective processes are charged accordingly.

In process costing system, ***no distinction is made between direct and indirect labour***, since both types may be charged to the same process account.

Direct Expenses

Expenses which are incurred specifically for a particular process are directly charged to that process. ***For example***, royalty payable for adopting a particular technology will be charged to the process concerned.

Production Overhead

Production overhead incurred in a process costing system is preferably accumulated in production overhead (factory overhead) subsidiary ledger for production and service department. Actual overhead is debited to each process.

In many cases predetermined rate of production overhead is used for charging overhead to different processes. This method is suitable if:

- (i) Production is not stable; and
- (ii) Fixed Production Overhead is significant.

Journal Entries

(i) *For issue / consumption of materials*

Process - 1 Account	Dr.
To Direct Materials Account	

(ii) *For labour cost paid*

Process - 1 Account	Dr.
To Direct Labour Account	

(iii) *For direct expenses paid*

Process - 1 Account	Dr.
To Direct Expenses Account	

(iv) *For production overhead charged*

Process - 1 Account	Dr.
To Production Overhead Account	

(v) *For transfer of partially finished goods from Process - 1 Account to Process - 2 Account*

Process - 2 Account	Dr.
To Process - 1 Account	

Steps for Dealing with Process Costing When All Output is Fully Complete

Step 1 : Draw up process accounts and other accounts in 'T' form as follows:

Dr.				Process Account				Cr.			
Particulars		Qty	Rate	₹	Particulars		Qty	Rate	₹		

Students should note that Process Account is nothing more than a Ledger Account with some additional columns on both the debit and credit sides showing 'Quantity' and 'Rate'.

Step 2: Calculate losses and output

Example:

- (i) Input 10,000 units
- (ii) Normal loss @ 10%
- (iii) Actual output 8,900 units.

(i) Calculate normal loss

$$\begin{aligned}\text{Normal Loss} &= \text{Input} \times \% \text{ of normal Loss} \\ &= 10,000 \text{ units} \times 10\% = \mathbf{1,000 \text{ units}}\end{aligned}$$

(ii) Calculate expected output

$$\begin{aligned}\text{Expected output} &= \text{Input} - \text{Normal Loss} \\ &= 10,000 \text{ units} - 1,000 \text{ units} = \mathbf{9,000 \text{ units}}\end{aligned}$$

(iii) Calculate abnormal loss / gain (if any)

Abnormal loss occurs when the expected output is more than the actual output and abnormal gain occurs when the expected output is less than the actual output.

In this example, expected output is more than actual output. So there is an abnormal loss of 9,000 units – 8,900 units = **100 units**.

Step 3 : Calculate cost per unit of output and losses

$$\text{Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input} - \text{Normal Loss)}}$$

$$\text{Cost of Abnormal Loss} = \text{Abnormal Loss (in units)} \times \text{cost per unit}$$

Step 4:

Debit Process Account with the cost of input, additional, materials, labour cost and production overhead.

Credit Process Account with the proceeds of normal loss sale (if any)

Credit Process Account with the value of output transferred to next process.

Step 5: Complete Accounts

- (i) Complete the Process Account
- (ii) Write up other accounts as per requirement.

Step 2 and 3 should be shown in the Working Notes.

Illustration 1

Manufacturing of product 'Fanta' requires three distinct processes. On completion the product is passed from Process - 3 to finished stock. During the month of December 2017, the following information was obtained:

Elements of Costs	Total ₹	Process		
		I ₹	II ₹	III ₹
Direct material	26,000	15,000	11,000	-
Direct labour	26,500	12,500	6,000	8,000
Direct expenses	8,000	3,000	-	5,000
Production overhead	79,500	-	-	-

10.10 Process Costing

Production overhead is absorbed by processes at a percentage of direct wages. Production during the period was 1,000 kg. There was no stock of raw materials or work-in-progress at the beginning or at the end of the month. There is no process loss also.

Show the Process Accounts and Finished Stock Account.

[C.U.B.Com. (Hons.) - Adapted]

Solution

Dr. Process I Account				Cr.			
Particulars	Qty (Kg)	Rate Per Kg	Amount ₹	Particulars	Qty (Kg)	Rate Per Kg	Amount ₹
To Direct Materials (Note 2)	1,000	15	15,000	By Process II A/c	1,000	68	68,000
To Direct Labour	—		12,500				
To Direct Expenses	—		3,000				
To Production Overhead (Note 1)	—		37,500				
	1,000		68,000		1,000		68,000

Dr. Process II Account				Cr.			
Particulars	Qty (Kg)	Rate Per Kg	Amount ₹	Particulars	Qty (Kg)	Rate Per Kg	Amount ₹
To Process I A/c	1,000	68	68,000	By Process III A/c	1,000	103	1,03,000
To Direct Material	—		11,000				
To Direct Labour	—		6,000				
To Production Overhead (Note 1)	—		18,000				
	1,000		1,03,000		1,000		1,03,000

Dr. Process III Account				Cr.			
Particulars	Qty (Kg)	Rate Per Kg	Amount ₹	Particulars	Qty (Kg)	Rate Per Kg	Amount ₹
To Process II A/c	1,000	103	1,03,000	By Finished Stock A/c	1,000	140	1,40,000
To Direct Labour	—		8,000				
To Direct Expenses	—		5,000				
To Production Overhead (Note 1)	—		24,000				
	1,000		1,40,000		1,000		1,40,000

Dr. Finished Stock Account — Product “Fanta”				Cr.			
Particulars	Qty (Kg)	Rate Per Kg	Amount ₹	Particulars	Qty (Kg)	Rate Per Kg	Amount ₹
To Process III A/c	1,000	140	1,40,000	By Balance c/d	1,000	140	1,40,000

Working Notes:

(1) Production overhead is absorbed as a percentage of Direct Wages.

$$\text{Production Overhead Absorption Rate} = \frac{\text{Production Overhead}}{\text{Direct Wages}} \times 100$$

$$= \frac{79,500}{26,500} \times 100 = 300\%$$

Production overhead to be charged:

Process - I : ₹ 12,500 × 300/100	₹ 37,500
Process - II : ₹ 6,000 × 300/100	₹ 18,000
Process - III : ₹ 8,000 × 300/100	₹ 24,000
	<u>₹ 79,500</u>

(2) There is no process loss, so output will be input, i.e., 1,000 kg

Classifying Losses in Process

At the time of processing **input** in a process, there may be some losses. These losses may be due to problems in operating environment, defective raw materials, wrong workmanship, problem with the machinery, evaporation, shrinkage and spoilage.

Example: A tea manufacturing company (like Tata Tea Ltd.) may have to tightly control the temperature and humidity in the processing area. In spite of all the control mechanisms, humidity or temperature occasionally varies by a small margin. As a result, some of the output of a process may be lost and cannot be used in the next process or cannot be sold as quality product.

When there are losses, there are three possibilities:

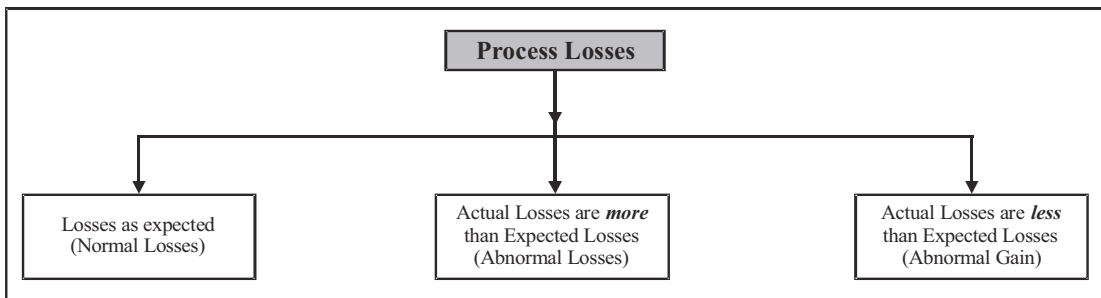


Fig. 10.6

Normal Loss

In many cases, some quantity of material is lost due to the manufacturing process and this loss of material is known as spoiled units, evaporation or shrinkage. If it is a common occurrence, inherent in the manufacturing process, then the loss occurred is called **Normal Loss**. Normal losses cannot be eliminated or reduced, even under efficient operating conditions. It can be worked out in advance. Generally, it is calculated on the basis of past experience or some empirical formula. Normal losses are expressed as a percentage of input to each process. It may also be referred in terms of output or of throughput (opening work-in-progress *plus* materials introduced *minus* closing work-in-progress).

Normal loss can be classified further into (i) Wastage; and (ii) Scrap. Generally, wastage cannot fetch any revenue but scrap can be sold for some consideration. However, accounting treatment is same for wastage and scrap.

Abnormal Loss

In a manufacturing process, there might be some losses that are resulting from **non-recurring** and **unusual** events. **For example**, wrong mixing of ingredients may lead to loss which is unusual. These losses are controllable and are not inherent to the manufacturing process. These losses are called **Abnormal Losses**. An abnormal loss occurs when the actual loss is **more** than the expected loss. In other words, abnormal loss is the difference **between the actual loss and the expected loss**. It is important to identify this category of loss, so that management is aware of the extent to which the actual losses are deviating from what was expected.

Abnormal Gain

In some exceptional cases, the actual process loss may be less than normal or expected process loss and this gain is called **Abnormal Gain**. Like abnormal losses, abnormal gains should be reported separately so that management is aware of the gains.

10.12 Process Costing

Example:

From the following information *calculate*:

(i) Normal loss in units; (ii) Abnormal loss in units; and (iii) Abnormal gains in units.

Input 2000 units and normal loss is 10% of input.

When actual output is (a) 1700 units; and (b) 1900 units.

Answer:

(a) **When actual output is 1,700 units**

(i) Normal loss = 10% of 2,000 units = 200 units

(ii) Abnormal loss = Expected output – Actual output

(A) **Expected output:**

Input	2,000	
Less: Normal Loss	<u>200</u>	1,800 units

(B) Actual Output		<u>1,700</u> units

Abnormal Loss (A – B)		<u>100</u> units

(b) **When actual output is 1,900 units**

(i) Normal Loss = 10% of 2,000 units = 200 units

(ii) Abnormal Gains = Actual Output – Expected Output

(A) Expected Output (2,000 – 200)		1,800 units

(B) Actual Output		<u>1,900</u> units

Abnormal Gains (B – A)		<u>100</u> units

Accounting for Normal Loss and Abnormal Loss

Normal and abnormal losses are treated differently.

Cost for units lost through normal loss is absorbed by the remaining "*good*" units produced during the period. The burden of normal loss is to be borne by the "*good*" units.

Cost related to **abnormal loss** is removed from the appropriate process account and charged to Costing Profit and Loss Account so that the completed units do not absorb the cost of lost units.

It should be noted that occasionally normal losses may incur a cost (rather than having a scrap value). This cost is charged to the process account as normal cost of the process.

Illustration 2

A product passes through Process 1 and Process 2.

	₹
1. Materials issued to Process 1 (5,000 units)	40,000
2. Labour cost	30,000
3. Manufacturing overheads	27,000
4. Normal Loss 3% of input (Scrap value — Nil)	
5. Actual output — 4,350 units.	

You are required to prepare Process 1 Account.

[C.U.B.Com. (Hons.) — Adapted]

Solution

Dr.				Cr.			
Process 1 Account							
Particulars	Qty (Unit)	Rate Per Unit	Amount (₹)	Particulars	Qty (Unit)	Rate Per Unit	Amount (₹)
To Materials	5,000	8	40,000	By Normal Loss (Note 1)	150	—	—
To Labour	—		30,000	By Abnormal Loss (Note 2)	500	20	10,000
To Manufacturing Overhead	—		27,000	By Process 2 A/c (Transferred to next process)	4,350	20	87,000
	<u>5,000</u>		<u>97,000</u>		<u>5,000</u>		<u>97,000</u>

Working Notes:

(1) Normal Loss = 3% of 5,000 units = 150 units.

(2) **Abnormal Loss:**

(A)	Expected Output		
	Input	5,000 units	
	Less: Normal Loss	<u>150 units</u>	4,850 units
(B)	Actual Output		<u>4,350 units</u>
	Abnormal Loss (A – B)		<u>500 units</u>

(3) Cost per Unit = $\frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$

$$= \frac{97,000 - 0}{5,000 - 150} = \frac{97,000}{4,850} = ₹ 20$$

(4) Cost of Abnormal Loss = 500 × ₹ 20 = ₹ 10,000.

The entire ₹ 10,000 will be debited to **Costing Profit and Loss Account**.

Illustration 3

From the following information, prepare :

- (i) Process K Account; and
- (ii) Abnormal Loss Account.
- (a) 1,000 tonnes @ ₹ 125 per tonne were initially introduced into the process.
- (b) Other expenses incurred in the process :
 - (i) Wages ₹ 28,000
 - (ii) Factory Overhead ₹ 8,000.
- (c) Normal Wastage : 5% of the total weight of materials initially introduced.
- (d) Normal scrap : 10% of the total weight of materials initially introduced.
- (e) Scrap realisation : ₹ 80 per tonne.
- (f) Actual output : 830 tonnes transferred to Process L.

[D.U.B.Com. (Hons.) — Adapted]

Solution

Dr.				Process K Account				Cr.			
Particulars	Qty (Tonne)	Rate Per Tonne	Amount (₹)	Particulars	Qty (Tonne)	Rate Per Tonne	Amount (₹)	Particulars	Qty (Tonne)	Rate Per Tonne	Amount (₹)
To Materials	1,000	125	1,25,000	By Normal Loss :							
To Labour	–		28,000	Wastage (5% of 1,000)	50						
To Factory Overhead	–		8,000	Scrap (10% of 1,000)	100	80	8,000				
				By Abnormal Loss A/c	20	180	3,600				
				By Process L A/c	830	180	1,49,400				
				(Transferred to next process)							
	1,000		1,61,000		1,000		1,61,000				

Dr.				Abnormal Loss Account				Cr.			
Particulars	Qty (Tonne)	Rate Per Tonne	Amount (₹)	Particulars	Qty (Tonne)	Rate Per Tonne	Amount (₹)	Particulars	Qty (Tonne)	Rate Per Tonne	Amount (₹)
To Process K A/c	20	180	3,600	By Bank A/c (Sale of scrap)	20	80	1,600				
				By Costing Profit and Loss A/c			2,000				
	20	180	3,600		20	80	3,600				

10.14 Process Costing

Working Notes:

- (1) **Normal Loss** Tonne
- | | | |
|---------------------|------------|--|
| Wastage 5% of 1,000 | 50 | |
| Scrap 10% of 1,000 | <u>100</u> | |
| | <u>150</u> | |
- (2) **Abnormal Loss:**
- | | | | |
|------------------------------|------------------|------------------|--|
| (A) Expected Output | | | |
| Input | 1,000 Tonne | | |
| Less: Normal Loss | <u>150 Tonne</u> | 850 Tonne | |
| (B) Actual Output | | <u>830 Tonne</u> | |
| Abnormal Loss (A – B) | | <u>20 Tonne</u> | |
- (3) **Cost per Tonne** =
$$\frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$
- $$= \frac{1,61,000 - 8,000}{850} = ₹ 180$$

- (4) **Cost of Abnormal Loss** = $20 \times ₹ 180 = ₹ 3,600$.

Illustration 4

From the following information relating to Process - 1, prepare: (i) Process - 1 Account; and (ii) Abnormal Loss Account.

- Units introduced 2000 units @ ₹ 20 per unit.
- Labour cost ₹ 10,800.
- Production overhead ₹ 14,000.
- Normal loss 10% of input. No scrap value.
- Units produced 1,700 units.

Solution

Dr. Process 1 Account				Cr.			
Particulars	Qty (Unit)	Rate Per Unit	Amount (₹)	Particulars	Qty (Unit)	Rate Per Unit	Amount (₹)
To Materials	2,000	20	40,000	By Normal Loss (Note 1)	200	—	—
To Labour	—	—	10,800	By Abnormal Loss (Note 4)	100	36	3,600
To Production Overhead	—	—	14,000	By Process 2 A/c (Transferred to next process)	1,700	36	61,200
	<u>2,000</u>		<u>64,800</u>		<u>2,000</u>		<u>64,800</u>

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Unit)	Rate Per Unit	Amount ₹	Particulars	Qty (Unit)	Rate Per Unit	Amount ₹
To Process 1 A/c (Note 4)	100	36	3,600	By Costing Profit and Loss A/c	100	36	3,600

Working Notes:

- (1) **Normal Loss** = 10% of 2,000 units = 200 units.
- (2) **Abnormal Loss:**
- | | | | |
|------------------------------|------------------|--------------------|--|
| (A) Expected Output | | | |
| Input | 2000 units | | |
| Less: Normal Loss | <u>200 units</u> | 1,800 units | |
| (B) Actual Output | | <u>1,700 units</u> | |
| Abnormal Loss (A – B) | | <u>100 units</u> | |

$$(3) \text{ Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{64,800 - 0}{2,000 - 200} = \frac{64,800}{1,800} = ₹ 36$$

$$(4) \text{ Cost of Abnormal Loss} = 100 \times ₹ 36 = ₹ 3,600.$$

Accounting for Increase in Units

In many industries (e.g., paint manufacturing) the addition of materials in latter processes and the further processing of the product result in an increase in the physical quantity of the product. *For example*, suppose that a paint manufacturer combined a number of basic ingredients in first manufacturing process and transferred 10,000 litres of the paint mixture to second process during the current month.

In the second process, spirit and certain inert ingredients were added to the paint concentrate, increasing the total mixtures to 20,000 litres. As a result, the output of second process would be double the input to the process. These 20,000 litres will be transferred to the packaging department for canning, labeling and packaging. In this situation, total cost of the process is spread among the larger number of units to produce a *lower average unit cost*.

Here, it should be noted that the Process Account will be prepared in the usual manner.

Accounting for the Sale of Scrap (Normal / Abnormal)

Units lost at the time of processing sometimes can be sold as scrap. Sale proceeds of *normal loss* is credited to the *Concerned Process Account*. Thus, the total cost of that process is reduced by the amount realized from sale of scrap.

Sale proceeds of *abnormal loss*, however, is credited to the *Abnormal Loss Account*. The balance of the Abnormal Loss Account is transferred to *Costing Profit and Loss Account*.

Accounting for Waste

Waste comprises discarded substances of nil value — for example, depletion due to evaporation. Waste is credited to the Process Account with the *units of normal loss* for the purpose of balancing physical inputs with physical outputs. Nothing is placed in the amount column. As there is no monetary value attaching to the waste, there is no need for the corresponding debit entry.

Illustration 5

In the process Q, 300 units of a product were transferred from Process P at a cost of ₹ 5,644. The additional expenses incurred for the process Q were ₹ 760 and overhead was charged @ 10% of expenses incurred. 20% of the input are normally lost and sold at ₹ 8 per unit. 220 units were produced in the Process Q.

Prepare : (i) Process Q Account; and (ii) Abnormal Loss Account.

[C.U.B.Com. (Hons.) — Adapted]

Solution

Dr.				Cr.			
Process Q Account							
Particulars	Qty (Unit)	Rate Per Unit	Amount (₹)	Particulars	Qty (Unit)	Rate Per Unit	Amount (₹)
To Process P A/c (Transferred)	300	18.81	5,644	By Normal Loss	60	8	480
To Expenses	—		760	By Abnormal Loss	20	25	500
To Overhead (10% of ₹ 760)	—		76	By Finished Stock A/c	220	25	5,500
	300		6,480		300		6,480

10.16 Process Costing

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Unit)	Rate Per Unit	Amount ₹	Particulars	Qty (Unit)	Rate Per Unit	Amount ₹
To Process Q A/c (Note 4)	20	25	500	By Bank A/c (Sold)	20	8	160
				By Costing Profit and Loss A/c			340
	20		500		20		500

Working Notes:

(1) **Normal Loss** = 20% of 300 = 60 units.

(2) **Abnormal Loss:**

(A) Expected Output

Input

300 units

Less: Normal Loss

60 units

240 units

(B) Actual Output

220 units

Abnormal Loss (A – B)

20 units

(3) Cost per Unit = $\frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$

$$= \frac{6,480 - 480}{240} = ₹ 25$$

(4) **Cost of Abnormal Loss** = 20 × ₹ 25 = ₹ 500.

Illustration 6

A product is produced through two distinct processes : Process - I and Process - II. On completion it is transferred to finished stock. From the following particulars during the month of December 2010, prepare Process Accounts, Finished Stock Account and Abnormal Loss Account.

	Process - I	Process - II
Units introduced	10,000	9,000
Transfer to next process / finished stock	9,000	8,250
Normal loss (on inputs)	10%	5%
Realisable value of normal loss (per unit)	₹ 2	₹ 4
Costs incurred:	₹	₹
Direct Materials	40,000	—
Direct Labour	20,000	20,000
Direct Expenses	12,000	8,600
Production Overhead (100% of direct labour)		

Assume that there was no opening or closing stock of raw materials and work-in-progress and scrap were sold for cash.

[C.U.B.Com.(Hons.) - Adapted]

Solution

Dr. Process I Account				Cr.			
Particulars	Qty (Units)	Rate Per Unit	Amount ₹	Particulars	Qty (Units)	Rate Per Unit	Amount ₹
To Direct Materials	10,000	4	40,000	By Normal Loss A/c (Note 1)	1,000	2	2,000
To Direct Labour	—		20,000	By Process II A/c (Note 1)	9,000	10	90,000
To Direct Expenses	—		12,000	(Transferred to next process)			
To Production Overhead (100% of Direct Labour)	—		20,000				
	10,000		92,000		10,000		92,000

Dr. Process II Account				Cr.			
Particulars	Qty (Units)	Rate Per Unit	Amount ₹	Particulars	Qty (Units)	Rate Per Unit	Amount ₹
To Process I A/c	9,000	10	90,000	By Normal Loss A/c (Note 2)	450	4	1,800
To Direct Labour	–		20,000	By Abnormal Loss A/c (Note 2)	300	16	4,800
To Direct Expenses	–		8,600	By Finished Stock A/c	8,250	16	1,32,000
To Production Overhead (100% of Direct Labour)	–		20,000				
	9,000		1,38,600		9,000		1,38,600

Dr. Finished Stock Account				Cr.			
Particulars	Qty (Unit)	Rate Per Unit	Amount ₹	Particulars	Qty (Unit)	Rate Per Unit	Amount ₹
To Process II A/c	8,250	16	1,32,000	By Balance c/d	8,250	16	1,32,000

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Unit)	Rate Per Unit	Amount ₹	Particulars	Qty (Unit)	Rate Per Unit	Amount ₹
To Process II A/c	300	16	4,800	By Bank A/c	300	4	1,200
				By Costing Profit and Loss A/c (Note 3)			3,600
	300		4,800		300		4,800

Working Notes:

(1) Process - I

- (a) (i) Normal Loss is 10% of input = 10% of 10,000 units = 1,000 units
Scrap value = 1,000 × ₹ 2 = ₹ **2,000**.
- (ii) Expected Output (10,000 - 1,000) 9,000 units
Actual Output 9,000 units
Abnormal Loss / Gain Nil

$$(b) \text{ Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{92,000 - 2,000}{10,000 - 1,000} = \frac{90,000}{9,000} = ₹ 10.$$

(2) Process - II

- (a) (i) Normal loss is 5% of input = 5% of 9,000 units = 450 units.
Scrap value = 450 units × ₹ 4 = ₹ **1,800**.
- (ii) Expected Output (9,000 - 450) 8,550 units
Actual Output 8,250 units
Abnormal Loss 300 units

$$(b) \text{ Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{1,38,600 - 1,800}{9,000 - 450} = \frac{1,36,800}{8,550} = ₹ 16.$$

- (c) Cost of abnormal loss = 300 × ₹ 16 = ₹ **4,800**.

10.18 Process Costing

It should be noted that abnormal loss is valued just like "good" units.

(3) Net amount of abnormal loss is transferred to Costing Profit and Loss Account. The amount is calculated as follows:

	₹
Cost of abnormal loss (300 × ₹ 16)	4,800
Less: Sale Proceeds of Abnormal Loss (300 × ₹ 4)	<u>1,200</u>
Amount to be Charged to Costing Profit and Loss Account	<u>3,600</u>

Illustration 7

600 kg. of materials was charged to Process A @ ₹ 4 per kg. The direct labour cost accounted for ₹ 200 and other departmental expenses to ₹ 760. The normal loss is 10% of input and the net production was 500 kg transferred to finished stock. Assuming that the process scrap itself is saleable at ₹ 2 per kg. Prepare Process A Account clearly showing the value of normal and abnormal loss. Also prepare Normal Loss Account and Abnormal Loss Account.

[D.U.B.Com. (Hons.) — Adapted]

Solution

Dr. Process A Account				Cr.			
Particulars	Qty (Units)	Rate Per Unit	Amount ₹	Particulars	Qty (Units)	Rate Per Unit	Amount ₹
To Materials	600	4	2,400	By Normal Loss A/c (Note 1)	60	2	120
To Labour	—		200	By Abnormal Loss (Note 2)	40	6	240
To Departmental Expenses	—		760	By Finished Stock A/c	500	6	3,000
	600		3,360		600		3,360
Dr. Normal Loss Account				Cr.			
Particulars	Qty (Unit)	Rate Per Unit	Amount ₹	Particulars	Qty (Unit)	Rate Per Unit	Amount ₹
To Process A A/c	60	2	120	By Cash / Bank A/c	60	2	120
Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Unit)	Rate Per Unit	Amount ₹	Particulars	Qty (Unit)	Rate Per Unit	Amount ₹
To Process A A/c	40	6	240	By Cash / Bank A/c	40	2	80
				By Costing Profit and Loss A/c			160
	40		240		40		240

Working Notes:

(1) Normal Loss = 10% of 600 = 60 kg..

(2) **Abnormal Loss:**

(A) Expected Output

Input

600 kg.

Less: Normal Loss

60 kg.

540 kg.

(B) Actual Output

500 kg.

Abnormal Loss (A – B)

40 kg.

(3) Cost per kg. = $\frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input} - \text{Normal Loss)}}$

$$= \frac{3,360 - 120}{600 - 60} = \frac{3,240}{540} = ₹ 6$$

(4) Cost of Abnormal Loss = 40 × ₹ 25 = ₹ 500.

Abnormal Gain

An abnormal gain occurs when the actual loss is less than the expected, normal loss. In other words, the actual output of goods under production is higher than that would normally be expected in the given level of input.

For example, Input is 10,000 kg and normal loss is 10% of input. Actual output is 9,200 kg.

Calculate abnormal gain (if any).

Calculation of Abnormal Gain

(A)	Actual loss = 10,000 – 9,200	800 kgs
(B)	Normal expected loss = 10% of 10,000	<u>1,000 kgs</u>
	Abnormal Gain (B – A)	<u>200 kgs</u>

OR

(A)	Actual Output	9,200 kg
(B)	Expected Output (Input – Normal Loss)	
	Input	10,000 kg
	Less: Normal Loss	<u>1,000 kg</u>
	Abnormal Gain (A – B)	<u>9,000 kg</u>
		<u>200 kg</u>

Abnormal Gain is valued at **its full process cost**. The respective Process Account is debited and Abnormal Gain Account is credited with the value of abnormal gains.

It should be noted that abnormal gain of 200 kgs was due to lesser normal loss (1,000 - 800 kg). Therefore, at the time of calculating actual abnormal gain, an adjustment entry is to be passed in the following manner:

Abnormal Gain A/c

Dr. [Scrap value of 200 kgs]

To Normal Loss A/c

[Scrap value of 200 kgs]

The above adjustment is required because actual loss is 800 kgs, not 1,000 kgs. The company will not be able to realise the scrap sales value of 200 kgs.

After adjustment, the balance of abnormal gain account will be credited to Profit and Loss Account.

Illustration 8

In a process, 200 units of materials have been introduced at a cost of ₹ 9,600 and other expenditures incurred in the process are: Wages ₹ 3,000 and Overheads ₹ 1,300. Estimated normal loss is 15% and scrap value is ₹ 10 per unit. The actual output is 180 units. All scrap were sold for cash.

Show

- Process Account;
- Abnormal Gain Account; and
- Normal Loss Account.

[C.U. B.Com(Hons.) - Adapted]

Solution

Dr.				Cr.			
Process Account							
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Material	200	48	9,600	By Normal Loss A/c (Note 1)	30	10	300
To Wages	–		3,000	By Finished Stock A/c	180	80	14,400
To Overhead	–		1,300				
To Abnormal Gain A/c (Note 3)	10	80	800				
	210		14,700		210		14,700

10.20 Process Costing

Dr. Normal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A/c	30	10	300	By Bank A/c	20	10	200
				By Abnormal Gain A/c	10	10	100
	30		300		30		300

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss A/c	10	10	100	By Process A/c (Note 3)	10	80	800
To Profit and Loss A/c			700				
	10		800		10		800

Working Notes:

- (1) Normal Loss = 15% of 200 units 30 units
 Actual loss = (200 – 180 units) 20 units
Abnormal Gain 10 units

OR

- Actual Output 180 units
 Expected Output (200 – 30) 170 units
Abnormal Gain 10 units

- (2) Cost per Unit =
$$\frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{13,900 - 300}{200 - 30} = \frac{13,600}{170} = ₹ 80.$$

- (3) Value of abnormal gain = 10 × ₹ 80 = ₹ 800.

Illustration 9

In a factory, a product is produced through two distinct processes: Process - A and Process - B. On completion, the product is transferred to finished stock. During the month of December, 2010, the following information was obtained:

	Process - A	Process - B
Units introduced	2,000	-
Units transferred to next process	1,800	-
Units transferred to finished stock	-	1,750
Value of units introduced (₹)	11,000	-
Materials (₹)	-	1,000
Labour (₹)	7,300	4,500
Overhead (₹)	2,800	2,240

The normal loss in each process is 5% and it was sold at ₹ 2 per unit. There was no stock of raw materials or Work-in-Progress at the beginning or at the end of the month.

Prepare the Process Account, Normal Loss Account, Abnormal Loss Account and Abnormal Gain Account.

[C.U.B.Com.(Hons.) - Adapted]

Solution

Dr. Process A Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Material (Input)	2,000	5.50	11,000	By Normal Loss A/c (Note 1a)	100	2	200
To Labour	–		7,300	By Process B A/c	1,800	11	19,800
To Overhead	–		2,800	By Abnormal Loss A/c (Note 1c)	100	11	1,100
	2,000		21,100		2,000		21,100

Dr. Process B Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	1,800	11	19,800	By Normal Loss A/c (Note 2a)	90	2	180
To Material			1,000	By Finished Stock A/c	1,750	16	28,000
To Labour			4,500				
To Overhead			2,240				
To Abnormal Gain (Note 2c)	40	16	640				
	1,840		28,180		1,840		28,180

Dr. Normal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	100	2	200	By Bank A/c	150	2	300
To Process B A/c	90	2	180	By Abnormal Gain A/c	40	2	80
	190		380		190		380

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	100	11	1,100	By Bank A/c	100	2	200
				By Profit and Loss A/c			900
	100		1,100		100		1,100

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss A/c	40	2	80	By Process - B A/c	40	16	640
To Profit and Loss A/c			560				
	40		640		40		640

Working Notes:

(1) Process - A

- (a) (i) Normal Loss is 5% of input = 5% of 2,000 units = 100 units
 Scrap value = $100 \times ₹ 2 = ₹ 200$.
- (ii) Expected Output (2,000 – 100)
- Actual Output
- Abnormal Loss**

1,900 units
1,800 units
100 units

10.22 Process Costing

$$(b) \text{ Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{21,100 - 200}{2,000 - 100} = \frac{20,900}{1,900} = ₹ 11.$$

$$(c) \text{ Value of abnormal loss} = 100 \times ₹ 11 = ₹ 1,100.$$

(2) Process - B

$$(a) (i) \text{ Normal loss is 5\% of input} = 5\% \text{ of } 1,800 \text{ units} = 90 \text{ units.}$$

$$\text{Scrap value} = 90 \text{ units} \times ₹ 2 = ₹ 180.$$

$$(ii) \text{ Expected Output (1,800 - 90)}$$

1,710 units

$$\text{Actual Output}$$

1,750 units

$$\text{Abnormal Gain}$$

40 units

$$(b) \text{ Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{27,540 - 180}{1,710} = \frac{27,360}{1,710} = ₹ 16.$$

$$(c) \text{ Value of abnormal gain} = 40 \times ₹ 16 = ₹ 640.$$

It should be noted that abnormal gain is valued at the cost per unit of normal output.

Defective Units and Rework Cost

Defective units are those units which are damaged or imperfect (but not spoiled) and cannot be transferred to next process or cannot be sold unless some **additional work** is done. Defective units may be normal defective units or abnormal defective units.

Additional cost incurred for **normal defective** units are simply treated as additional cost of the process and are allocated amongst good units produced during the period.

Additional cost incurred for **abnormal defective** units are debited to **Costing Profit and Loss Account**.

Illustration 10

D Ltd. introduced 5,000 units in a process at a cost of ₹ 10,000. The wages and overheads incurred are ₹ 10,000 and ₹ 8,000 respectively. It is expected that 10% of the input is likely to be defective. Actual output of goods is 4,400 units. The rectification of defective units costs ₹ 4 per unit.

You are required to (i) Show Process Account; and (ii) Calculate the cost per unit and show how will you deal with the cost of rectification of abnormal defective units.

[D.U.B.Com.(Hons.) - 2011]

Solution

In the books of D Ltd.

Dr.

Process Account

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Materials (Input)	5,000	2	10,000	By Abnormal Loss A/c (Note 5) (Excessive defective)	100	6	600
To Wages	—		10,000	By Finished Stock A/c (Note 2)	4,900	6	29,400
To Overheads	—		8,000				
To Expenses for Rectification of Normal Defective Units (Note 1)			2,000				
	5,000		30,000		5,000		30,000

Working Notes :

- (1) Expenses for rectification of normal defective units will be debited to Process Account as factory overhead.

Normal defective = $5,000 \times 10\% = 500$ units.

Expenses for rectification = $500 \times ₹ 4 = ₹ 2,000$.

- (2) Total output = Actual output + Rectified Units = $4,400 + 500 = 4,900$ units

- (3) There is no normal loss. Therefore, the cost per unit will be :

$$\text{Cost Per Unit} = \frac{\text{Process Cost}}{\text{Normal Output}} = \frac{30,000}{5,000} = ₹ 6.$$

- (4) Abnormal Loss = $5,000 - 4,900 = 100$ units.

- (5) Value of abnormal loss = $100 \times ₹ 6 = ₹ 600$.

- (6) Cost of rectification of abnormal defective units will be debited to Costing Profit and Loss Account.

Illustration 11

PCT introduces 1,000 units in a process at a cost of ₹ 10 per unit. Wages and overhead incurred are ₹ 9,000 and ₹ 8,000 respectively. It is expected that 10% of total output is likely to be defective. Actual output of good unit is 850. Cost of rectification of a defective unit is ₹ 5. There is no wastage or scrap of materials.

Required :

Calculate cost per unit if :

- (i) defectives are rectified;
(ii) defectives are not rectified but sold as 'seconds' @ ₹ 9 each.

[D.U.B.Com. (Hons.) — 2008]

Solution

Calculation of Cost Per Unit

Situation	If defectives are rectified (₹)	If defectives are not rectified (₹)
Cost of Materials introduced (1,000 x ₹ 10)	10,000	10,000
Wages	9,000	9,000
Overhead	8,000	8,000
	27,000	27,000
Add: Cost of rectification of normal defective units (100 x ₹ 5)	500	—
Less: Realisable value of normal defective units (100 x ₹ 9)	—	900
(A) Total Cost	27,500	26,100
(B) Number of Units	1,000	900
Cost per Unit (A ÷ B)	₹ 27.50	₹ 29.00

Working Notes :

- (1) Calculation of Abnormal Defective Units :

Expected Output (1,000 – 100) 900 Units

Actual Output (Good) 850 Units

Abnormal Defective 50 Units

Tutorial Notes :

- (1) Cost of rectification of abnormal defectives (50 x ₹ 5) = ₹ 250 will be charged to **Costing Profit and Loss Account**.

- (2) Loss on Sale of abnormal defectives [50 x (29 – 9)] = ₹ 1,000 will be charged to **Costing Profit and Loss Account**.

10.24 Process Costing

Illustration 12

Y Ltd. produces a single product which undergoes two processes. From the following information prepare Process Accounts, Normal Loss Account, Abnormal Loss Account and Abnormal Gain Account.

Process	A	B
Raw materials issued (3,000 units) (₹)	15,000	-
Additional materials (₹)	1,000	780
Direct Wages (₹)	14,000	20,000
Production Overhead (₹)	3,000	7,500
Normal Loss as % of Input	10%	5%
Scrap Value per unit	₹ 2	₹ 5
Output in units	2,800	2,600

[C.U.B.Com.(Hons.) - Adapted]

Solution

In the books of Y Ltd.

Dr.				Cr.			
Process A Account				Process B Account			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Raw Materials (Input)	3,000	5	15,000	By Normal Loss A/c (Note 1a)	300	2	600
To Materials (Additional)	-		1,000	By Process B A/c	2,800	12	33,600
To Direct Wages	-		14,000				
To Production Overhead	-		3,000				
To Abnormal Gain A/c (Note 1c)	100	12	1,200				
	3,100		34,200		3,100		34,200

Dr.				Cr.			
Process B Account				Normal Loss Account			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	2,800	12	33,600	By Normal Loss A/c	140	5	700
To Materials (Additional)	-		780	By Abnormal Loss A/c (Note 2c)	60	23	1,380
To Direct Wages	-		20,000	By Finished Stock A/c	2,600	23	59,800
To Production Overhead	-		7,500				
	2,800		61,880		2,800		61,880

Dr.				Cr.			
Normal Loss Account				Abnormal Gain Account			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	300	2	600	By Abnormal Gain A/c	100	2	200
To Process B A/c	140	5	700	By Bank A/c - Process A	200	2	400
				By Bank A/c - Process B	140	5	700
	440		1,300		440		1,300

Dr.				Cr.			
Abnormal Gain Account				Costing Profit and Loss A/c			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss A/c	100	2	200	By Process A A/c	100	12	1,200
To Costing Profit and Loss A/c	-		1,000				
	100		1,200		100		1,200

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process B A/c	60	23	1,380	By Bank A/c	60	5	300
				By Costing Profit and Loss A/c			1,080
	60		1,380		60		1,380

Working Notes:

(1) Process - A

- (a) (i) Normal Loss is 10% of input = 10% of 3,000 units = 300 units
Scrap value = 300 × ₹ 2 = ₹ 600.
- (ii) Expected Output (3,000 – 300) 2,700 units
Actual Output 2,800 units
Abnormal Gain 100 units

(b) Cost per Unit =
$$\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{33,000 - 600}{3,000 - 300} = \frac{32,400}{2,700} = ₹ 12.$$

(c) Value of abnormal gain = 100 × ₹ 12 = ₹ 1,200.

(2) Process - B

- (a) (i) Normal loss is 5% of input = 5% of 2,800 units = 140 units.
Scrap value = 140 units × ₹ 5 = ₹ 700.
- (ii) Expected Output (2,800 - 140) 2,660 units
Actual Output 2,600 units
Abnormal Loss 60 units

(b) Cost per Unit =
$$\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{61,880 - 700}{2,800 - 140} = \frac{61,180}{2,660} = ₹ 23.$$

(c) Value of abnormal loss = 60 × ₹ 23 = ₹ 1,380.

Illustration 13

The product of Company A passes through two processes A and B and then to Finished Stock Account. In each process, 5% of the total weight is lost and 10% is scrap which realizes from Process A ₹ 80 per tonne and Process B ₹ 200 per tonne respectively.

The following are the figures relating to both the processes:

	Process A	Process B
Material (tonnes)	1,000	70
Cost of material per tonne (₹)	125	200
Wages (₹)	28,000	10,000
Expenses (₹)	8,000	5,250
Output (tonnes)	830	780

Prepare Process Accounts, Abnormal Loss Account and Abnormal Gain Account.

10.26 Process Costing

Solution

Dr. Process A Account				Cr.			
Particulars	Qty (Tonnes)	Rate ₹	Amount ₹	Particulars	Qty (Tonnes)	Rate ₹	Amount ₹
To Materials (Input)	1,000	125	1,25,000	By Normal Wastage A/c (Note 2)	50		
To Wages	–		28,000	By Normal Loss A/c	100	80	8,000
To Expense	–		8,000	By Abnormal Loss A/c (Note 1c)	20	180	3,600
				By Process B A/c (Note 1b)	830	180	1,49,400
	1,000		1,61,000		1,000		1,61,000

Dr. Process B Account				Cr.			
Particulars	Qty (Tonnes)	Rate ₹	Amount ₹	Particulars	Qty (Tonnes)	Rate ₹	Amount ₹
To Process A A/c	830	180	1,49,400	By Normal Wastage A/c (Note 3)	45		
To Materials	70	200	14,000	By Normal Loss A/c	90	200	18,000
To Wages			10,000	By Finished Stock A/c (Note 1d)	780	210	1,63,800
To Expenses			5,250				
To Abnormal Gain A/c	15	210	3,150				
	915		1,81,800		915		1,81,800

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Tonnes)	Rate ₹	Amount ₹	Particulars	Qty (Tonnes)	Rate ₹	Amount ₹
To Process A A/c	20	180	3,600	By Cash / Bank A/c	20	80	1,600
				By Costing P/L A/c			2,000
	20		3,600		20		3,600

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Tonnes)	Rate ₹	Amount ₹	Particulars	Qty (Tonnes)	Rate ₹	Amount ₹
To Normal Loss A/c	15	200	3,000	By Process B A/c	15	210	3,150
To Costing P/L A/c			150				
	15		3,150		15		3,150

Working Notes:

(1) Process - A

- (a) (i) Normal Wastage is 5% of input = 5% of 1,000 units = 50 tonnes
(ii) Normal Loss (scrap) is 10% of input = 10% of 1,000 = 100 tonnes
Scrap value = $100 \times ₹ 80 = ₹ 8,000$.
(iii) Expected Output (1,000 – 50 – 100) 850 tonnes
Actual Output 830 tonnes
Abnormal Loss 20 tonnes

$$(b) \text{ Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{1,61,000 - 8,000}{1,000 - 50 - 100} = \frac{1,53,000}{850} = ₹ 180.$$

$$(c) \text{ Value of abnormal loss} = 20 \times ₹ 180 = ₹ 3,600.$$

Process - B

(a) (i)	Output of Process A transferred	830 tonnes
(ii)	Physical material added	<u>70 tonnes</u>
	Total Input	900 tonnes
(b) (i)	Normal wastage is 5% of input = 5% of 900 = 45 tonnes.	
(ii)	Normal loss (scrap) is 10% of input = 10% of 900 = 90 tonnes.	
	Scrap value = $90 \times ₹ 200 = ₹ 18,000$.	
(c)	Expected Production (900 – 45 – 90)	765 tonnes
	Actual Production	<u>780 tonnes</u>
	Abnormal Gain	<u>15 tonnes</u>

$$(d) \text{ Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input} - \text{Normal Wastage} - \text{Normal Loss)}}$$

$$= \frac{1,78,650 - 18,000}{900 - 45 - 90} = \frac{1,60,650}{765} = ₹ 210.$$

$$(c) \text{ Value of Abnormal Gain} = 15 \times ₹ 210 = ₹ 3,150.$$

(3) Tutorial Note

Wastage comprises discarded substances of nil value. Wastage is credited to the Process Account with the units of normal loss for the purpose of balancing physical *inputs with physical outputs*. Nothing is placed in the amount column.

As there is no monetary value attached to the wastage, a corresponding debit entry will not be required.

Illustration 14

The product of a manufacturing concern passes through two processes — A and B. The normal losses and abnormal losses of defective units having scrap value of ₹ 2 and ₹ 5 per unit in processes A and B respectively. The following information relates to the month ending on 31st March, 2017 :

Particulars	Process - A	Process - B
(i) Raw materials issued @ ₹ 5	3,000 units	—
(ii) Normal loss	10% of input	5% of input
(iii) Output	2,800 units	2,600 units
(iv) Additional components	₹ 1,000	₹ 2,210
(v) Direct Wages	₹ 4,000	₹ 3,000
(vi) Direct Expenses	₹ 10,000	₹ 14,000
(vii) Production overhead (as a percentage of direct wages)	75%	125%

There was no opening or closing work-in-progress but opening and closing stock of finished goods were ₹ 20,000 and ₹ 23,000 respectively.

You are required to prepare :

(1) Process A Account;	(2) Process B Account;
(3) Finished Stock Account;	(4) Normal Loss Account
(5) Abnormal Loss Account	(6) Abnormal Gain Account

[D.U.B.Com. (Hons.) — Adapted]

10.28 Process Costing

Solution

Dr. Process A Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Materials	3,000	5	15,000	By Normal Loss	300	2	600
To Additional Input			1,000	By Process B A/c	2,800	12	33,600
To Direct Wages			4,000				
To Direct Expenses			10,000				
To Production Overhead			3,000				
To Abnormal Gain A/c (Note 1c)	100	12	1,200				
	3,100		34,200		3,100		34,200

Dr. Process B Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	2,800	12	33,600	By Normal Loss	140	5	700
To Additional Input			2,210	By Abnormal Loss	60	21	1,260
To Direct Wages			3,000	By Finished Stock A/c	2,600	21	54,600
To Direct Expenses			14,000				
To Production Overhead			3,750				
	2,800		56,560		2,800		56,560

Dr. Finished Stock Account				Cr.	
Particulars	Amount (₹)		Particulars	Amount (₹)	
To Balance b/d	20,000		By Cost of Goods Sold A/c	51,600	
To Process B A/c	54,600		(Balancing figure)		
			By Balance c/d	23,000	
	74,600			74,600	

Dr. Normal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	300	2	600	By Abnormal Gain A/c	100	2	200
To Process B A/c	140	5	700	By Bank A/c (Balancing fig.)	340		1,100
	440		1,300		440		1,300

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process B A/c	60	21	1,260	By Bank A/c	60	5	300
				By Costing Profit and Loss A/c			960
	60		1,260		60		1,260

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss	100	2	200	By Process A A/c	100	12	1,200
To Costing Profit and Loss A/c			1,000				
	100		1,200		100		1,200

Working Notes:

(1) Process - A

- (a) (i) Normal Loss is 10% of input = 10% of 3,000 units = 300 units
Scrap value = $300 \times ₹ 2 = ₹ 600$.
- (ii) Expected Output (3,000 – 300) 2,700 units
Actual Output 2,800 units
Abnormal Gain 100 units

(b) Cost per Unit = $\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$

$$= \frac{33,000 - 600}{3,000 - 300} = \frac{32,400}{2,700} = ₹ 12.$$

(c) Value of abnormal gain = $100 \times ₹ 12 = ₹ 1,200$.

(2) Process - B

- (a) (i) Normal loss is 5% of input = 5% of 2,800 units = 140 units.
Scrap value = $140 \text{ units} \times ₹ 5 = ₹ 700$.
- (ii) Expected Output (2,800 - 140) 2,660 units
Actual Output 2,600 units
Abnormal Loss 60 units

(b) Cost per Unit = $\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$

$$= \frac{56,560 - 700}{2,800 - 140} = \frac{55,860}{2,660} = ₹ 21 \text{ per unit.}$$

(c) Value of abnormal loss = $60 \times ₹ 21 = ₹ 1,260$.

Illustration 15

X Ltd. process product 'Z' through two distinct processes: Process - A and Process - B. On completion, it is transferred to finished stock.

From the following information relating to the year 2016-17 prepare Process Accounts and Finished Stock Account.

Particulars	Process - A	Process - B
(i) Raw materials used	1,000 units	—
(ii) Cost per unit	₹ 200	—
(iii) Transfer to next process — Finished Stock	940 units	870 units
(iv) Normal Loss (on inputs)	5%	10%
(v) Direct Wages	₹ 15,600	₹ 13,200
(vi) Direct Expenses	75% of direct wages	75% of direct wages
(vii) Sundry Expenses	-	₹ 2,954
(viii) Realisable value of scrap per unit	₹ 4.50	₹ 5.75

800 units of finished goods were sold at a profit of 20% on cost. Assume that there was no opening or closing stock of work-in-progress.

10.30 Process Costing

Solution

In the books of X Ltd.

Dr.

Process A Account

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Raw Materials (Input)	1,000	200	2,00,000	By Normal Wastage A/c	50	4.50	225
To Direct Wages	–		15,600	By Abnormal Loss A/c			
To Direct Expense (75% of Wages)	–		11,700	(Note 1c)	10	239.03	2,390
				By Process B A/c (Note 1b)	940	239.03	2,24,685
	1,000		2,27,300		1,000		2,27,300

Dr.

Process B Account

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	940	239.03	2,24,685	By Normal Loss A/c	94	5.75	541
To Direct Wages	–		13,200	By Finished Stock A/c	870	295.74	2,57,296
To Direct Expense (75% of Wages)	–		9,900				
To Sundry Expenses			2,954				
To Abnormal Gain A/c	24	295.74	7,098				
	964		2,57,837		964		2,57,837

Dr.

Finished Stock Account

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process B A/c	870	295.74	2,57,296	By Cost of Goods Sold	800	295.74	2,36,594
				By Balance c/d	70	295.74	20,702
	870		2,57,296		870		2,57,296

Dr.

Costing Profit and Loss Account

Cr.

Particulars	₹	Particulars	₹
To Cost of Goods Sold	2,36,594	By Sales (800 units) (Balancing figure)	2,83,913
To Net Profit (20% of Cost)	47,319		
	2,83,913		2,83,913

Working Notes :

(1) Process - A

- (a) (i) Normal Loss is 5% of input = 5% of 1,000 units = 50 units

Scrap value = 50 × ₹ 4.50 = ₹ 225.

- (ii) Expected Output (1,000 – 50)

Actual Output

Abnormal Loss

950 Units

940 Units

10 Units

- (b) Cost per Unit =
$$\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$
- $$= \frac{2,27,300 - 225}{1,000 - 50} = \frac{2,27,075}{950} = ₹ 239.026 \text{ (say ₹ 239.03)}$$

- (c) Value of abnormal loss = 239.03 × ₹ 10 = ₹ 2,390.30 (say, ₹ 2,390).

Process - B

- (a) (i) Normal loss (scrap) is 10% of input = 10% of 940 = 94 units.

Scrap value = $94 \times ₹ 5.75 = ₹ 540.5$ (say ₹ 541).

Expected Output (940 – 94)

846 units

Actual Output

870 units

Abnormal Gain

24 units

- (b) Cost per Unit = $\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$

$$= \frac{2,50,739 - 541}{940 - 94} ₹ 295.74.$$

Illustration 16

Z Ltd. produced product X through three processes - P1, P2 and P3. On January 1, raw materials 1,000 units were introduced in process P1 at ₹ 50 per unit. The details of expenses incurred on the three processes during the year 2000 were as under:

		P1	P2	P3
Sundry other materials	(₹)	1,600	3,315	3,220
Labour	(₹)	2,600	8,000	6,392
Normal loss	(% of Input)	5%	10%	5%
Scrap value per unit	(₹)	1	3	6
Actual output	(units)	940	846	410
Sale price of output per unit	(₹)	70	100	200

Entire output of P1 was passed to the next process while $\frac{1}{2}$ of the output of P2 was passed to the next process and the balance was sold. The entire output of P3 was sold. Management expenses and selling expenses were ₹ 6,000 and ₹ 9,000 respectively. These are not allocable to the processes.

You are required to prepare - (a) Process Accounts and (b) Statement of profit.

[C.U.B.Com.(Hons.) - Adapted]

Solution

In the books of Z Ltd.

Dr.

Process P1 Account

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Raw Materials (Input)	1,000	50	50,000	By Normal Loss A/c (Note 1)	50	1	50
To Sundry Other Materials	–		1,600	By Abnormal Loss A/c (Note 1)	10	57	570
To Labour	–		2,600	By Process 2 A/c	940	57	53,580
	1,000		54,200		1,000		54,200

Dr.

Process P2 Account

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process 1 A/c	940	57	53,580	By Normal Loss A/c	94	3	282
To Sundry Other Materials	–		3,315	By Process 3 A/c	423	76.37	32,306
To Labour	–		8,000	By Finished Stock of Process 2 A/c	423	76.37	32,307
	940		64,895		940		64,895

10.32 Process Costing

Dr. Process P3 Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process 2 A/c	423	76.37	32,306	By Normal Loss A/c	21	6	126
To Sundry Other Materials	–		3,220	By Finished Stock of Process 3 A/c	410	103.96	42,624
To Labour	–		6,392				
To Abnormal Gain A/c	8	103.96	832				
	431		42,750		431		42,750

Statement of Profit

Particulars	₹	₹
Sales:		
423 Units from Process 2 @ ₹ 100	42,300	
410 Units from Process 3 @ ₹ 200	82,000	1,24,300
Less: Cost of Goods Sold (Note 6)		74,931
		49,369
Less: Management Expenses	6,000	
Selling Expenses	9,000	15,000
		34,369
Add: Abnormal Gain (Note 5)		784
		35,153
Less: Abnormal Loss (Note 4)		560
Net Profit		34,593

Working Notes :

(1) Process - P1

- (a) (i) Normal Loss is 5% of input = 5% of 1,000 units = 50 units

Scrap value = $50 \times ₹ 1 = ₹ 50$.

- (ii) Expected Output (1,000 – 50)

Actual Output

Abnormal Loss

950 Units

940 Units

10 Units

- (b) Cost per Unit = $\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$

$$= \frac{54,200 - 50}{1,000 - 50} = \frac{54,150}{950} = ₹ 57.$$

- (c) Value of abnormal loss = $10 \times ₹ 57 = ₹ 570$.

(2) Process - P2

- (a) (i) Normal loss is 10% of input = 10% of 940 = 94 units.

Scrap value = $94 \times ₹ 3 = ₹ 282$.

- (ii) Expected Output (940 – 94)

Actual Output

Abnormal Loss/Gain

846 Units

846 Units

Nil Units

- (b) Cost per Unit = $\frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$

$$= \frac{64,895 - 282}{940 - 94} = \frac{64,613}{846} = ₹ 76.3747.$$

(3) Process - P3

- (a) (i) Normal Loss is 5% of input = 5% of 423 units = 21.15 units (say 21 units).
Scrap value = 21 × ₹ 6 = ₹ 126.
- (ii) Expected Output (423 – 21) 402 units
Actual Output 410 units
Abnormal Gain 8 units

$$(b) \text{ Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{41,918 - 126}{423 - 21} = \frac{41,792}{402} = ₹ 103.96.$$

Dr. (4) Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process 1 A/c	10	57	570	By Bank / Cash A/c	10	1	10
				By Costing Profit and Loss A/c			560
	10		570		10		570

Dr. (5) Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss A/c	8	6	48	By Process 3 A/c	8	103.96	832
To Costing Profit and Loss A/c			784				
	8		832		8		832

Dr. (6) Cost of Goods Sold Account			Cr.	
Particulars	₹	Particulars	₹	
To Finished Stock of Process 2 A/c	32,307	By Costing Profit and Loss A/c	74,931	
To Finished Stock of Process 3 A/c	42,624			
	74,931		74,931	

Calculation of Missing Figures

Illustration 17

A raw material has to pass through three successive processes to reach the finished product stage. The loss of material expressed as percentage of input is:

- Process - 1 : 10%
Process - 2 : 20%
Process - 3 : 25%

Required:

Calculate raw material introduced in Process - 1, if the finished product transferred from Process - 3 is 1,080 units.

[D.U.B.Com. - 2008]

Solution

Let us assume that the input = 100 units.

- (i) Output of process - 1 = 100 × 90% = 90 units
(ii) Output of process - 2 = 90 × 80% = 72 units
(iii) Output of Process - 3 = 72 × 75% = 54 units

10.34 Process Costing

When output of Process - 3 is 54 units then input = 100 units

When output of Process - 3 is 1 units then input = 100 / 54

When output of Process - 3 is 1080 units then input = $(100 \times 1080) / 54 = 2000$ units

Illustration 18

In Process D, 9000 units of a product was transferred from Process C at a cost of ₹ 54,000. The additional expenses incurred for Process D were - Sundry materials ₹ 2,500, Labour ₹ 6,000, Direct expenses ₹ 3,350 and overhead charged @ 200% of labour. Wastage of Process D was sold at ₹ 2 per unit. The final product from Process D was sold at ₹ 10 fetching a profit of 10% on sale.

Calculate the rate of normal loss of Process D on the basis of input.

[C.U.B.Com.(Hons.) - Adapted]

Solution

Selling Price of final product of Process - D ₹ 10

Less: Profit (10% of ₹ 10) 1

Cost of final product per unit 9

Let total normal loss = x

$$\text{Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input} - \text{Normal Loss)}}$$

Putting the values in the above equation, we get,

$$\text{or, } 9 = \frac{(54,000 + 2,500 + 6,000 + 3,350 + 12,000) - 2x}{9,000 - x}$$

$$\text{or, } 9(9,000 - x) = 77,850 - 2x.$$

$$\text{or, } 7x = 3150 \text{ or, } x = 450.$$

$$\text{So, rate of normal loss of process D} = \frac{\text{Normal loss (Units)}}{\text{Input (Units)}} \times 100 = \frac{450}{9,000} \times 100 = 5\%$$

Illustration 19

In a manufacturing unit, raw material passes through four processes, P, Q, R and S. The output of each process is the input of the subsequent process. The loss in the four process, P, Q, R and S are 25%, 20%, 20% and 16 2/3% respectively, of the input.

If the end product at the end of process S is 40,000 kg.; what is the quantity of raw materials required to be fed at the beginning of process P having cost per unit ₹ 5 ?

Also find out the effect of increase or decrease in the material cost of the end product for variation of every rupee in the cost of raw material.

[D.U.B.Com. (Hons.) — Adapted]

Solution

Let the raw materials introduced in Process 'P' be 100 kg.

Calculation of Output of Process 'S'

Particulars	Kg.
Input in Process P	100
Less : Normal Loss @ 25% of Input (100 Kg.)	25
Output of Process P / Input of Process Q	75
Less: Normal Loss @ 20% of Input (75 Kg.)	15
Output of Process Q / Input of Process R	60
Less : Normal Loss @ 20% of Input (60 Kg.)	12
Output of Process R / Input of Process S	48
Less: Normal Loss @ 16 2/3% of Input (48 Kg.)	8
Output of Process S	40

(A) It is given that output of Process S = 40,000 kg.

$$\therefore \text{Quantity of raw materials introduced in Process P} = \frac{100}{40} \times 40,000 \text{ kg.} = 1,00,000 \text{ kg.}$$

(B) Cost of raw materials introduced = 1,00,000 kg × ₹ 5 = ₹ **5,00,000**.

(C) **Calculation of Total Normal Loss of all the Processes**

Input in Process P	1,00,000 Kg.
Less: Output of Process S	<u>40,000 Kg.</u>
Total Normal Loss	<u>60,000 Kg.</u>

$$\text{Percentage of Normal Loss} = \frac{60,000}{1,00,000} \times 100 = 60\%$$

Calculation of Material Cost Per Unit of Finished Product

	Quantity (Kg.)	Rate (₹)	Amount (₹)
Input in Process P	1,00,000	5	5,00,000
Less: Normal Loss (Total)	60,000		
Final Output of Process S	40,000		5,00,000

$$\text{Material Cost per Kg. of Final Output} = \frac{5,00,000}{40,000} = ₹ \mathbf{12.50}$$

For every rupee of increase / decrease in the cost of raw materials, the cost of final product will increase / decrease by $\frac{12.50}{5} = ₹ \mathbf{2.50}$

Illustration 20

XYZ Ltd. manufactures a product which passes through two processes : Process A and Process B and then it is transferred to Finished Stock Account. From the following particulars, prepare Process Accounts:

		Process A	Process B
Input	(units)	30,000	26,000
Materials	(₹)	60,000	8,000
Labour	(₹)	36,000	30,550
Overhead	(₹)	18,000	21,900
Normal Loss	(%)	10%	?
Scrap value per unit	(₹)	2	3

There was no opening or closing work-in-progress. The final output from Process B transferred to Finished Stock was 25,000 units. These finished goods are sold at ₹ 7.50 per unit with a profit of ₹ 1 per unit. What was normal loss rate in Process B ?

[C.U.B.Com.(Hons.) - Adapted]

Solution

Dr.

**In the books of XYZ
Process A Account**

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Materials (Input)	30,000	2	60,000	By Normal Loss A/c	3,000	2	6,000
To Labour	—		36,000	By Abnormal Loss A/c (Note 1c)	1,000	4	4,000
To Overhead	—		18,000	By Process B A/c (Note 1b)	26,000	4	1,04,000
	30,000		1,14,000		30,000		1,14,000

10.36 Process Costing

Dr. Process B Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	26,000	4	1,04,000	By Normal Loss A/c (Note 2)	1,300	3	3,900
To Materials (addition)	–		8,000	By Finished Stock A/c (Note 2)	25,000	6.5	1,62,500
To Labour	–		30,550				
To Overhead			21,900				
To Abnormal Gain A/c (Note 2b & c)	300	6.50	1,950				
	26,300		1,66,400		26,300		1,66,400

Working Notes :

(1) Process - A

- (a) (i) Normal Loss is 10% of input = 10% of 30,000 units = 3,000 units
Scrap value = 3,000 × ₹ 2 = ₹ 6,000.
- (ii) Expected Output (30,000 - 3,000) 27,000 units
Actual Output 26,000 units
Abnormal Loss 1,000 units

(b) Cost per Unit = $\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$

$$= \frac{1,14,000 - 6,000}{30,000 - 3,000} = \frac{1,08,000}{27,000} = ₹ 4$$

(c) Value of abnormal loss = 1,000 × ₹ 4 = ₹ 4,000.

(2) Process - B

- (a) Good units transferred to finished stock = 25,000 units. All these units were sold @ ₹ 7.50 which includes a profit ₹ 1 per unit.
Therefore, total cost of finished goods = 25,000 × ₹ 6.5 = ₹ 1,62,500.
We know,

$$\text{Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

In this problem, normal loss has not been given. Let us assume that total normal loss = x.

$$\text{So, Cost per Unit} = \frac{1,64,450 - 3x}{26,000 - x}$$

$$\text{or, } 6.5(26,000 - x) = 164,450 - 3x$$

$$\text{or, } 1,69,000 - 6.5x = 1,64,450 - 3x$$

$$\text{or, } 3.5x = 4,550$$

$$\text{or } x = 1,300.$$

Therefore, % of normal loss = $1300 / 26,000 \times 100 = 5\%$ of input.

- (b) Expected output (26,000 - 1,300) 24,700
Actual output 25,000
Abnormal Gain 300
- (c) Value of abnormal gain = 300 × ₹ 6.50 = ₹ 1,950.

Illustration 21

In a certain process, material is mixed and cooked in batches of 1,000 lbs. each. Cooking results in 10 per cent loss of weight of the mixture. Since the cooking requires considerable skill and constant watching, there is generally a further loss from spoilage which is not discovered until process has been completed. Also, past experience shows that normally two batches out of every ten started in the process are spoiled in this way.

In a given month, the production records show:

- (i) Production started in process - 50 batches of 1,000 lbs. each.
- (ii) Production completed and transferred to finished goods is 34,200 lbs.
- (iii) There is no inventory of work-in-process at the beginning or end of the month.

Costs recorded during the month amounted to ₹ 45,000.

Prepare the Process Account for the month and determine the cost per pound of finished product.

[D.U.B.Com.(Hons.) - 2000]

Solution

Dr.				Cr.			
Process Account							
Particulars	Qty (lbs)	Rate ₹	Amount ₹	Particulars	Qty (lbs)	Rate ₹	Amount ₹
To Process Cost	50,000	0.9	45,000	By Loss of Weight	5,000		
				By Normal Loss A/c (Note 1)	9,000		
				By Abnormal Loss A/c (Note 2 & 4)	1,800	1.25	2,250
				By Finished Goods Stock A/c (Note 5)	34,200	1.25	42,750
	50,000		45,000		50,000		45,000

Working Notes:

- (1) Normal Loss (Weight) = 10% of 50,000 5,000 lbs.
 Normal spoilage = 20% (i.e., 2 out of 10 batches) of (50,000 - 5,000) 9,000 lbs.
 Total Normal Loss 14,000 lbs.
- (2) Expected Output (50,000 - 14,000) 36,000 lbs.
 Actual Output 34,200 lbs.
 Abnormal Loss 1,800 lbs.
- (3) Cost per Unit = $\frac{\text{Process Cost}}{\text{Expected Output}} = \frac{45,000}{36,000} = ₹ 1.25$
- (4) Cost of Abnormal Loss = 1,800 × ₹ 1.25 = ₹ 2,250.
- (5) Value of finished goods = 34,200 × ₹ 1.25 = ₹ 42,750.

Illustration 22

At the end of process A, carried on in a factory during the week ending July 31st, 2011, the number of units produced was 850 excluding 50 units damaged at the very end of the process which is normal. The damaged units realized ₹ 3 per unit as scrap. A normal wastage of 10 per cent occurs during the process, the wastage realized was ₹ 2 per unit.

A unit of raw materials costs ₹ 4. The other expenses for the week were :

Wages	500
Power	500
General expenses	450

Forty per cent of the output is sold as to show a profit of $16\frac{2}{3}$ per cent on the selling price; the rest of the output is transferred to process B.

Prepare Process A Account.

[D.U.B.Com. (Hons.) - Adapted]

10.38 Process Costing

Solution

In this problem quantity of raw material has not been given. Before preparing process A Account, it is necessary to calculate the quantity of input. It has been calculated as follows:

(i) Number of units produced	850
Add: Damaged Units	<u>50</u>
Number of units produced after 10% loss of input as wastage	<u>900</u>
Input = $900 / .90 \times 100 = 1,000$ units.	

*Expected output = 90% of the input.

Dr. Process A Account				Cr.			
Particulars	Qty (Unit)	Rate Per Unit	Amount ₹	Particulars	Qty (Unit)	Rate Per Unit	Amount ₹
To Materials (Input)	1,000	4	4,000	By Normal Loss A/c (10% of Input)	100	2	200
To Wages			500	By Normal Damages A/c	50	3	150
To Power			500	By Cost of Goods Sold A/c (Note 3)	340	6	2,040
To General Expenses			450	By Process B A/c	510	6	3,060
	<u>1,000</u>		<u>5,450</u>		<u>1,000</u>		<u>5,450</u>

Working Notes :

- (1) (a) Normal Wastage is 10% of input. So, 10% of 1,000 units = 100 units.
Scrap value = $100 \times ₹ 2 = ₹ 200$.
(b) Normal damage = 50 units. Amount realised from damaged units = $50 \times ₹ 3 = ₹ 150$.

$$(2) \text{ Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value} - \text{Sale of Damaged Units}}{\text{Expected Output (Input} - \text{Normal Loss} - \text{Normal Damage)}}$$

$$\text{Cost per Unit} = \frac{4,000 + 500 + 500 + 450 + 200 + 150}{(1,000 - 100 - 50)} = \frac{5,100}{850} = ₹ 6$$

- (3) Cost of goods sold [(40% of 850) $\times ₹ 6$] = ₹ 2,040.

Illustration 23

The product manufactured by the Standard Chemicals Ltd. passes through three processes - I, II and III. The following costs have been incurred for the month of September 2017:

	Process I (₹)	Process II (₹)	Process III (₹)
1. Materials consumed	40,000	7,500	5,000
2. Direct wages	22,500	10,000	10,000
3. Direct expenses	20,500	2,250	2,505
Total	83,000	19,750	17,505
4. Output	Units 3,900	Units 3,850	Units 3,200
5. Finished Process Stock:			
(i) 01-9-2017	600	550	800
(ii) 30-9-2017	500	800	Nil
6. Stock Valuation on 01-9-2017 (₹. per unit)	24.50	31.00	37.00
7. Percentage of wastage	2	5	10
8. Net Realisable Value of wastage per unit (₹)	13.50	16.25	21.00

Four thousand units of raw materials were introduced in Process I at a cost of ₹ 20,000.

Stocks are valued and transferred to subsequent processes at weighted average cost. The percentage of wastage is computed on the number of units entering the process concerned.

(i) Process Accounts; (ii) Process Stock Accounts; (iii) Normal Wastage Account; (iv) Abnormal Wastage / Effective Account. *[D.U.B.Com. (Hons.) - Adapted]*

Solution

In the books of Standard Chemicals Ltd.

Dr. Process - I Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Materials (Input)	4,000	5	20,000	By Normal Wastage A/c	80	13.5	1,080
To Materials (Additional)			40,000	By Abnormal Wastage A/c	20	26	520
To Direct Wages			22,500	(Note 1b)			
To Direct Expenses			20,500	By Process 1 Stock A/c	3,900	26	1,01,400
	4,000		1,03,000		4,000		1,03,000

Dr. Process - I Stock Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Balance b/d	600	24.50	14,700	By Process II A/c (Note 1c)	4,000	25.80	1,03,200
To Process I A/c	3,900	26.00	1,01,400	By Balance c/d	500	25.80	12,900
	4,500		1,16,100		4,500		1,16,100

Dr. Process - II Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process I Stock A/c	4,000	25.80	1,03,200	By Normal Wastage A/c (2a)	200	16.25	3,250
To Materials (Additional)			7,500	By Process II Stock A/c	3,850	31.50	1,21,275
To Direct Wages			10,000				
To Direct Expenses			2,250				
To Abnormal Effectives A/c	50	31.50	1,575				
	4,050		1,24,525		4,050		1,24,525

Dr. Process - II Stock Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Balance b/d	550	31.00	17,050	By Process III A/c	3,600	*31.44	1,13,175
To Process II A/c	3,850	31.50	1,21,275	By Balance c/d	800	31.44	25,150
	4,400		1,38,325		4,400		1,38,325

*Actual = ₹ 31.4375.

Dr. Process - III Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹) s
To Process II Stock A/c	3,600	31.44	1,13,175	By Normal Wastage A/c	360	21.00	7,560
To Materials (Additional)			5,000	By Abnormal Wastage A/c	40	38.00	1,520
To Direct Wages			10,000	By Process III Stock A/c	3,200	38.00	1,21,600
To Direct Expenses			2,505				
	3,600		1,30,680		3,600		1,30,680

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Dr. **Process - III Stock Account** Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Balance b/d	800	37.00	29,600	By Cost of Goods Sold A/c	4,000	37.80	1,51,200
To Process III A/c	3,200	38.00	1,21,600				
	4,000		1,51,200		4,500		1,51,200

Dr. **Normal Wastage Account** Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process I A/c	80	13.50	1,080	By Bank A/c	590		11,078
To Process II A/c	200	16.25	3,250	By Abnormal Effectives A/c	50	16.25	812
To Process III A/c	360	21.00	7,560				
	640		11,890		640		11,890

Dr. **Abnormal Wastage Account** Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process I A/c	20	26	520	By Bank A/c (Process I)	20	13.50	270
To Process III A/c	40	38	1,520	By Bank A/c (Process III)	40	21.00	840
				By Costing P/L A/c			930
	60		2,040		60		2,040

Dr. **Abnormal Effectives Account** Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Wastage A/c	50	16.25	812	By Process II A/c	50	31.50	1,575
To Costing P/L A/c (Net Gain)			763				
	50		1,575		50		1,575

Working Notes :

(1) Process - I

- (a) (i) Normal wastage = 2% of 4000 80 units
(ii) Actual wastage (4000 - 3900) 100 units
Abnormal Loss (ii) - (i) 20 units

$$(b) \text{ Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Wastage}}{\text{Expected Output (Input} - \text{Normal Wastage)}}$$

$$= \frac{1,03,000 - 1,080}{3,920 (4,000 - 80)} = ₹ 26$$

- (c) **Weighted Average Cost per unit transferred to Process II.**

$$\text{Weighted Average Cost Per Unit} = \frac{\text{Value of Opening Stock} + \text{Cost of Current Period}}{\text{Opening Stock} + \text{Current Production}}$$

$$= \frac{14,700 + 1,01,400}{600 + 3,900} = ₹ 25.80$$

(d) **Number of Units Transferred to Process II**

Opening Stock	600 units
Transferred from Process I	<u>3,900</u> units
	4,500 units
Closing Stock	<u>500</u> units
Transferred	<u>4,000</u> units

(2) Process - II

- (a) (i) Normal wastage = 5% of 4000 200 units
(ii) Actual wastage (4000 - 3850) 150 units
Abnormal Effective (Gain) (ii) - (i) 50 units

(b) Cost per Unit = $\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Wastage}}{\text{Expected Output (Input} - \text{Normal Wastage)}}$

$$= \frac{(1,03,200 + 7,500 + 10,000 + 2,250) - 3,250}{4,000 - 200} = \frac{1,22,950 - 3,250}{3,800} = ₹ 31.50$$

(c) **Weighted Average Cost per unit transferred to Process III**

$$\text{Weighted Average Cost Per Unit} = \frac{\text{Value of Opening Stock} + \text{Cost of Current Period}}{\text{Opening Stock} + \text{Current Production}}$$

$$= \frac{17,050 + 1,21,275}{550 + 3,850} = ₹ 31.4375$$

(d) **Number of Units Transferred to Process III**

Opening Stock	550 units
Transferred from Process II	<u>3,850</u> units
	4,400 units
Closing Stock	<u>800</u> units
Transferred	<u>3,600</u> units

(3) Process - III

- (a) (i) Normal wastage = 10% of 3,600 360 units
(ii) Actual wastage (3,600 - 3,200) 400 units
Abnormal Loss (ii) - (i) 40 units

(b) Cost per Unit = $\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Wastage}}{\text{Expected Output (Input} - \text{Normal Wastage)}}$

$$= \frac{(1,13,175 + 5,000 + 10,000 + 2,505) - 7,560}{3,600 - 360} = \frac{1,23,120}{3,240} = ₹ 38$$

Process Accounting When There is Work-in-Progress (WIP)

So far we have ignored the problems of work-in-progress in process accounting. In all our previous illustrations we have assumed that there is no work-in-progress either at the beginning or at the end of the period. However, in practice, there might be some work-in-progress at the beginning of the period as well as at the end of the period. If there is opening and closing work-in-progress, the calculation of cost per unit requires some additional computations.

It must be remembered that the cost of a **complete** unit and the cost of an **incomplete** unit can not be the same. Therefore, when there is opening and closing work-in-progress, care should be taken at the time of calculating cost per unit of complete unit and incomplete unit. In this situation, **incomplete units** are **mathematically** converted into an **equivalent** number of fully completed units.

The equivalent units is the number of complete units that could have been obtained from the materials, labour and overheads that went into the partially completed units.

For example, in a month a chemical company (ICI Ltd.) had in process 1,00,000 litres of a chemical, of which 70,000 litres were completed during the month and were transferred to packing and labelling department but the remaining 30,000 litres were only 40% complete. The equivalent unit would be:

	<u>Equivalent litres</u>
70,000 litres fully complete	70,000
30,000 litres 40% complete (30,000 × 40%)	<u>12,000</u>
	Equivalent litres 82,000

Cost per unit is calculated in the usual manner. Let us assume that the total cost of processing the above 1,00,000 litres of chemical in that month was ₹ 3,28,000.

Cost per Equivalent Unit = ₹ 3,28,000 / 82,000 litres = ₹ 4.

Cost of each incomplete unit = 4 × 40% = ₹ 1.60

(i) Value of chemical transferred to packing and labelling department (70,000 × ₹ 4)	₹ 2,80,000
(ii) Value of closing work-in-progress (30,000 × ₹ 1.60)	<u>48,000</u>
Total	<u>3,28,000</u>

In the same example, let us assume, at the beginning of the month 30,000 litres of chemical were there, which were only 40% complete. During the month 70,000 litres of chemical were fully processed and transferred to packing and labelling department. There was no closing work-in-progress.

In this case, equivalent unit is calculated as follows:

	<u>Equivalent litres</u>
(i) Opening work-in-progress of 30,000 litres incomplete chemical completed and transferred which is equivalent to [30,000 (100% – 40%)]	18,000
(ii) Chemical introduced during the month and completed within the month (70,000 – 30,000)	<u>40,000</u>
	Equivalent litres 58,000

It should be noted that equivalent units should be calculated separately for:

- (i) **Direct materials;**
- (ii) **Direct Labour; and**
- (iii) **Factory overhead**

Separate equivalent units are to be calculated because the proportion of total work performed in respect of incomplete units is not always same for each cost element (i.e., direct materials 60%, direct labour and factory overheads 40% complete).

Methods of Calculating Equivalent Units of Production

There are **two** methods for computing the equivalent units of production for a period:

- (1) FIFO method
- (2) Weighted Average method

Note: There is another method called LIFO method. As per AS-2 'Inventories', LIFO is not an acceptable method anymore. Therefore, it has not been discussed here.

FIFO Method

In FIFO method, it is necessary to convert both **opening WIP** and **closing WIP** to an equivalent units basis. Different rules are adapted for conversion of opening WIP and closing WIP.

- (a) **Opening WIP:** The equivalent units represent the work to be done **to complete** the incomplete opening stock of WIP. **For example**, at the beginning of a period there were 3,000 units 60% complete. For calculating equivalent units the **remaining 40%** (100% - 60%) is to be taken into consideration. So the equivalent units will be $3,000 \times 40\% = 1,200$ units.
- (b) **Closing WIP:** The equivalent units represent the work already done to bring the units to this stage of production. **For example**, at the end of the period there were 3,000 units 60% complete. For calculating equivalent units this 60% complete is to be taken into consideration. So the equivalent units will be 60% of 3,000 units = 1,800 units.

In FIFO method it is assumed that opening WIP is the first group of units to be processed and completed during the current period.

Under FIFO method, it must be noted that **the units transferred to next process / finished stock** consist of **two** parts. One part contains the units from opening stock of WIP that were completed and transferred (in our example 1,200 units). The other part contains the units that were both **introduced** and **completed** during the **current period**. The following diagram will clear the concept of FIFO method.

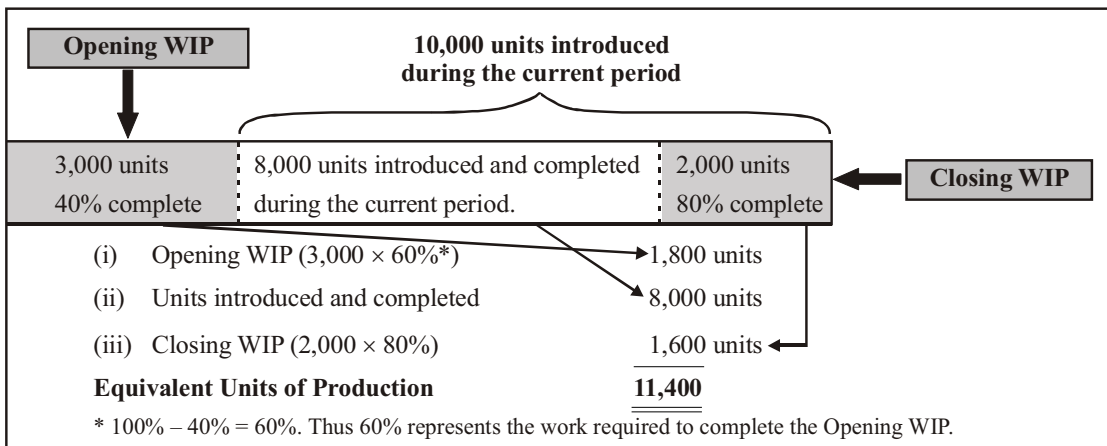


Fig. 10.7

The following points should be noted in respect of FIFO method :

1. Only cost of the **current** period is taken into consideration for calculating cost per unit. No cost of previous period is taken into consideration.
2. Separate equivalent units are calculated for each element of cost - direct material, direct labour and factory overhead.

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3. Equivalent units of production = Equivalent units to complete opening WIP*
+ Units introduced and completed during the current period
+ Equivalent units in closing WIP

*Equivalent units to complete opening WIP = Units in opening WIP $\times$ (100% – percentage of completion of opening WIP)

Alternatively, equivalent units of production can be calculated as follows:

$$\begin{aligned}\text{Equivalent units of production} &= \text{Total units transferred to next process / finished stock} \\ &+ \text{Equivalent units in closing WIP} \\ &- \text{Equivalent units in opening stock}\end{aligned}$$

Preparation of Process Account

The following steps are followed at the time of preparation of Process Account:

Step 1 : Prepare a statement of equivalent production and compute the equivalent units.

Step 2 : Prepare a statement of cost and compute cost per equivalent unit.

Step 3 : Prepare a statement of distribution of cost.

Step 4 : Prepare Process Account in the usual manner.

Elements of Cost with Different Degrees of Completion

It is very common that different categories of unit (e.g., work-in-progress, normal losses, abnormal losses and abnormal gains) have achieved different degrees of completion for different elements of cost (e.g., direct material, direct labour and factory overhead).

For example:

- (i) Opening WIP: Direct materials 100%, direct labour 60%, overhead 50%.
- (ii) Abnormal loss: Direct materials 60%, direct labour 30%, overhead 30%.
- (iii) Closing WIP: Materials 100%, Labour 50%, Overhead 40%.

In such situations separate equivalent production calculations must be made for **each element of cost** for **each category of unit**.

Illustration 24

P Ltd. manufactures a range of products and the data below refer to one product which goes through one process only.

- 1. There was no opening WIP stock.
- 2. Units introduced into the process 5,000 units @ ₹ 300.
- 3. Units completed and transferred to finished stock 4,000 units.
- 4. Closing work-in-progress was 1,000 units but these were incomplete, having reached the following percentages of completion for each elements of cost listed:

Direct materials	100%
Direct wages	50%
Factory overhead	40%
- 5. Cost incurred during the period:

Direct wages	₹ 90,000
Factory overhead	₹ 44,000

Materials are introduced at the beginning of the process. Labour and overheads are applied uniformly throughout the process.

You are required to prepare:

- (a) a Statement of equivalent production; (b) a Statement of cost; (c) a Statement of distribution of cost; and
- (d) Process Account

Solution

(a) Statement of Equivalent Production

Input		Output		Equivalent Units					
				Direct Materials		Direct Labour		Factory Overhead	
Details	Units	Details	Units	%	Units	%	Units	%	Units
Materials Introduced	5,000	Introduced and Completely Processed	4,000	100	4,000	100	4,000	100	4,000
		Closing W.I.P.	1,000	100	1,000	50	500	40	400
	5,000		5,000		5,000		4,500		4,400

(b) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Direct Material	15,00,000	5,000	300
2. Direct Labour	90,000	4,500	20
3. Factory Overhead	44,000	4,400	10
Total	16,34,000		330

(c) Statement of Distribution of Cost

Production	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Finished Production (see Tutorial Note)	Direct materials	4,000	300	12,00,000	13,20,000
	Direct labour	4,000	20	80,000	
	Factory overhead	4,000	10	40,000	
2. Closing W.I.P.	Direct materials	1,000	300	3,00,000	3,14,000
	Direct labour	500	20	10,000	
	Factory overhead	400	10	4,000	
					16,34,000

In the books of P Ltd.

Dr.				Cr.			
Particulars	Qty (Units)	Rate Per Unit	Amount ₹	Particulars	Qty (Units)	Rate Per Unit	Amount ₹
To Direct Materials (Input)	5,000	300	15,00,000	By Finished Stock A/c	4,000		13,20,000
To Direct Labour			90,000	By Closing W.I.P.	1,000		3,14,000
To Factory Overhead			44,000				
	5,000		16,34,000		5,000		16,34,000

Tutorial Note: Valuation of finished goods can be done without calculating element-wise calculation. It can be done as follows also:

$$4,000 \times ₹ 330 \text{ (total cost of an equivalent unit)} = ₹ 13,20,000$$

Illustration 25

The Vega Manufacturing Co. uses FIFO method of inventory valuation in process costing. The following data relate to Process - I for the month of April, 2017:

(i) Beginning work-in-process:	
Quantity	1,500 units
Value	₹ 4,500
(ii) Introduced during the month	5,000 units
(iii) Transferred to Process - II	5,500 units
(iv) Ending work-in-process	1,000 units

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(v) Degree of completion:	Beginning WIP	Ending WIP
Materials	100%	100%
Labour and overhead	80%	60%
(vi) Costs added during the month:		
Materials		₹ 10,000
Labour		₹ 9,800
Overheads		₹ 4,900

You are required to prepare :

- (a) a Statement of equivalent production; (b) a Statement of Cost; (c) a Statement of Distribution of Cost;
 (d) Process - I Account.

[D.U.B.Com.(Hons.) - Adapted]

Solution

(a) Statement of Equivalent Production

Input		Output		Equivalent Units					
				Direct Materials		Direct Labour		Factory Overhead	
Details	Units	Details	Units	%	Units	%	Units	%	Units
Opening W.I.P.	1,500	Remainder Processed	1,500			*20	300	*20	300
Introduced	5,000	Introduced and Completely Processed (Note 1)	4,000	100	4,000	100	4,000	100	4,000
		Closing W.I.P.	1,000	100	1,000	60	600	60	600
	6,500		6,500		5,000		4,900		4,900

*100% – 80% = 20% (Remaining work done in respect of opening W.I.P. during the current period).

When % of completion of labour and overheads are same for both opening W.I.P. and closing W.I.P., labour and overhead columns can be merged into one.

(b) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Material	10,000	5,000	2
2. Labour	9,800	4,900	2
3. Overhead	4,900	4,900	1
Total	24,700		5

(c) Statement of Distribution of Cost / Evaluation of Cost

Production	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
Opening Stock :	Materials	–	2	–	
	Labour	300	2	600	
	Overhead	300	1	300	
Cost of Current Period				900	
Add: Cost of Previous Period				4,500	
Value of Opening Stock transf. to Process II:					5,400
Cost of Units Introduced and Completely Processed	Materials	4,000	2	8,000	
	Labour	4,000	2	8,000	
	Overhead	4,000	1	4,000	20,000
Cost of Completely Processed Units transferred to Process II					25,400

Closing W.I.P.	Materials	1,000	2	2,000	
	Labour	600	2	1,200	
	Overhead	600	1	600	3,800

Dr. Process I Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Opening Stock	1,500	3	4,500	By Process II A/c	5,500		25,400
To Materials	5,000	2	10,000	By Closing W.I.P.	1,000		3,800
To Labour			9,800				
To Overhead			4,900				
	6,500		29,200		6,500		29,200

Normal Losses and Equivalent Unit

We know, normal losses are very common in process costing. At the beginning of this chapter, we have seen that the normal losses are absorbed by *good* units.

At the time of calculating equivalent units for different elements of cost, normal loss is simply *omitted*. By doing this, the cost of these omitted units is automatically apportioned between all good units.

Abnormal Losses and Equivalent Unit

At the time of calculating equivalent units for different elements of cost, the percentage of completion of abnormal losses is to be taken into consideration. Abnormal losses are to be valued in the usual manner.

Illustration 26

During a month, 2,000 units were introduced into Process 1. The normal loss was estimated at 5% on input. At the end of the month, 1,400 units had been produced and transferred to next process, 460 units were incompleated and 140 units had been scrapped. It was estimated that incompleated units had reached a stage in production as follows :

Direct Material	75% completed
Direct Labour	50% completed
Factory Overheads	50% completed
The cost of 2,000 units introduced was ₹ 5,800.	
Direct materials introduced during the process amounted to ₹ 1,440.	
Production overheads incurred were ₹ 1,670. Direct labour ₹ 3,340.	
Units scrapped realised ₹ 1 each.	

The units scrapped have passed through the process, so were 100% completed as regards material, labour and overheads.

You are required to : (a) prepare a Statement of Equivalent Production; (b) Statement of Cost; (c) Evaluate the cost of abnormal loss, finished goods and closing stock; and (d) prepare the Process Account and Abnormal Loss Account.

Solution (a) Statement of Equivalent Production

Input		Output		Equivalent Units					
				Direct Materials		Direct Labour		Factory Overhead	
Details	Units	Details	Units	%	Units	%	Units	%	Units
Introduced	2,000	Introduced and transferred to next process	1,400	100	1,400	100	1,400	100	1,400
		Normal Loss (Note 1)	100						
		Abnormal Loss (Note 2)	40	100	40	100	40	100	40
		Closing W.I.P.	460	75	345	50	230	50	230
	2,000		2,000		1,785		1,670		1,670

10.48 Process Costing

Working Notes:

(1) Normal Loss is 5% of Input = 5% of 2,000 = **100 units**.

(2) Units Scrapped :

Less: Normal Loss

Abnormal Loss

140

100

40

(b) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Direct Materials introduced	5,800		
Material added	1,440		
	7,240		
Less: Sale of Normal Scrap (100 x ₹ 1)	100		
	7,140	1,785	4
2. Direct Labour	3,340	1,670	2
3. Factory Overhead	1,670	1,670	1
Total	12,150		7

(c) Statement of Evaluation

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Cost of Units Introduced and completely processed	Direct Materials	1,400	4	5,600	
	Direct Labour	1,400	2	2,800	
	Factory Overhead	1,400	1	1,400	9,800
2. Abnormal Loss	Direct Materials	40	4	160	
	Direct Labour	40	2	80	
	Factory Overhead	40	1	40	280
4. Closing W.I.P.	Direct Materials	345	4	1,380	
	Direct Labour	230	2	460	
	Factory Overhead	230	1	230	2,070

Dr. Process I Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Materials Introduced	2,000	2.90	5,800	By Normal Loss	100	1	100
To Direct Materials			1,440	By Abnormal Loss	40	7	280
To Direct Labour			3,340	By Process II A/c	1,400	7	9,800
To Factory Overhead			1,670	By Closing W.I.P.	460		2,070
	2,000		12,250		2,000		12,250

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process I A/c	40	7	280	By Bank	40	1	40
				By Costing Profit and Loss A/c			240
	40		280		40		280

Illustration 27

The following data is available in respect of Process Z for January, 2007:

(i) Opening stock of work-in-progress 800 units at a cost of ₹ 4,000.

(ii) The degree of completion of opening work-in-progress: Materials 100%, Labour 60%, Overheads 60%.

(iii) Input of materials 9,200 units.

- (iv) Units scrapped 1,200 units. The stage of completion is: Materials 100%, Labour 80%, Overheads 80%.
- (v) Closing work-in-progress: 900 units. The stage of completion of these units was: Materials 100%, Labour 70% and Overheads 70%.
- (vi) 7,900 units were completed and transferred to next process.
- (vii) Normal loss is 8% of the total input.

You are required to compute equivalent production (use FIFO).

[D.U.B.Com. (Hons.) - 2007]

Solution

(a) Statement of Equivalent Production

Input		Output		Equivalent Units					
				Direct Materials		Direct Labour		Factory Overhead	
Details	Units	Details	Units	%	Units	%	Units	%	Units
Opening W.I.P.	800	Remainder Processed	800	—	—	*40	320	*40	320
Introduced	9,200	Introduced and transferred to Next Process (Note 1)	7,100	100	7,100	100	7,100	100	7,100
		Normal Loss (Note 2)	800	—	—	—	—	—	—
		Abnormal Loss (Note 3)	400	100	400	80	320	80	320
		Closing W.I.P.	900	100	900	70	630	70	630
	10,000		10,000		8,400		8,370		8,370

*100% – 60% (already processed) = 40% remaining work has been done during the **current period**.

Tutorial Note: In the previous period, materials were 100% complete. In this current period no materials were used to finish the opening WIP. Therefore in materials column of this Statement, unit has been taken as NIL.

Working Notes:

- (1) Complete units transferred to next process 7,900
Less: Opening WIP completed and transferred 800
Introduced and Completely Processed during the current period 7,100
- (2) Normal Loss is 8% of the total input
Total Input = Opening WIP 800 units + Introduced 9,200 units = 10,000 units
Therefore, normal loss = 8% of 10,000 = **800 units**.
- (3) Units scrapped 1,200
Less: Normal loss 800
Abnormal Loss 400

Illustration 28

Following data is available in respect of Process I for March, 2007:

- (i) Opening stock of work-in-progress: 800 units at a cost of ₹ 4,000.
- (ii) The degree of completion of opening W.I.P.:
Materials 100%
Labour 60%
Overheads 60%
- (iii) Input of materials at a total cost of ₹ 36,800 for 9,200 units.
- (iv) Direct wages incurred ₹ 16,740.
- (v) Production overheads ₹ 8,370.
- (vi) Units scrapped 1,200 units. The stage of completion of these units was:
Materials 100%
Labour 80%
Overheads 80%

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(vii) Closing work-in-progress: 900 units. The stage of completion of these units was:

Materials	100%
Labour	70%
Overheads	70%

(viii) 7,900 units were completed and transferred to the next process.

(ix) Normal loss is 8% of the total input (opening stock plus units put into the process).

(x) Scrap value is ₹ 4 per unit.

You are required to:

(a) Compute equivalent production. (b) Calculate cost per equivalent unit.

(c) Calculate cost of abnormal loss (or gain), closing work-in-progress and units transferred to the next process using FIFO method.

(d) Show the Process Account for March, 2007.

[D.U.B.Com.(Hons.) - 2007]

Solution

(a) Statement of Equivalent Production

Input		Output		Equivalent Units					
				Materials		Labour		Factory Overhead	
Details	Units	Details	Units	%	Units	%	Units	%	Units
Opening W.I.P.	800	Remainder Processed	800			*40	320	*40	320
Introduced	9,200	Introduced and Completely Processed	7,100	100	7,100	100	7,100	100	7,100
		Normal Loss	800	—	—	—	—	—	—
		Abnormal Loss	400	100	400	80	320	80	320
		Closing W.I.P.	900	100	900	70	630	70	630
	10,000		10,000		8,400		8,370		8,370

*100% – 60% (already completed during previous period) = 40% completed during the **current period**.

(b) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials	36,800		
Less: Sale of Scrap (800 x ₹ 4)	3,200		
	33,600	8,400	4
2. Labour	16,740	8,370	2
3. Overhead	8,370	8,370	1
Total	58,710		7

(c) Statement of Evaluation

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Opening Stock of W.I.P.					
Cost of Previous Period	—	—	—	4,000	
Cost Incurred during the Current Period					
	Materials	—	—	—	
	Labour	320	2	640	
	Overhead	320	1	320	
Value of Opening Stock transferred to next process after completion					4,960
2. Cost of Units Introduced and Completely Processed					
	Materials	7,100	4	28,400	
	Labour	7,100	2	14,200	
	Overhead	7,100	1	7,100	49,700
Cost of Completely Processed Units Transferred to next Process					54,660

3. Abnormal Loss	Materials	400	4	1,600	
	Labour	320	2	640	
	Overhead	320	1	320	2,560
4. Closing Stock of W.I.P.	Materials	900	4	3,600	
	Labour	630	2	1,260	
	Overhead	630	1	630	5,490

Dr. Process I Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Opening Stock	800	5	4,000	By Normal Loss A/c	800	4	3,200
To Materials (Input)	9,200	4	36,800	By Abnormal Loss A/c	400		2,560
To Labour			16,740	By Process II A/c	7,900		54,660
To Overhead			8,370	By Closing W.I.P.	900		5,490
	10,000		65,910		10,000		65,910

Working Notes:

- (1) Complete units transferred to next process 7,900
Less: Opening WIP completed and transferred 800
Introduced and completed processed during the current period 7,100
- (2) Normal loss is 8% of total input = 8% of 10,000 Units 800
(opening WIP 800 units + 9,200 units introduced)
- (3) Units scrapped 1,200
Less: Normal loss 800
Abnormal Loss 400

Illustration 29

X Ltd., a manufacturer of a specialized product is having a process costing system. The stock of work-in-progress at the end of each month is valued on FIFO basis. At the beginning of a month, the stock of work-in-progress was 400 units (40 per cent complete), which was valued as follows:

Materials	₹ 3,600
Labour	₹ 3,400
Overhead	₹ 1,000
	<u>₹ 8,000</u>

During the month, actual issue of materials for production purpose was ₹ 68,500. Wages and overheads in the month amounted to ₹ 79,800 and ₹ 21,280 respectively.

Finished production taken into the stock in the month was 2,500 units. There was no loss in the process.

At the end of the month, the stock of work-in-progress was 500 units (60 per cent, complete as to labour and overheads and 80 per cent, complete as to materials).

Prepare a Process Cost Sheet showing total and unit costs.

[I.C.W.A. (Inter) - Adapted]

Solution Process Cost Sheet

Particulars	Degree of Completion	Units	₹	Total Cost (₹)	Cost per Unit (₹)
Opening Stock of WIP :	40%	400			
Materials			3,600		
Labour			3,400		
Overhead			1,000	8,000	

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Input Added :		2,600			
Materials			68,500		
Labour			79,800		
Overhead			21,280	1,69,580	
Total		3,000		1,77,580	
Less: Closing Stock of WIP (Note 3)		500			
Materials	80%		10,000		
Labour	60%		9,068		
Overhead	60%		2,418	21,486	
Cost of Production		2,500		1,56,094	62.44

Students should note that cost of production as per Process Cost Sheet should tally with “Cost of goods completely processed units transferred to next Process” as appearing in the statement of evaluation (Note 3, Item 3).

Working Notes : (1) Statement Showing Equivalent Production – FIFO Method

Input		Output		Equivalent Units			
				Materials		Labour and Overheads	
Details	Units	Details	Units	%	Units	%	Units
Opening W.I.P.	400	Remainder Processed	400	60	240	60	240
Input of Materials	2,600	Introduced and	2,100	100	2,100	100	2,100
(Balancing figure)		Completely Processed					
		Closing W.I.P.	500	80	400	60	300
	3,000		3,000		2,740		2,640

(2) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials	68,500	2,740	25.000
2. Direct Labour	79,800	2,640	30.227
3. Overheads	21,280	2,640	8.061
Total	1,69,580		63.288

(3) Statement of Evaluation of Cost

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Opening Stock of W.I.P.				8,000	
Cost of Previous Period					
Cost Incurred during the Current Period					
	Materials	240	25.000	6,000	
	Labour	240	30.227	7,254	
	Overhead	240	8.061	1,935	
Value of Opening Stock transferred to next Process					23,189
2. Cost of Units Introduced and Completed					
	Materials	2100	25.000	52,500	
	Labour	2100	30.227	63,477	
	Overhead	2100	8.061	16,928	1,32,905
3. Cost of Completely Processed Units transferred to next Process					1,56,094
4. Closing Stock of W.I.P.					
	Materials	400	25.000	10,000	
	Labour	300	30.227	9,068	
	Overhead	300	8.061	2,418	21,486

Abnormal Gain and Equivalent Unit

We know that abnormal gain occurs when the actual loss is less than expected normal loss. At the time of calculating equivalent production, abnormal gain is deducted from all elements of cost taking **100% complete**. These units have been completely processed and will be transferred to next process or finished stock.

The concerned Process Account is debited and Abnormal Gain Account is credited with the value of abnormal gains. For calculating net gains, an adjustment entry is passed by debiting Abnormal Gain Account and crediting Normal Loss Account with the scrap value of normal loss, which has been converted into good unit.

Illustration 30

Following data pertains to Process I for the month of April 2010 of Kohinoor Ltd.:

Opening work-in-progress	1,500 units at ₹ 15,000
Degree of completion: materials 100%, labour and overheads $33\frac{1}{3}\%$	
Input of materials	18,500 units at ₹ 52,000
Direct labour	₹ 14,000
Overheads	₹ 28,000
Closing work-in-progress	5,000 units
Degree of completion: materials 90%, labour and overheads 30%	
Normal process loss	10% of total input (i.e., opening WIP + units put in)
Scrap value	₹ 2.00 per unit
Units transferred to next process	15,000 units

You are required to:

- Compute equivalent units of production.
- Compute cost per equivalent unit for each cost element, i.e., materials, labour and overheads.
- Compute the cost of finished output and closing work-in-progress.
- Prepare the Process and other Accounts.

Assume:

- FIFO method is used by the company.
- The cost of opening work-in-progress is fully transferred to the next process.

Solution

(a) Statement of Equivalent Production

Input		Output		Equivalent Units			
				Materials		Labour and Overheads	
Details	Units	Details	Units	%	Units	%	Units
Opening W.I.P.	1,500	Remainder Processed	1,500	—	—	$66\frac{2}{3}\%$	1,000
Input of Materials	18,500	Introduced and Completely Processed	13,500	100	13,500	100	13,500
		Normal Loss	2,000	—	—	—	—
		Closing W.I.P.	5,000	90	4,500	30	1,500
	20,000		22,000	—	18,000	—	16,000
		Less: Adnormal Gains (Note 1)	2,000	100	2,000	100	2,000
	20,000		20,000		16,000		14,000

(b) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials	52,000		
Less: Sale of Scrap (2000 x ₹ 2)	4,000		

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	48,000	16,000	3
2. Direct Labour	14,000	14,000	1
3. Overheads	28,000	14,000	2
Total	90,000		6

(c) Statement of Evaluation of Cost

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Opening Stock of W.I.P.					
Cost of Previous Period				15,000	
Cost Incurred during the Current Period					
	Materials	Nil			
	Labour	1,000	1	1,000	
	Overhead	1,000	2	2,000	
Value of Opening Stock transferred to next Process					18,000
2. Units Introduced and Completely Processed					
	Materials	13,500	3	40,500	
	Labour	13,500	1	13,500	
	Overhead	13,500	2	27,000	81,000
Transferred to Process 2					99,000
3. Closing Stock of W.I.P.					
	Materials	4,500	3	13,500	
	Labour	1,500	1	1,500	
	Overhead	1,500	2	3,000	18,000
4. Abnormal Gains					
	Materials	2,000	3	6,000	
	Labour	2,000	1	2,000	
	Overhead	2,000	2	4,000	12,000

In the books of Kohinoor Ltd.

Dr. Process I Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Opening Stock	1,500	10	15,000	By Normal Loss A/c	2,000	2	4,000
To Materials (Input)	18,500		52,000	By Process 2 A/c	15,000		99,000
To Direct Labour			14,000	By Closing W.I.P. A/c	5,000		18,000
To Overheads			28,000				
To Abnormal Gain A/c	2,000		12,000				
	22,000		1,21,000		22,000		1,21,000

Dr. Normal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process 1 A/c	2,000	2	4,000	By Abnormal Gain A/c	2,000	2	4,000

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate Per Unit	Amount ₹	Particulars	Qty (Units)	Rate Per Unit	Amount ₹
To Normal Loss A/c	2,000	2	4,000	By Process 1 A/c	2,000	6	12,000
To Costing P/L A/c (Net abnormal gain)			8,000				
	2,000		12,000		2,000		12,000

Working Note :

(1) Normal Loss = 10% of total input (1,500 + 18,500)	2,000
Actual Loss	<u>Nil</u>
Abnormal Gain	<u>2,000</u>

Previous Process Cost

In many process industries, there would be more than one process involved in the manufacturing of a final product. Materials pass through all these processes in succession. The **output** of Process 1 becomes the input of Process 2 and **output** of Process 2 becomes the **input** of Process 3 and so on. Output of Process 1 must be **100% complete** before transferring it to Process 2. The Process 2 will carry out some additional conversion works, and may add some materials.

At the time of calculation of equivalent units for Process 2, **materials from previous process must** be taken as **100% complete** and it is to be treated as a separate element of cost - **Material 1**. Materials added in Process 2 will be shown in the statement of equivalent production as - **Material 2**.

It is to be noted that the scrap value of normal loss of Process 2 will be deducted from Material 1, based on the assumption that scrap value is produced from basic material. However, there is no hard and fast rule that scrap value has to be deducted from Material 1. This is purely a matter of convenience. There are **three** alternatives:

- (i) Deduct from Material 1.
- (ii) Deduct from Material 2.
- (iii) Apportion between Material 1 and Material 2.

Points to Remember		
1. Material 1 :	(i)	Completed units from previous process;
	(ii)	100% complete in respect of direct materials, direct labour and overheads (incurred in the previous process);
	(iii)	At the time of valuing closing WIP of Process 2, all elements of cost will be taken as 100% complete.
2. Material 2 :	(i)	direct materials added in Process 2;
	(ii)	At the time of valuing closing WIP of Process 2, degree of completion must be taken into consideration.

Illustration 31

Following data relate to Process Q:

(i) Opening work-in-progress	Units	4000
Degree of completion:		
Materials 100%	₹	24,000
Labour 60%	₹	14,400
Overheads 60%	₹	7,200
(ii) Received during the month of April from Process P:		
40,000 units	₹	1,71,000
(iii) Expenses incurred in Process Q during the month:		
Materials	₹	79,000
Labour	₹	1,38,230
Overheads	₹	69,120
(iv) Closing Work-in-progress	Units	3000
Degree of completion:		
Materials	(%)	100
Labour and overheads	(%)	50
(v) Units scrapped	Units	4,000
Degree of completion:		
Material 100%, Labour and overheads 80%.		

10.56 Process Costing

- (vi) Normal loss : 5% of current input.
(vii) Spoiled goods realized ₹ 1.50 each on sale.
(viii) Completed units transferred to warehouse : 37,000 units.

Prepare, using FIFO method :

- (a) Statement of equivalent production; (b) Statement of cost per equivalent unit; (c) Statement of evaluation;
(d) Process Q Account; and (e) Abnormal Loss Account.

[D.U.B.Com. (Hons.) - 2008]

Solution

Process Q

(a) Statement of Equivalent Production

Input		Output		Equivalent Units					
				Material (1)		Material (2)		Labour & Overhead	
Details	Units	Details	Units	%	Units	%	Units	%	Units
Opening W.I.P.	4,000	Remainder Processed	4,000	—	—	—	—	40	1,600
Received from Process P	40,000	Introduced and Completely Processed (Note 1)	33,000	100	33,000	100	33,000	100	33,000
		Normal Loss	2,000						
		Abnormal Loss	2,000	100	2,000	100	2,000	80	1,600
		Closing W.I.P.	3,000	100	3,000	100	3,000	50	1,500
	44,000		44,000		38,000		38,000		37,700

(b) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials (1)			
This period cost	1,71,000		
Less: Sale of Scrap (2000 x ₹ 1.50)	3,000		
	1,68,000	38,000	4.42
2. Materials (2)			
This period cost	79,000	38,000	2.08
2. Labour			
This period cost	1,38,230	37,700	3.67
3. Overhead			
	69,120	37,700	1.83
Total	4,54,350		12.00

(c) Statement of Evaluation

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Opening Stock of W.I.P. :					
Cost of Previous Period				*45,600	
Cost Incurred during the Current Period to complete W.I.P.	Materials (1)	Nil	4.42		
	Materials (2)	Nil	2.08		
	Labour	1,600	3.67	5,867	
	Overhead	1,600	1.83	2,933	
Value of Opening Stock transferred to Warehouse					54,400
Cost of Units Introduced and Completely processed	Materials (1)				
	Materials (2)	33,000	12		3,96,000
	Labour				
	Overhead				
2. Cost of Completely Processed Units transferred to Warehouse					4,50,400

3. Abnormal Loss	Materials (1)	2,000	4.42	8,840	
	Materials (2)	2,000	2.08	4,160	
	Labour	1,600	3.67	5,872	
	Overhead	1,600	1.83	2,928	21,800
4. Closing Stock of W.I.P.	Materials (1)	3,000	4.42	13,260	
	Materials (2)	3,000	2.08	6,240	
	Labour	1,500	3.67	5,505	
	Overhead	1,500	1.83	2,745	27,750

*₹ 24,000 + ₹ 14,400 + ₹ 7,200 = ₹ 45,600.

Dr. Process-Q Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Opening W.I.P.	4,000		45,600	By Normal Loss A/c	2,000	1.50	3,000
To Process P A/c	40,000		1,71,000	By Abnormal Loss A/c	2,000		21,800
To Materials			79,000	By Finished Stock A/c	37,000		4,50,000
To Labour			1,38,230	By Closing W.I.P. A/c	3,000		27,750
To Overheads			69,120				
	44,000		5,02,950		44,000		5,02,950

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process Q A/c	2,000		21,800	By Cash / Bank A/c	2,000	1.5	3,000
	2,000		21,800	By Costing Profit and Loss A/c	2,000		18,800
							21,800

Illustration 32

From the following information prepare:

- Statement of equivalent production;
- Statement of element of cost / unit;
- Statement of apportionment of cost;
- Process II Account under FIFO method.
 - Opening stock - 800 units costing ₹ 6,038 (transferred in cost ₹ 1,200, material ₹ 1,578, labour ₹ 1,710, overheads ₹ 1,550).
 - Transferred from previous Process I 12,000 units costing ₹ 16,350.
 - Cost incurred in Process II

Material	₹ 11,600
Labour	₹ 20,760
Overheads	₹ 15,570
 - Normal loss in Process II - 10% of production.
 - Scrap realised @ ₹ 10 / 10 units.
 - Closing stock 1,800 units.
 - Transferred to next process - 9,700 units.
 - Degree of completion:

	Opening Stock (%)	Closing Stock (%)	Scrapped Units (%)
Material	60	60	100
Labour	40	51	41
Overheads	40	51	41

10.58 Process Costing

Solution

Process II (a) Statement of Equivalent Production

Input		Output		Equivalent Units					
				Material (1)		Material (2)		Labour & Overhead	
Details	Units	Details	Units	%	Units	%	Units	%	Units
Opening W.I.P.	800	Remainder Processed	800	—	—	*40	320	**60	480
Transferred from Process I	12,000	Introduced and Completely Processed (Note 1)	8,900	100	8,900	100	8,900	100	8,900
		Normal Loss (Note 2)	1,100	—	—	—	—	—	—
		Abnormal Loss (Note 3)	200	100	200	100	200	41	82
		Closing W.I.P.	1,800	100	1,800	60	1,080	51	918
	12,800		12,800		10,900		10,500		10,380

*100% – 60% = 40%. ** 100% – 40% = 60%.

(b) Statement of Cost per Unit

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials (1) This period cost	16,350	10,900	1.50
2. Materials (2) This period cost	11,600		
Less: Scrap value of normal loss (Note 4)	1,100	10,500	1.00
2. Labour This period cost	20,760	10,380	2.00
3. Overheads This period cost	15,570	10,380	1.50
Total			6.00

Statement of Apportionment of Cost

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Opening Stock of W.I.P. : Cost of Previous Period		—	—	6,038	
Cost incurred during the Current Period to complete W.I.P.	Materials (1)	Nil	—		
	Materials (2)	320	1.00	320	
	Labour	480	2.00	960	
	Overhead	480	1.50	720	
Value of Opening Stock transferred to Next Process after completion					8,038
Cost of Units Introduced and Completely Processed		8,900	6		53,400
2. Cost of Completely Processed Units Transferred to next process					61,438
3. Abnormal Loss	Materials (1)	200	1.50	300	
	Materials (2)	200	1.00	200	
	Labour	82	2.00	164	
	Overhead	82	1.50	123	787
4. Closing Stock of W.I.P.	Materials (1)	1,800	1.50	2,700	
	Materials (2)	1,080	1.00	1,080	
	Labour	918	2.00	1,836	
	Overhead	918	1.50	1,377	6,993

Dr. Process II Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Opening Stock	800		6,038	By Normal Loss A/c (Note 2)	1,100	1	1,100
To Process I A/c	12,000		16,350	By Abnormal Loss A/c	200		787
To Materials			11,600	By Process III A/c	9,700		61,438
To Labour			20,760	By Closing W.I.P. A/c	1,800		6,993
To Overheads			15,570				
	12,800		70,318		12,800		70,318

Working Notes:

- (1) Number of units transferred to next Process 9,700
Less: Opening WIP finished during the period 800
Units introduced and completely processed 8,900
- (2) Normal loss is 10% of production.
Production = Opening WIP + Units introduced – Closing WIP
= 800 + 12,000 - 1,800 = 11,000 units
Normal loss = 10% of 11,000 units = 1,100 units.
- (3) Abnormal Loss = Expected Output - Actual Output
Opening WIP 800
Add: Input 12,000
12,800
Less: Closing WIP 1,800
Production 11,000
Less: Normal Loss (10% of Production) 1,100
Expected Output 9,900
Less: Actual Output 9,700
Abnormal Loss 200
- (4) Scrap value has been deducted from Material 2. Alternatively, it can be deducted from Material 1. If scrap value is deducted from Material 1 cost of Material 1 and Material 2 will come in fraction which will lead to mismatch between debit total and credit total of the Process II Account.

Weighted Average Method

The Weighted Average Method blends together the work that was done in the *previous period* with the work that is done in the current period. This method also blends together the cost that was incurred in the previous period with the cost that is incurred in the current period. Here, it should be noted that the opening WIP must be stated in analysed form; that is, *separate* figures must be given for material cost, labour cost and factory overhead.

In the Weighted Average Method, the equivalent units of production is calculated as follows:

Completed units transferred to the next process or to finished stock	***
<i>Plus</i>	
Equivalent units in closing WIP (taking into consideration the percentage of completion in respect of each element of cost)	***
	<u>***</u>

A visual perspective of the computation of equivalent units of production under Weighted Average Method is given in the next page:

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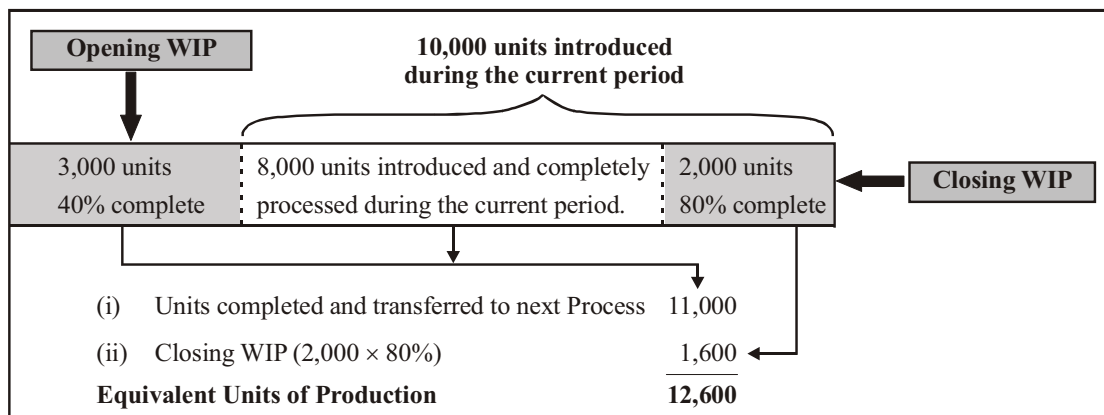


Fig. 10.8

Cost per Equivalent Unit is Calculated as follows:

1. The cost in the opening WIP for each element of cost is **added** to the corresponding cost for the same element for work performed during the current period, thus obtaining **total cost for each element**.
2. Total cost obtained above is divided by the corresponding equivalent production for each element to get the average process cost for that element.
3. Total cost of equivalent unit is obtained by adding costs of all elements of cost (direct material, direct labour and factory overhead).

Comparison of FIFO Method and Weighted Average Method

	FIFO Method		Weighted Average Method
1.	In computing equivalent units, only work needed to complete units in opening WIP is included.	1.	In computing equivalent units, the units in opening WIP are treated as if they were introduced and completed during the current period.
2.	Units introduced and completely processed are shown separately at the time of calculating equivalent units.	2.	Units introduced and completely processed are not shown separately. It is blended with opening WIP units.
3.	Only cost of the current period is included in computation of costs per equivalent unit.	3.	Cost of the opening WIP are added with the cost of the current period in computation of costs per equivalent unit.
4.	Computation of equivalent units in closing WIP is similar under both methods.	4.	Computation of equivalent units in closing WIP is similar under both methods.
5.	For application of this method, break-up of cost of each element of cost is not required .	5.	For application of this method, break-up of cost of each element of cost is necessary.
6.	Some managers believe that this method is complex, but it is more accurate than Weighted Average Method.	6.	This method is simple but it is not very accurate when costs are fluctuating from period to period.

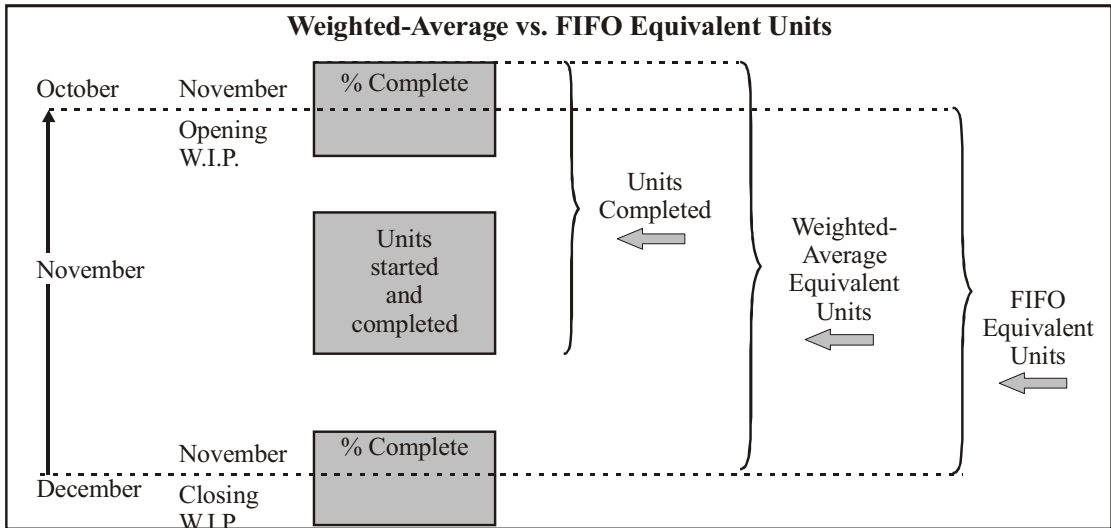


Fig. 10.9

Selection of a Costing Method

Selecting a costing method (FIFO / Weighted Average), the cost accountant should clearly understand the advantages and disadvantages of both methods. In general, cost accountants prefer Weighted Average Method for the following reasons:

1. The weighted average is simple to use.
2. Closing WIP Inventory level is very low in relation to monthly production.
3. Cost of input is stable.
4. Monthly production is stable.

Some accountants, however, prefer to use FIFO Method for the following reasons:

1. The cost per unit of production is more accurate.
2. The unit costs reflect current conditions more clearly.
3. Costs can be controlled by comparing costs of previous period. If there is major variation, proper action can be taken in time.

Selection of method will depend upon the nature of production process and management's policy.

FIFO method is recommended in the following situations:

- (i) If the closing WIP is generally high and widely varying from month to month.
- (ii) Costs of input and conversion costs are highly volatile.

Illustration 33

From the following information relating to Process I of a factory for the month of March, 2012, prepare the Statement of Equivalent Production, Statement of Cost, Statement of Evaluation and Process Account using average cost method :

(i) Opening work-in-progress	500 units.
(a) Materials	₹ 27,000
(b) Labour	₹ 8,000
(c) Overheads	₹ 12,500
	₹ 47,500

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- (ii) Cost incurred during March, 2012
- | | ₹ |
|-----------------------------------|----------|
| Input of Materials (14,000 units) | 5,74,750 |
| Labour | 1,19,300 |
| Overheads | 1,78,450 |
- (iii) Process loss :
- Normal loss : 10% of opening W.I.P. and input
Value of scrapped unit : ₹ 10 each
Actual loss during March, 2012 : 1,500 units
Degree of completion : Materials 100%; Labour and Overheads 60%
- (iv) Closing work-in-progress : 1,000 units
Degree of completion : Materials 100%; Labour and Overheads 70%
- (v) Processed units transferred to process II : 12,000 units during March, 2012.

[D.U.B.Com. (Hons.) - 2012]

Statement of Equivalent Production

Input		Output	Equivalent Units					
				Material		Labour		Overhead
Details	Units	Details	Units	%	Units	%	Units	Units
Opening W.I.P.	500	Units completed and transferred	12,000	100	12,000	100	12,000	12,000
Units Introduced during the current period	14,000	Normal Loss (10% of 14,500)	1,450					
		Abnormal Loss	50	100	50	60	30	30
		Closing W.I.P.	1,000	100	1,000	70	700	700
	14,500		14,500		13,050		12,730	12,730

Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials :			
Cost of previous period	27,000		
Cost of current period	5,74,750		
	6,01,750		
Less: Scrap Value of Normal Loss (1,450 x ₹ 10)	14,500		
	5,87,250	13,050	45
2. Labour :			
Cost of previous period	8,000		
Cost of current period	1,19,300		
	1,27,300	12,730	10
3. Overhead :			
Cost of previous period	12,500		
Cost of current period	1,78,450		
	1,90,950	12,730	15
Total			70

Statement of Evaluation

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Units completed and transferred		12,000	70		8,40,000
2. Abnormal Loss	Materials	50	45	2,250	
	Labour	30	10	300	
	Overhead	30	15	450	3,000
3. Closing W.I.P.	Materials	1,000	45	45,000	
	Labour	700	10	7,000	
	Overhead	700	15	10,500	62,500
Total					9,05,500

Dr. Process I Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Opening Stock of W.I.P.	500		47,500	By Normal Loss A/c	1,450	10	14,500
To Materials	14,000		5,74,750	By Abnormal Loss A/c	50		3,000
To Labour			1,19,300	By Process II A/c	12,000	70	8,40,000
To Overheads			1,78,450	By Closing W.I.P. A/c			62,500
	14,500		9,20,000		14,500		9,20,000

Illustration 34

Roy & Johnson (P) Ltd. gives the following particulars relating to Process A in its plant for the month of December, 2010:

Work-in-progress (opening balance) on 1.12.2010 - 500 units	Cost	₹
	Material	4,800
	Labour	3,200
	Overheads	<u>6,400</u>
		<u>14,400</u>

Units introduced during the month - 19,500

Processing costs incurred during the month:

	₹	
Materials	1,86,200	
Labour	72,000	
Overheads	<u>1,06,400</u>	3,64,600

Output: Units transferred to Process B 18,200

Units scrapped (completely processed) 1,400

Work-in-process (closing balance) 400

[Degree of completion: Materials - 100%; Labour and overhead - 50%]

Normal loss in processing is 5% of total input and normal scrapped units fetch ₹ 1 each.

Prepare the following statements for Process A for December, 2010:

- Statement of equivalent production;
- Statement of cost;
- Statement of evaluation;
- Process 'A' Account.

[I.C.W.A. (Inter) - Adapted]

Solution

There is no mention about the method to be followed. In this problem, the percentage of completion of closing WIP has not been given but the break-up of cost in respect of different element of cost has been given. Therefore, **Weighted Average Method** is to be adopted for calculating equivalent units of production.

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Solution

Process A (a) Statement of Equivalent Production

Input		Output		Equivalent Units			
				Materials		Labour and Overheads	
Details	Units	Details	Units	%	Units	%	Units
Opening W.I.P.	500	Units completed and transferred to Process B	18,200	100	18,200	100	18,200
Units Introduced during the month	19,500	Normal Loss	1,000				
		Abnormal Loss	400	100	400	100	400
		Closing W.I.P.	400	100	400	50	200
	20,000		20,000		19,000		18,800

(b) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials :			
Cost of previous period	4,800	19,000	10
Cost of current period	1,86,200		
	1,91,000		
Less: Scrap Value	1,000		
	1,90,000		
2. Labour :			
Cost of previous period	3,200	18,800	4
Cost of current period	72,000		
	75,200		
3. Overhead :			
Cost of previous period	6,400	18,800	6
Cost of current period	1,06,400		
	1,12,800		
Total			20

Statement of Evaluation

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Units completed and transferred to Process B		18,200	20		3,64,000
2. Closing W.I.P.	Materials	400	10	4,000	
	Labour	200	4	800	
	Overhead	200	6	1,200	6,000
3. Abnormal Loss		400	20		8,000
Total					3,78,000

In the books of Roy & Johnson (P) Ltd.

Dr.

Process A Account

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Opening Stock of WIP	500		14,400	By Normal Loss A/c	1,000	1	1,000
To Materials	19,500		1,86,200	By Abnormal Loss A/c	400	20	8,000
To Labour			72,000	By Process B A/c	18,200	20	3,64,000
To Overheads			1,06,400	By Closing Stock of WIP	400		6,000
	20,000		3,79,000		20,000		3,79,000

Illustration 35

Data relating to work done in Process A of a company during the month of April 2000 is given below:

Opening work-in-progress (1000 units)	₹
Materials	40,000
Labour	7,500
Overheads	22,500
Materials introduced in Process A (19,000 units)	7,40,000
Direct labour	1,79,500
Overheads	5,38,500
Units scrapped :	1,500 units
Degree of completion: Materials 100%; Labour and overheads 80%.	
Closing work-in-progress :	1,000 units
Degree of completion: Materials 100%; Labour and overheads 80%.	
Units finished and transferred to Process B	17,500 units
Normal loss : 5% of total input including opening W.I.P.	
Scrapped units fetch ₹ 20 per piece.	

Required:

- (a) Statement of Equivalent Production; (b) Statement of Cost; (c) Statement of Distribution of Cost; and,
(d) Process 'A' Account and other Accounts.

[I.C.W.A. (Stage 1) - December, 2000]

Solution

There is no mention about the method to be followed. In this problem, the percentage of completion of opening WIP has not been given but the break-up of cost in respect of different elements of cost has been given. Therefore, **Weighted Average Method** is to be adopted for calculating equivalent units of production.

Weighted Average Method

(a) Statement of Equivalent Production

Input		Output		Equivalent Units			
				Materials		Labour and Overheads	
Details	Units	Details	Units	%	Units	%	Units
Opening W.I.P.	1,000	Units completed and transferred to Process B	17,500	100	17,500	100	17,500
Materials Introduced	19,000	Normal Loss	1,000	—	—	—	—
		Abnormal Loss	500	100	500	80	400
		Closing W.I.P.	1,000	100	1,000	80	800
			20,000		19,000		18,700

(b) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials :			
Cost of previous period	40,000		
Cost of current period	7,40,000		
	7,80,000		
Less: Scrap Value of Normal Loss (1,000 x ₹ 20)	20,000		
	7,60,000	19,000	40
2. Labour :			
Cost of previous period	7,500		
Cost of current period	1,79,500		
	1,87,000	18,700	10

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3. Overhead :			
Cost of previous period	22,500		
Cost of current period	5,38,500		
	5,61,000	18,700	30
Total			80

(c) Statement of Distribution of Cost

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Units completed and transferred to Process B		17,500	80		14,00,000
2. Closing W.I.P.	Materials	1,000	40	40,000	72,000
	Labour	800	10	8,000	
	Overhead	800	30	24,000	
3. Abnormal Loss	Materials	500	40	20,000	36,000
	Labour	400	10	4,000	
	Overhead	400	30	12,000	
Total					15,08,000

Dr. Process A Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Opening Stock of WIP	1,000	70	70,000	By Normal Loss A/c	1,000	20	20,000
To Materials	19,000		7,40,000	By Process B A/c	17,500	80	14,00,000
To Direct Labour			1,79,500	By Abnormal Loss A/c	500		36,000
To Overheads			15,38,500	By Closing Stock of WIP	1,000		72,000
	20,000		15,28,000		20,000		15,28,000

Dr. Normal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	1,000	20	20,000	By Banks A/c	1,000	20	20,000

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	500		36,000	By Bank A/c	500	20	10,000
				By Costing P/L A/c			26,000
	500		36,000		500		36,000

Illustration 36

K Ltd. manufactures a product that requires three separate processes for its completion. Output from Process 1 is immediately transferred to Process 2 and that of Process 2 to Process 3. The following information is available for Process 2 for the month of November, 2010:

- Opening WIP : 1,000 units
- Opening WIP value : Material (1) ₹ 4,000; Material (2) ₹ 2,000; Direct labour ₹ 350; Factory overhead ₹ 800.
- Transfer from Process 1 : 16,000 units at ₹ 81,000.
- Cost incurred during the period: (a) Direct materials : ₹ 43,750; (b) Direct labour : ₹ 14,300; (c) Factory overheads : ₹ 28,500.
- Transfer to Process 3 : 14,500 units

- (vi) Normal loss : 5% of production
 (vii) Scrap value per unit : ₹ 5
 (viii) Units scrapped :
 500 (100% complete as to materials, 60% complete as to labour and 20% complete as to factory overheads)
 (ix) Closing WIP :
 2,000 units (50% complete as to materials, 20% complete as to labour and factory overheads).

You are required to prepare a :

- (a) Statement of equivalent production; (b) Statement of cost; (c) Statement of evaluation; (d) Process 2 Account and other Accounts.
 [Use Weighted Average Method.]

Solution

Weighted Average Method

(a) Statement of Equivalent Production

Input		Output		Equivalent Units							
				Material (1)		Material (2)		Labour		Overhead	
Details	Units	Details	Units	%	Units	%	Units	%	Units	%	Units
Opening W.I.P.	1,000	Units Completely Processed and Transferred	14,500	100%	14,500	100	14,500	100	14,500	100	14,500
Transferred from Process 1	16,000	Normal Loss (Note 1)	750	—	—	—	—	—	—	—	—
		Closing W.I.P.	2,000	100	2,000	50	1,000	20	400	20	400
			17,250		16,500		15,500		14,900		14,900
		Less: Abnormal Gain (Note 2)	250	100	250	100	250	100	250	100	250
	17,000		17,000		16,250		15,250		14,650		14,650

(b) Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials (1)			
Cost of previous period	4,000		
Cost of current period	81,000		
	85,000		
Less: Scrap Value of normal loss (750 x ₹ 5)	3,750		
	81,250	16,250	5
2. Materials (2)			
Cost of previous period	2,000		
Cost of current period	43,750		
	45,750	15,250	3
3. Direct Labour			
Cost of previous period	350		
Cost of current period	14,300		
	14,650	14,650	1
4. Factory Overhead			
Cost of previous period	800		
Cost of current period	28,500		
	29,300	14,650	2
Total			11

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(c) Statement of Evaluation

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Units Completed and transferred to Process 3		14,500	11		1,59,500
2. Closing W.I.P.	Materials (1)	2,000	5	10,000	
	Materials (2)	1,000	3	3,000	
	Labour	400	1	400	
	Overhead	400	2	800	14,200
3. Abnormal Gain		250	11		2,750

In the books of K Ltd.

Dr. Process 2 Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Opening Stock of WIP	1,000		7,150	By Normal Loss A/c	750	5	3,750
To Process 1 A/c	16,000		81,000	By Process 3 A/c	14,500	11	1,59,500
To Direct Materials			43,750	By Closing Stock of W.I.P.	2,000		14,200
To Direct Labour			14,300				
To Factory Overheads			28,500				
To Abnormal Gains	250	11	2,750				
	17,250		1,77,450		17,250		1,77,450

Dr. Normal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process 2 A/c	750	5	3,750	By Bank A/c	500	5	2,500
				By Abnormal Gain A/c	250	5	1,250
	750		3,750		750		3,750

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss A/c	250	5	1,250	By Process 2 A/c	250	11	2,750
To Costing P/L A/c (Net Gain)			1,500				
	250		2,750		250		2,750

Working Notes:

- Normal loss is 5% of production.
 $\text{Production} = \text{Opening WIP} + \text{transfer from Process 1} - \text{Closing WIP}$
 $= 1,000 + 16,000 - 2,000 = 15,000.$
 $\text{Normal loss} = 5\% \text{ of } 15,000 = 750 \text{ units}.$

It should be noted that percentage of completion for normal loss is immaterial. Therefore, it is to be ignored.

- Abnormal gain is deducted at the end taking 100% complete because all units have been transferred to Process 3.

Inter-Process Profit

So far we have seen that finished product of one process is transferred to the next process **at cost**. Now-a-days many manufacturing organizations are transferring finished product of one process to the next process at a price (called transfer price), which includes some percentage of profit. The established transfer price is a cost to the transferee (receiving) process and a revenue to the transferor (sending) process.

The **main objectives** are :

1. To provide some useful information for evaluating the preference of each process.
2. To evaluate whether the cost of production is in line with market price.
3. To ensure that the transferee process is not given the benefit of economies achieved by the transferor process.
4. To expose the inefficiencies of different processes.
5. To ensure that the autonomy of each process is not undermined.

Limitations of this system

1. Unfortunately the system involves an unnecessary complication of the accounts.
2. For Balance Sheet purpose, the closing stock value to be recomputed after deducting the unrealised profit in stock balance. This is very time consuming and complicated.
3. There is no universally accepted transfer pricing method (e.g., cost plus profit, market price, etc.). Wrong transfer pricing policy may demotivate some processing departments.

Preparation of Process Account

Process Account is prepared in 'T' form with **three** columns on each side. **First** column for total, **second** column for cost and **third** column for profit. Ruling of a **Process Account** is given below:

Dr. Cr. Process 1 Account							
Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)

Steps for Preparing First Process Account

1. **First** item to be entered on the *debit* side of the Process Account is **opening stock**. The cost of opening stock is entered in the first column (i.e., 'Total' column) and second column (i.e., 'Cost' column). Nothing is entered in the profit column as there will be no profit element in the opening stock of **First Process**.
2. **Second** item to be entered on the debit side of the Process Account is the direct materials cost. It is entered in the 'Total' column and 'Cost' column only. Nothing is entered in the 'Profit' column.
3. **Third** item to be entered on the debit side of the Process Account is the direct labour cost. It is entered in the 'Total' column and 'Cost' column only. Nothing is entered in the 'Profit' column.
4. **Add** both 'Total' column and 'Cost' column.
5. **Deduct** closing stock (if it is valued at prime cost) from 'Total' column and 'Cost' column. The resultant figures of both the columns represent **prime cost** of goods transferred to next process.
6. **Last** item to be entered on the debit side of the Process Account is the factory overhead. It is entered in the 'Total' column and 'Cost' column only. Nothing is entered in the 'Profit' column.
7. **Add** both 'Total' column and 'Cost' column. The resultant figures of both the columns represent **Process Cost**.
8. Calculate the amount of gross profit based on percentage of profit **on cost** or **on transfer price**.

If it is based on cost, the calculation is simple. Just find out the figure by multiplying process cost with the percentage of profit.

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Example: Process cost is ₹ 1,00,000. Transfer price is based on 20% profit on cost. In this case, gross profit will be : ₹ 1,00,000 × 20% = ₹ 20,000.

If it is based on **transfer price**, the calculation is different. First you calculate percentage of profit on cost, then you multiply this percentage with the process cost. It will give you the figure for gross profit.

Example: Process cost is ₹ 1,00,000. Goods are transferred to next process based on 20% profit on transfer price.

In this case, percentage of profit on cost to be calculated first as follows:

Let transfer price be ₹ 100, then profit is ₹ 20 (20% of ₹ 100) and cost will be ₹ 80 (₹ 100 - ₹ 20).

The percentage of profit on cost = ₹ 20 / ₹ 80 × ₹ 100 = 25%

Gross Profit will be : ₹ 1,00,000 × 25% = ₹ 25,000.

9. **Enter** gross profit in the 'Total' column and 'Profit' column. Nothing is entered in the 'Cost' column.
10. **Add** all the three columns (i.e., 'Total', 'Cost' and 'Profit'). The first column (i.e., 'Total') will show transfer price for second process. The sum of 'Cost' and 'Profit' columns will be equal to first column.
11. On the **credit** side of the Process Account enter the respective figures of 'Total' column, 'Cost' column and 'Profit' column. Close the Process Account by putting double lines on each column of debit side and credit side.
12. Bring down the balance of closing stock on the debit side of the Process Account as opening stock of next period.

Steps for Preparing Second and Subsequent Processes

1. **First** item to be entered on the debit side of the Second Process Account is the opening stock. The figure of opening stock of second process includes profit (It is given in the Problem). Deduct profit from the figure of opening stock to get the cost of opening stock. Now, enter gross figure of opening stock in the 'Total' column, Cost (gross figure *less* profit) in the 'Cost' column and profit in the 'Profit' column.
2. **Second** item to be entered on the debit side of the Second Process Account is the value of goods received from **First Process**. Enter the respective figures in the respective columns.
3. **Enter** direct materials, direct labour in usual manner (i.e., in the 'Total' and 'Cost' columns only).
4. **Add** all the three columns. Sum of 'Cost' and 'Profit' columns will be equal to 'Total' column.
5. **Deduct** closing stock from 'Total', 'Cost' and 'Profit' columns. The profit element in closing stock is calculated as follows:

$$\text{Profit in Closing Stock} = \frac{\text{'Profit' column total}}{\text{'Total' column total}} \times \text{Closing Stock}$$

Example:

(a) **Closing stock** = ₹ 4,500.

(b) **'Total' column total** ₹ 90,000

(c) **'Profit' column total** ₹ 15,000

(d) **'Cost' column total** ₹ 75,000

(e) $\text{Profit in Closing Stock} = \frac{15,000}{90,000} \times 4,500 = ₹ 750$

Here cost of closing stock = ₹ 4,500 - ₹ 750 = ₹ 3,750.

If we take the figures of above example, the different items will appear in the Process Account as follows:

Dr. Second Process Account				Cr.			
Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
To Sundries	90,000	75,000	15,000				
Less: Closing Stock	4,500	3,750	750				
Prime Cost	85,500	71,250	14,250				

6. **Last** item to be entered on the debit side of the Process Account is the factory overhead. It is entered in the 'Total' column and 'Cost' columns only. Nothing is entered in the 'Profit' column.
7. **Add** all the three columns. The resultant figures represent Process Cost.
8. **Calculate** the amount of gross profit in the usual manner (as we have done in case of First Process Account).
9. **Enter** gross profit in the 'Total' column and 'Profit' column. Nothing is entered in the 'Cost' column.
10. **Add** all the three columns (i.e., 'Total', 'Cost' and 'Profit'). The first column will show transfer price for third process / finished stock. The sum of 'Cost' and 'Profit' columns will be equal to first column.
11. On the credit side of the **Process Account**, enter the respective figures of 'Total' column, 'Cost' column and 'Profit' column. Close the Process Account by putting double lines on each column of the debit side and credit side.
12. Bring down the balance of closing stock on the debit side of the Process Account as opening stock of the next period.

Illustration 37

A Ltd. produces product 'AXE' which passes through two processes before it is completed and transferred to finished stock. The following data relate to October 2007.

Particulars	Process		Finished Stock (₹)
	I (₹)	II (₹)	
Opening Stock	7,500	9,000	22,500
Direct Materials	15,000	15,750	
Direct Wages	11,200	11,250	
Factory Overheads	10,500	4,500	
Closing Stock	3,700	4,500	11,250
Inter-process Profit included in opening stock	—	1,500	8,250

Output of process I is transferred to process II at 25% profit on the transfer price.

Output of process II is transferred to finished stock at 20% profit on the transfer price. Stocks in process are valued at prime cost. Finished stock is valued at the price at which it is received from the process II. Sales during the period are ₹ 1,40,000.

Required: Process Cost Accounts and Finished Goods Account showing the profit element of each stage.

Solution

A three-column (1st for 'Total', 2nd for 'Cost' and last for 'Profit') ledger is used for the Process Accounts. This ruling of ledger is adopted to facilitate the calculation of the provision for profit in closing stocks.

For calculating prime cost, closing stock has been deducted on the **debit** side. Students must bring it down after ruling off the account at the end of the period.

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Dr. Process I Account				Cr.			
Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
To Opening Stock	7,500	7,500		By Process II A/c (Transfer)	54,000	40,500	13,500
To Direct Materials	15,000	15,000					
To Direct Wages	11,200	11,200					
	33,700	33,700					
Less: Closing Stock	3,700	3,700					
Prime Cost	30,000	30,000					
To Factory Overhead	10,500	10,500					
Process Cost	40,500	40,500					
To Gross Profit (Note 1)	13,500	–	13,500				
	54,000	40,500	13,500		54,000	40,500	13,500
To Opening Stock b/d	3,700	3,700					

Dr. Process II Account				Cr.			
Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
To Opening Stock	9,000	7,500	1,500	By Finished Stock A/c (Transfer)	1,12,500	75,750	36,750
To Process I A/c (Transfer)	54,000	40,500	13,500				
To Direct Materials	15,750	15,750					
To Direct Wages	11,250	11,250					
	90,000	75,000	15,000				
Less: Closing Stock (Note 2)	4,500	3,750	750				
Prime Cost	85,500	71,250	14,250				
To Factory Overhead	4,500	4,500					
Process Cost	90,000	75,750	14,250				
To Gross Profit (Note 3)	22,500	–	22,500				
	1,12,500	75,750	36,750		1,12,500	75,750	36,750
To Opening Stock b/d	4,500	3,750	750				

Dr. Finished Stock Account				Cr.			
Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
To Opening Stock	22,500	14,250	8,250	By Sales	1,40,000	82,500	57,500
To Process II A/c	1,12,500	75,750	36,750				
	1,35,000	90,000	45,000				
Less: Closing Stock (Note 4)	11,250	7,500	3,750				
	1,23,750	82,500	41,250				
To Gross Profit	16,250	–	16,250				
	1,40,000	82,500	57,500		1,40,000	82,500	57,500
To Opening Stock b/d	11,250	7,500	3,750				

Working Notes:

Let the transfer price be ₹ 100, then profit is ₹ 25 and cost will be (₹ 100 – ₹ 25) = ₹ 75.

When cost is ₹ 75 then profit is ₹ 25

When cost is ₹ 1 then profit is ₹ 25/75

When cost is ₹ 40,500 then profit is (₹ 25 / 75) × 40,500 = ₹ 13,500.

- Out of ₹ 90,000 total cost, profit is ₹ 15,000.

If total cost is ₹ 4,500, then profit is 15,000 / 90,000 × 4,500 = ₹ 750.

3. Let the transfer price be ₹ 100, then profit is ₹ 20 and cost will be (₹ 100 – ₹ 20) = ₹ 80.
 When cost is ₹ 80 then profit is ₹ 20
 When cost is ₹ 1 then profit is ₹ 20 / 80
 When cost is ₹ 90,000 then profit is ₹ 20 / 80 × ₹ 90,000 = ₹ 22,500.
4. Out of ₹ 1,35,000 total cost, profit is ₹ 45,000.
 If total cost is ₹ 11,250, profit is 45,000 / 1,35,000 × 11,250 = ₹ 3,750.

Illustration 38

P Ltd. produces product 'Zed' which passes through three processes before it is completed and transferred to finished stock. The following data will be available for the month of November, 2017 (all figures in ₹):

Particulars	Process			Finished Stock
	A	B	C	
Opening Stock	7,000	11,200	14,000	28,000
Direct Materials	56,000	16,800	21,000	
Direct Labour	49,000	56,000	49,000	
Factory Overhead	28,000	33,600	28,000	
Closing Stock	14,000	5,600	21,000	42,000
Inter-process Profit included in Opening Stock	—	1,953	3,766	9,148

Additional information :

- (i) Output of process A is transferred to process B at 25% on the transfer price.
- (ii) Output of process B is transferred to process C at 20% on the transfer price.
- (iii) Output of process C is transferred to finished stock at 10% on the transfer price.
- (iv) Stock in process is valued at prime cost.
- (v) Finished stock is valued at price at which it is received from process C.
- (vi) Sales during the period are ₹ 5,60,000.

You are required to show:

(a) Process Cost Accounts; (b) Finished Stock Account; (c) Provision for Unrealised Profit in Stock Account; and (d) Extract of the Balance Sheet.

Solution (a)

Dr. Process A Account				Cr.			
Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
To Opening Stock	7,000	7,000		By Process B A/c (Transfer)	1,68,000	1,26,000	42,000
To Direct Materials	56,000	56,000					
To Direct Labour	49,000	49,000					
	1,12,000	1,12,000					
Less: Closing Stock	14,000	14,000					
Prime Cost	98,000	98,000					
To Factory Overhead	28,000	28,000					
Process Cost	1,26,000	1,26,000					
To Gross Profit (Note 1)	42,000		42,000				
	1,68,000	1,26,000	42,000		1,68,000	1,26,000	42,000
To Opening Stock b/d	14,000	14,000					

10.74 Process Costing

Dr. Process B Account				Cr.			
Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
To Opening Stock	11,200	9,247	1,953	By Process C A/c (Transfer)	3,50,000	2,37,024	1,12,976
To Process A A/c (Transfer)	1,68,000	1,26,000	42,000				
To Direct Materials	16,800	16,800					
To Direct Labour	56,000	56,000					
	2,52,000	2,08,047	43,953				
Less: Closing Stock (Note 2)	5,600	4,623	977				
Prime Cost	2,46,400	2,03,424	42,976				
To Factory Overhead	33,600	33,600					
Process Cost	2,80,000	2,37,024	42,976				
To Gross Profit (Note 3)	70,000		70,000				
	3,50,000	2,37,024	1,12,976		3,50,000	2,37,024	1,12,976
To Opening Stock b/d	5,600	4,623	977				

Dr. Process C Account				Cr.			
Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
To Opening Stock	14,000	10,234	3,766	By Finished Stock A/c (Transfer)	4,90,000	3,29,907	1,60,093
To Process B A/c (Transfer)	3,50,000	2,37,024	1,12,976				
To Direct Materials	21,000	21,000					
To Direct Wages	49,000	49,000					
	4,34,000	3,17,258	1,16,742				
Less: Closing Stock (Note 4)	21,000	15,351	5,649				
Prime Cost	4,13,000	3,01,907	1,11,093				
To Factory Overhead	28,000	28,000					
Process Cost	4,41,000	3,29,907	1,11,093				
To Gross Profit (Note 5)	49,000		49,000				
	4,90,000	3,29,907	1,60,093		4,90,000	3,29,907	1,60,093
To Opening Stock b/d	21,000	15,351	5,649				

Dr. (b) Finished Stock Account				Cr.			
Particulars	Total (₹)	Cost (₹)	Profit (₹)	Particulars	Total (₹)	Cost (₹)	Profit (₹)
To Opening Stock	28,000	18,852	9,148	By Sales	5,60,000	3,20,481	2,39,519
To Process C A/c	4,90,000	3,29,907	1,60,093				
	5,18,000	3,48,759	1,69,241				
Less: Closing Stock (Note 6)	42,000	28,278	13,722				
	4,76,000	3,20,481	1,55,519				
To Gross Profit	84,000	—	84,000				
	5,60,000	3,20,481	2,39,519		5,60,000	3,20,481	2,39,519
To Opening Stock b/d	42,000	28,278	13,722				

Dr. (c) Provisions for Unrealised Profit in Stock Account				Cr.			
Particulars		(₹)	(₹)	Particulars		(₹)	(₹)
To Profit and Loss A/c (Note 7) Process B			976	By Balance b/d: Process B Process C Finished Stock		1,953 3,766 9,148	14,867

To Balance c/d:				By Profit and Loss A/c (Note 8)			
Process B		977		Process C		1,883	
Process C		5,649		Finished Stock		4,574	6,457
Finished Goods		13,722	20,348				
			21,324				21,324
				By Balance b/d:			
				Process B		977	
				Process C		5,649	
				Finished Stock		13,722	20,348

Gross Profit for the month of November 2010 will be :

Process A		₹ 42,000
Process B	70,000	
Add: Excess provision	976	70,976
Process C	49,000	
Less: Addition Provision	1,883	47,117
Finished Stock	84,000	
Less: Additional Provision	4,574	79,426
Total		<u>2,39,519</u>

Students should check this figure of gross profit with the profit column of Finished Stock Account.

(d) Balance Sheet (Extract)

Stock will appear in the Balance Sheet as:	₹	
Process A	14,000	
Process B	4,623	
Process C	15,351	
Finished Stock	<u>28,278</u>	62,252

Working Notes:

- Let the transfer price be ₹ 100, then profit is ₹ 25 and cost will be (₹ 100 – ₹ 25) = ₹ 75.
When cost is ₹ 75 then profit is ₹ 25
When cost is ₹ 1 then profit is 25 / 75
When cost is ₹ 1,26,000 then profit is (25 / 75) × 1,26,000 = ₹ **42,000**.
- Out of ₹ 2,52,000 total cost, profit is ₹ 43,953.
If total cost is ₹ 5,600, then profit is 43,953 / 2,52,000 × 5,600 = ₹ **977**.
- Let transfer price be ₹ 100, then profit is ₹ 20 and cost will be (₹ 100 – ₹ 20) = ₹ 80.
When cost is ₹ 80 then profit is ₹ 20
When cost is ₹ 1 then profit is 20 / 80
When cost is ₹ 2,80,000 then profit is (20 / 80) × 2,80,000 = ₹ **70,000**.
- Out of ₹ 4,34,000 total cost, profit is ₹ 1,16,742. If total cost is ₹ 21,000, the profit is ₹ 1,16,742 / 4,34,000 × ₹ 21,000 = ₹ **5,649**.
- Let transfer price be ₹ 100, then profit is ₹ 10 and cost will be (₹ 100 – ₹ 10) = ₹ 90.
When cost is ₹ 90 then profit is ₹ 10
When cost is ₹ 1 then profit is 10 / 90
When cost is ₹ 4,41,000 then profit is (10 / 90) × 4,41,000 = ₹ 49,000.
- Out of ₹ 5,18,000 total cost, profit is ₹ 1,69,241. If total cost is ₹ 42,000 then profit is 1,69,241 / 5,18,000 × ₹ 42,000 = ₹ **13,722**.
- Excess provision in respect of Process B**
Opening balance of provision ₹ 1,953
Less: Provision required for closing stock 977 976

10.76 Process Costing

(8) Additional provision in respect of Process C and finished stock.

	New	Old	Required
Process C	5,649	3,766	1,883
Finished Stock	13,722	9,148	4,574

Previous Years' C.U. Question Paper (with Solution)

[For General Candidates Only]

Illustration 39

A chemical product passes through three different processes to convert into a finished product. Data relating to the product for the month of January 2008 are given below:

	Total	Process - I	Process - II	Process - III
Basic raw materials (20,000 units)	20,000	20,000	-	-
Other materials (₹)	13,000	4,000	5,000	4,000
Direct wages (₹)	30,000	12,000	10,000	8,000
Direct expenses (₹)	57,590	14,000	29,140	14,450
Production Overhead (₹)	15,000	-	-	-
(absorbed as a percentage of wages)				
Output (in units)	-	18,200	17,400	16,400
Normal Loss in process of Input	-	10%	7.5%	5%
Scrap Value per Unit	-	₹ 1.00	₹ 2.00	₹ 3.00

There was no stock at start or at end in any process. All goods are sold at 20% profit on sales.

You are required to prepare the necessary accounts.

[C.U.B.Com. (Hons.) - 2008]

Solution

Dr.

Process - I Account

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Raw Materials	20,000	1	20,000	By Normal Loss A/c	2,000	1	2,000
To Other Materials			4,000	By Process - II A/c	18,200	3	54,600
To Direct Wages			12,000				
To Direct Expenses			14,000				
To Production Overheads (50% of Wages)			6,000				
To Abnormal Gain A/c	200	3	600				
	20,200		56,600		20,200		56,600

Dr.

Process - II Account

Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process - I A/c	18,200	3	54,600	By Normal Loss A/c	1,365	2	2,730
To Other Materials			5,000	By Process - III A/c	17,400	6	1,04,400
To Direct Wages			10,000				
To Direct Expenses			29,140				
To Production Overheads			5,000				
To Abnormal Gain A/c	565	6	3,390				
	18,765		1,07,130		18,765		1,07,130

Dr. Process - III Account Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process - II A/c	17,400	6	1,04,400	By Normal Loss A/c	870	3	2,610
To Other Materials			4,000	By Abnormal Loss A/c	130	8	1,040
To Direct Wages			8,000	By Finished Stock A/c	16,400	8	1,31,200
To Direct Expenses			14,450				
To Production Overheads			4,000				
	17,400		1,34,850		17,400		1,34,850

Dr. Normal Loss Account Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process - I A/c	2,000	1	2,000	By Abnormal Gain A/c	200	1	200
To Process - II A/c	1,365	2	2,730	By Abnormal Gain A/c	565	2	1,130
To Process - III A/c	870	3	2,610	By Bank A/c	3,470		6,010
	4,235		7,340		4,235		7,340

Dr. Abnormal Gain Account Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss A/c - Process I	200	1	200	By Process - I A/c	200	3	600
To Normal Loss A/c - Process II	565	2	1,130	By Process - II A/c	565	6	3,390
To Profit and Loss A/c			2,660				
	765		3,990		765		3,990

Dr. Abnormal Loss Account Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process - III A/c	130	8	1,040	By Bank A/c	130	3	390
				By Profit and Loss A/c			650
	130		1,040		130		1,040

Dr. Finished Stock Account Cr.

Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process - III A/c	16,400	8	1,31,200	By Cost of Goods Sold A/c	16,400	8	1,31,200

Dr. Costing Profit and Loss Account Cr.

Particulars	₹	Particulars	₹
To Cost of Goods Sold A/c	1,31,200	By Sales A/c	1,64,000
to Abnormal Loss A/c	650	By Abnormal Gain A/c	2,660
To Net Profit	34,810		
	1,66,660		1,66,660

Working Notes :

(1) Process - I

- (a) (i) Normal loss is 10% of input = 10% of 20,000 units = 2000 units
Scrap value = 2,000 × Re 1 = ₹ 2,000.

- (ii) Expected output (2,0000 – 2,000)

Actual output

Abnormal Gain

18,000 units
18,200 units
200 units

10.78 Process Costing

$$(b) \quad \text{Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{56,000 - 2,000}{20,000 - 2,000} = \frac{54,000}{18,000} = ₹ 3$$

$$(c) \quad \text{Value of Abnormal Gain} = 200 \times ₹ 3 = ₹ 600.$$

(2) Process - II

$$(a) \quad (i) \quad \text{Normal loss is 7.5\% of input} = 7.5\% \text{ of } 18,200 \text{ units} = 1365 \text{ units}$$

$$\text{Scrap value} = 1365 \times ₹ 2 = ₹ 2,730.$$

(ii) Expected output (18200 – 1365)	16,835 Units
Actual output	<u>17,400</u> Units
Abnormal Gain	<u>565</u> Units

$$(b) \quad \text{Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{1,03,740 - 2,730}{18,200 - 1,365} = \frac{1,01,010}{16,835} = ₹ 6.$$

$$(c) \quad \text{Value of Abnormal Gain} = 565 \times ₹ 6 = ₹ 3,390.$$

(2) Process - III

$$(a) \quad (i) \quad \text{Normal loss is 5\% of input} = 5\% \text{ of } 17,400 \text{ units} = 870 \text{ units}$$

$$\text{Scrap value} = 870 \times ₹ 3 = ₹ 2,610.$$

(ii) Expected output (17,400 – 870)	16,530 units
Actual output	<u>16,400</u> units
Abnormal Loss	<u>130</u> units

$$(b) \quad \text{Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{1,34,850 - 2,610}{17,400 - 870} = \frac{1,32,240}{16,530} = ₹ 8.$$

$$(c) \quad \text{Value of Abnormal Gain} = 130 \times ₹ 8 = ₹ 1,040.$$

Illustration 40

The following information is available in respect of Process II of a product :

Input (1,000 Units)	₹ 5,000 (Cost)
Further materials introduced	₹ 6,000
Direct labour	₹ 4,000
Overhead Charges	75% of labour cost
Output of Process II	900 units
Normal wastage	15% input
Scrap value of wastage	₹ 2 per unit

Prepare :

- Process II Account; and
- Abnormal Gain Account.

Solution

Dr. Process II Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process I A/c (Input)	1,000	5	5,000	By Normal Loss	150	2	300
To Materials			6,000	By Finished Stock A/c	900	20.82	18,740
To Direct Labour			4,000				
To Overheads (75% of Direct Wages)			3,000				
To Abnormal Gain A/c	50	20.82	1,040				
	1,050		19,040		1,050		19,040

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss A/c	50	2	100	By Process II A/c	50	20.82	1,040
To Costing Profit and Loss A/c			940				
	50		1,040		50		1,040

Working Notes :

(1) Process - II

- (a) (i) Normal loss is 15% of input = 15% of 1,000 units = 150 units
Scrap value = $150 \times ₹ 2 = ₹ 300$.
- (ii) Expected output (1,000 – 150) 850 units
Actual output 900 units
Abnormal Gain 50 units

(b) Cost per Unit =
$$\frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{18,000 - 300}{1,000 - 150} = \frac{17,700}{850} = ₹ 20.82$$

(c) Value of Abnormal Gain = $50 \times ₹ 20.82 = ₹ 1,040$ (Approx.).

Illustration 41

A product passes through three processes — A, B, C. 1,000 units @ ₹ 4 per unit was introduced in process A. Production overheads are absorbed as a percentage of direct wages. The following information is available from the cost records :

Particulars	Process A (₹)	Process B (₹)	Process C (₹)	Total (₹)
Other materials	5,200	4,000	2,050	11,250
Direct wages	4,500	7,360	2,800	14,660
Production overheads				14,660

The actual output and information relating to normal loss of the different processes are given below :

Particulars	Normal Loss as a percent of input	Output Units	Variable of Scrap per unit (₹)
Process A	10%	900	2
Process B	20%	680	4
Process C	25%	540	5

10.80 Process Costing

Prepare Process Accounts, Abnormal Loss Account and Abnormal Gain Account.

[C.U.B.Com. (Hons.) - 2010]

Solution

Dr. Process A Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Materials (Input)	1,000	4	4,000	By Normal Loss	100	2	200
To Other Materials			5,200	By Process B A/c (Note 1b)	900	20	18,000
To Direct Wages			4,500				
To Production Overheads			4,500				
	1,000		18,200		1,000		18,200

Dr. Process B Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	900	20	18,000	By Normal Loss	180	4	720
To Other Materials			4,000	By Abnormal Loss A/c	40	50	2,000
To Direct Wages			7,360	By process C A/c	680	50	34,000
To Production Overheads			7,360				
	900		36,720		900		36,720

Dr. Process C Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process B A/c	680	50	34,000	By Normal Loss	170	5	850
To Other Materials			2,050	By Finished Stock A/c	540	80	43,200
To Direct Wages			2,800				
To Production Overheads			2,800				
To Abnormal Gain A/c	30	80	2,400				
	710		44,050		710		44,050

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process B A/c	40	50	2,000	By Bank A/c	40	4	160
				By Costing Profit and Loss A/c			1,840
	40		2,000		40		2,000

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss A/c	30	5	150	By Process C A/c	30	80	2,400
To Costing Profit and Loss A/c			2,250				
	30		2,400		30		2,400

Dr. Normal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	100	2	200	By Bank A/c (Sale of Normal Loss of Process A)	100	2	200
To Process B A/c	180	4	720	By Bank A/c (Sale of Normal Loss of Process B)	180	4	720
To Process C A/c	170	5	850	By Bank A/c (Sale of Normal Loss of Process C)	140	5	700
				By Abnormal Gain A/c (Adjustment of abnormal gain)	30	5	150
			1,770				1,770

Working Notes :

(1) Process - A

- (a) (i) Normal loss is 10% of input = 10% of 1,000 units = **100 units**
 Scrap value = $100 \times ₹ 2 = ₹ 200$.
- (ii) Expected output (1,000 – 100) 900 units
 Actual output 900 units
Abnormal Loss / Gain Nil

$$(b) \text{ Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{18,200 - 200}{1,000 - 100} = \frac{18,000}{900} = ₹ 20$$

(2) Process - B

- (a) (i) Normal loss is 20% of input = 20% of 900 units = **180 units**
 Scrap value = $180 \times ₹ 4 = ₹ 720$.
- (ii) Expected output (900 – 180) 720 units
 Actual output 680 units
Abnormal Loss 40 units

$$(b) \text{ Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{36,720 - 720}{900 - 180} = \frac{36,000}{720} = ₹ 50$$

- (c) Value of Abnormal Loss = $40 \times ₹ 50 = ₹ 2,000$.

(3) Process - C

- (a) (i) Normal loss is 25% of input = 25% of 680 units = **170 units**
 Scrap value = $170 \times ₹ 5 = ₹ 850$.
- (ii) Expected output (680 – 170) 510 units
 Actual output 540 units
Abnormal Gain 30 units

10.82 Process Costing

$$(b) \quad \text{Cost per Unit} = \frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input} - \text{Normal Loss)}}$$

$$= \frac{41,650 - 850}{680 - 170} = \frac{40,800}{510} = ₹ 80$$

$$(c) \quad \text{Value of Abnormal Loss} = 30 \times ₹ 80 = ₹ 2,400.$$

Illustration 42

XYZ Ltd. produces a standard product through Process A and Process B. Finished product of Process A is used as raw materials of Process B.

From the following details prepare Process A A/c, Process B A/c, Abnormal Loss A/c, Abnormal Gain A/c and Normal Loss A/c :

Particulars	Process A	Process B
Input (Units)	15,000	13,000
Labour cost (₹)	18,000	15,275
Normal Loss	10%	5%
Material cost (₹)	30,000	4,000
Factory overhead (₹)	9,000	10,950
Scrap value per unit (₹)	2.00	3.00

There was no opening or closing work-in-progress.

The final output from Process B was 12,500 units.

[B.Com. (Hons.) - 2012]

Solution

In the books of XYZ Ltd.

Dr.				Cr.			
Process A Account							
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Materials	15,000	2	30,000	By Normal Loss A/c	1,500	2	3,000
To Labour Cost			18,000	By Abnormal Loss A/c	500	4	2,000
To Factory Overheads			9,000	To Process B A/c	13,000	4	52,000
	15,000		57,000		15,000		57,000

Dr.				Cr.			
Process B Account							
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	13,000	4	52,000	By Normal Loss A/c	650	3	1,950
To Materials			4,000	By Finished Stock A/c	12,500	6.5	81,250
To Labour Cost			15,275				
To Factory Overheads			10,950				
To Abnormal Gain A/c	150	6.5	975				
	13,150		83,200		13,150		83,200

Dr.				Cr.			
Normal Loss Account							
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	1,500	2	3,000	By Bank A/c	1,500	2	3,000
To Process B A/c	650	3	1,950	By Bank A/c	500	3	1,500
				By Abnormal Gain A/c	150	3	450
	2,150		4,950		2,150		4,950

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Process A A/c	500	4	2,000	By Bank A/c	500	2	1,000
				By Costing Profit and Loss A/c			1,000
	500		2,000		500		2,000

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate (₹)	Amount (₹)	Particulars	Qty (Units)	Rate (₹)	Amount (₹)
To Normal Loss A/c	150	3	450	By Process B A/c	150	6.5	975
To Costing Profit and Loss A/c			525				
	150		975		150		975

Working Notes :

(1) Process - A

- (a) (i) Normal loss is 10% of input = 10% of 15,000 units = 1,500 units
Scrap value = 1,500 × ₹ 2 = **₹ 3,000.**
- (ii) Expected output (15,000 – 1,500) 13,500 units
Actual output 13,000 units
Abnormal Loss 500 units

(b) Cost per Unit =
$$\frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{57,000 - 3,000}{15,000 - 1,500} = \frac{54,000}{13,500} = \text{₹ 4}$$

(2) Process - B

- (a) (i) Normal loss is 5% of input = 5% of 13,000 units = 650 units
Scrap value = 650 × ₹ 3 = **₹ 1,950.**
- (ii) Expected output (13,000 – 650) 12,350 units
Actual output 12,500 units
Abnormal Gain 150 units

(b) Cost per Unit =
$$\frac{\text{Total Cost of the Process} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{82,225 - 1,950}{12,350} = \text{₹ 6.50}$$

- (c) Value of Abnormal Gain = 150 × ₹ 6.50 = **₹ 975.**

Illustration 43

Following details are given in respect of a manufacturing unit for the month of April, 2011:

- (i) Opening work-in-progress 5000 units.
- (a) Materials (100% complete) ₹ 18,750
- (b) Labour (60% complete) ₹ 7,500
- (c) Overheads (60% complete) ₹ 3,750
- (ii) Units introduced into the process 17,500 units

10.84 Process Costing

(iii) 17,500 units are transferred to the next process.

(iv) Process costs for the period are:

	₹
Materials	2,50,000
Labour	1,95,000
Overheads	97,500

(v) The stage of completion of units in closing WIP are estimated to be:

Materials 100%;

Labour 50%;

Overheads 50%.

You are required to prepare a Statement of Equivalent Units of Production and Statement of Cost. Also find the value of:

(i) Output transferred;

(ii) Closing work-in-progress using average cost method.

[C.U.B.Com. (Hons.) - 2013]

Solution

Statement of Equivalent Units of Production

Input		Output		Equivalent Units			
				Materials		Labour and Overheads	
Details	Units	Details	Units	%	Units	%	Units
Opening W.I.P.	5,000	Units completed and transferred	17,500	100	17,500	100	17,500
Units Introduced during the current period	17,500	Closing W.I.P. (Balancing figure)	5,000	100	5,000	50	2,500
	22,500		22,500		22,500		20,000

Statement of Cost

Element of Cost	Cost ₹	Equivalent Production (Unit)	Cost per Unit (₹)
1. Materials :			
Cost of previous period	18,750		
Cost of current period	2,50,000		
	2,68,750	22,500	11.944
2. Labour :			
Cost of previous period	7,500		
Cost of current period	1,95,000		
	2,02,500	20,000	10.125
3. Overhead :			
Cost of previous period	3,750		
Cost of current period	97,500		
	1,01,250	20,000	5.063
Total			27.132

Statement of Evaluation

Particulars	Element of Cost	Equivalent Production (Unit)	Cost per Unit (₹)	Cost (₹)	Total Cost (₹)
1. Units completed and transferred		17,500	27.132		4,74,810
2. Closing W.I.P.	Materials	5,000	11.944	59,720	
	Labour	2,500	10.125	25,313	
	Overhead	2,500	5.063	12,657	97,690
Total					5,72,500

Illustration 44

X Ltd. produced a product through two distinct processes A and B and then to finished stock. From the following information, prepare Process A A/c, Process B A/c, Normal Loss A/c, Abnormal Loss A/c and Abnormal Gain A/c:

	Process A	Process B
Input (Units)	15,000	13,000
Materials (₹)	30,000	4,000
Labour (₹)	18,000	15,275
Overhead (₹)	9,000	10,950
Normal Loss	10%	?
Scrap value per unit (₹)	2.00	3.00

There is no opening and closing work-in-progress. The final output from process B transferred to finished stock 12,500 units. The finished goods are sold at ₹ 7.50 per unit with a profit of ₹ 1.00 per unit.

[C.U.B.Com. (Hons.) - 2014]

Solution

In the books of X Ltd.

Dr. Process A Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Materials (Input)	15,000	2	30,000	By Normal Loss A/c	1,500	2	3,000
To Labour	—		18,000	By Abnormal Loss A/c	500	4	2,000
To Overheads	—		9,000	By Process B A/c	13,000	4	52,000
	15,000		57,000		15,000		57,000

Dr. Process B Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Process A A/c	13,000	4	52,000	By Normal Loss A/c	650	3	1,950
To Materials			4,000	By Finished Stock A/c	12,500	6.50	81,250
To Labour			15,275				
To Overheads			10,950				
To Abnormal Gain A/c	150	6.50	975				
	13,150		83,200		13,150		83,200

Dr. Normal Loss Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Process A A/c	1,500	2	3,000	By Bank A/c	1,500	2	3,000
To Process B A/c	650	3	1,950	By Bank A/c	500	3	1,500
				By Abnormal Gain A/c	150	3	450
	2,150		4,950		2,150		4,950

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Process A A/c	500	4	2,000	By Bank A/c	500	2	1,000
				By Costing Profit and Loss A/c			1,000
	500		2,000		500		2,000

10.86 Process Costing

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Normal Loss A/c	150	3	450	By Process B A/c	150	6.5	975
To Costing Profit and Loss A/c			525				
	150		975		150		975

Working Notes:

(1) Process - A

- (a) (i) Normal Loss is 10% of input = 10% of 15,000 units = 1,500 units
(ii) Scrap value = 1,500 × ₹ 2 = ₹ 3,000.
(iii) Expected Output (15,000 – 1,500) 13,500 units
Actual Output 13,000 units
Abnormal Loss 500 units

- (b) Cost per Unit = $\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$

$$= \frac{57,000 - 3,000}{15,000 - 1,500} = \frac{54,000}{13,500} = ₹ 4.$$

- (c) Value of abnormal loss = 50 × ₹ 4 = ₹ 2,000.

Process - B

- (a) Good units transferred to finished stock = 12,500 units. All these units were sold @ ₹ 750 which includes a profit of ₹ 1 per unit. The cost per unit = (₹ 7.50 – ₹ 1.00) = ₹ 6.50
Therefore, the total cost of finished goods = 12,500 × ₹ 6.5 = ₹ 81,250.

We know,

$$\text{Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

In this problem, normal loss has not been given. Let us assume that total normal loss = x.

$$\text{So, Cost per unit} = \frac{[(52,000 + 4,000 + 15,275 + 10,950) - 3x]}{13,000 - x}$$

$$\text{or, } 6.5 = \frac{82,225 - 3x}{13,000 - x}$$

$$\text{or, } 6.5 (13,000 - x) = 82,225 - 3x$$

$$\text{or, } 84,500 - 6.5x = 82,225 - 3x$$

$$\text{or } 3.5x = 2,275 \quad \text{or } x = 650$$

Therefore, % of normal loss = 650 / 13,000 × 100 = 5%.

- (b) Expected Output (13,000 – 650) 12,350 units
Actual Output 12,000 units
Abnormal Gain 150 units

- (c) Value of abnormal loss = 150 × ₹ 6.5 = ₹ 975.

Illustration 45

At the end of process A carried on in a factory during the month ending 31st December, 2014, the number of units produced was 1,900 excluding 110 units abnormally damaged during the process. The damaged units realised ₹ 4.00 per unit of scrap. A normal wastage of 8% occurs during the process, the wastage realised was ₹ 3.00 per unit.

A unit of raw material cost was ₹ 5.00. The other expenses for the month were :

Wages	₹ 900.00
Power	300.00
General expenses	800.00

45% of the output is sold so as to show a profit of $16\frac{2}{3}\%$ on selling price. The rest of the output of Process A transferred to Process B A/c

Prepare Process A A/c and Abnormal Loss A/c.

[C.U.B.Com. (Hons.) - 2015]

Solution

In this problem quantity of raw materials introduced has not been given. Before preparing Process A Account, it is necessary to calculate the quantity of input first. It has been calculated as under :

Number of units produced	1,900
Add: Abnormal loss	110
Number of Units produced after 8% loss of input as normal loss	2,010

$$\text{Therefore, Input} = \frac{2,010}{92} \times 100 = 2,185 \text{ units}$$

Dr. Process A Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Materials (Input)	2,185	5	10,925	By Normal Loss A/c	175	3	525
To Wages	—		900	By Abnormal Loss A/c	110	6.169	679
To Power	—		300	By Cost of Goods Sold (Note 3)	855	6.169	5,274
To General Expenses	—		800	By Process B A/c	1,045	6.169	6,447
	2,185		12,925		2,185		12,925

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Process A A/c	110	6.169	679	By Bank A/c	110	4	440
				By Costing Profit and Loss A/c			239
	110		679		110		679

Working Notes:

(1) Process - A

- (a) (i) Normal Loss is 8% of input = 8% of 2,185 units = 175 units
(ii) Scrap value = $175 \times ₹ 3 = ₹ 525$.

(b)
$$\text{Cost per Unit} = \frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{12,925 - 525}{2,185 - 175} = \frac{12,400}{2,010} = ₹ 6.169.$$

- (c) Cost of Goods Sold = $(45\% \text{ of } 1,900) \times ₹ 6.169 = ₹ 5,274$.

The Question set in C.U.B.Com.Hons. - 2016 is similar to Illustration 37 (Page 10.71). therefore, no answer has been provided here. Students are requested to refer Page 10.71 for answer.

10.88 Process Costing

Illustration 46

Digvijoy Ltd. manufactures a product which passes through two distinct process — Process A and Process B and then it is transferred to finished stock. From the following particulars, prepare (a) Process Accounts; (b) Abnormal Loss Account; and (c) Abnormal Gain Account :

	Process A	Process B
Input (units)	60,000	52,000
Material (₹)	60,000	8,000
Labour (₹)	36,000	30,550
Overhead (₹)	18,000	21,900
Normal Loss	10%	?
Scrap value per unit (₹)	1.00	3.00

There was no opening or closing work-in-progress. The final output from Process B transferred to finished stock was 50,000 units. These finished goods are sold at ₹ 3.90 per unit fetching a profit of 20% on cost.

[C.U.B.Com. (Hons.) - 2017]

Solution

In the books of Digvijoy Ltd.

Dr. Process A Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Materials (Input)	60,000	1	60,000	By Normal Loss A/c	6,000	1	6,000
To Labour			36,000	By Abnormal Loss A/c	2,000	2	4,000
To Overhead			18,000	By Process B A/c (Note 1)	52,000	2	1,04,000
	60,000		1,14,000		60,000		1,14,000

Dr. Process B Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Process A A/c	52,000	2	1,04,000	By Normal Loss A/c (Note 2)	18,200	3	54,600
To Materials			8,000	By Finished Stock A/c	50,000	3.25	1,62,500
To Labour			30,550				
To Overhead			21,900				
To Abnormal Gain A/c	16,200	3.25	52,650				
	68,200		2,17,100		68,200		2,17,100

Dr. Normal Loss Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Process A A/c	6,000	1	6,000	By Bank A/c (Scrap sold)	6,000	1	6,000
To Process B A/c	18,200	3	54,600	By Abnormal Gain A/c	16,200	3	48,600
				By Bank A/c (Scrap sold)	2,000	3	6,000
	24,200		60,600		24,200		60,600

Dr. Abnormal Loss Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Process A A/c	2,000	2	4,000	By Bank A/c (Scrap sold)	2,000	1	2,000
				By Costing Profit and Loss A/c			2,000
	2,000		4,000		2,000		4,000

Dr. Abnormal Gain Account				Cr.			
Particulars	Qty (Units)	Rate ₹	Amount ₹	Particulars	Qty (Units)	Rate ₹	Amount ₹
To Normal Loss A/c	16,200	3	48,600	By Process B A/c	16,200	3.25	52,650
To Costing Profit and Loss A/c			4,050				
	16,200		52,650		16,200		52,650

Working Notes :

(1) Process – A

- (a) (i) Normal Loss is 10% of input = 10% of 60,000 units = **6,000 units**
 Scrap Value = 6,000 × ₹ 1 = **₹ 6,000**
- (ii) Expected output (60,000 – 6,000) 54,000 units
 Actual output 52,000 units
Abnormal Loss 2,000 units

(b) Cost per Unit =
$$\frac{\text{Total Process Cost} - \text{Scrap Value of Normal Loss}}{\text{Expected Output (Input - Normal Loss)}}$$

$$= \frac{1,14,000 - 6,000}{60,000 - 6,000} = \frac{1,08,000}{54,000} = ₹ 2.$$

- (c) Value of Abnormal Loss = 20,000 × ₹ 2 = **₹ 4,000.**

(2) Process – B

In the question, normal loss percentage of Process B has not been given. Finished goods are sold at a profit of 20% on cost. If the cost is ₹ 100, then profit is ₹ 20 and selling price is ₹ 120. When selling price is ₹ 120, the cost is ₹ 100. Therefore, the cost per unit of finished goods = ₹ 3.90 × 100 ÷ 120 = **₹ 3.25.**

Let Normal Loss be x

$$\text{Cost per Unit} = \frac{\text{Total Cost of the Process} - 3 \times x}{52,000 - x}$$

$$\text{or } 3.25 (52,000 - x) = 1,64,450 - 3x$$

$$\text{or } 1,69,000 - 3.25x = 1,64,450 - 3x$$

$$\text{or } -3.25x + 3x = 1,64,450 - 1,69,000$$

$$\text{or } 0.25x = 4,550$$

$$\text{or } x = 18,200$$

Therefore, Normal Loss = 18,200 units

- (3) Expected output = 52,000 – 18,200 33,800
 Actual output 50,000
Abnormal Gain 16,200

THEORETICAL QUESTIONS

- (a) What do you mean by 'Process Costing'? (Page 10.1)
 (b) Mention few industries where this method can be applied. (Page 10.3) [C.U. B.Com. (Hons.) - Adapted]
- Describe the general features of Process Costing. (Page 10.3)
 [C.U. B.Com. (Hons.) - Adapted], [Madras University - April, 2008]
- What are the advantages and limitations of process costing system ? (Page 10.4)
- What are the different methods of processing ? Describe any one method with the help of a diagram. (Page 10.5)
- Compare job-order costing and process costing system. (Page 10.4)

10.90 Process Costing

6. Explain clearly how an abnormal gain arises in a process. Indicate where would it appear in a process account and how it would be valued. (Page 10.11)
7. Explain the term 'Normal Loss'. (Page 10.11) *[Madras University - April, 2006]*
8. How is the normal loss treated in process costing ? (Page 10.12) *[Madras University - April, 2008]*
9. How would you treat the abnormal loss and abnormal gain in process costing ? (Page 10.12) *[Madras University - April, 2006]*
10. Explain how abnormal loss arises in a process. State where it would appear in the Process Account and how would it be valued. (Page 10.12)
11. What are equivalent units ? Why are they needed in process costing system ? (Page 10.43)
12. Why is it necessary to treat 'previous process cost' as a separate element of cost in process costing system ? (Page 10.54)
13. "The value of scrap generated in a process should be credited to the process account." Do you agree with this statement ? (Page 10.11) *[C.A. (Inter) - Nov., 1995]*
14. Distinguish between job costing and process costing. (Page 10.4) *[C.A. (Inter) - Nov., 1996]*
15. Write short notes on: (a) Abnormal Gain in Process Costing. (Page 10.16) *[C.A. (Inter) - May, 1993]*
16. Explain the treatment of by-product in process costing. (Page 10.38) *[C.S. (Inter) - Adapted]*

PRACTICAL QUESTION

Preparation of Process Accounts When There is no WIP

Preparation of Process Account

- 10.1 Ravindra Manufacturing Company's product passes through two distinct processes A and B and then to finished stock. It is known from past experience that wastage occurs in the process as under:
In process A, 5% of the units entering to process and in process B, 10% of the units entering the process. The scrap value of wastage in process A is ₹ 16 per 100 units and in process B is ₹ 20 per 100 units. The process figures are (in ₹) :
- | | Process A | Process B |
|------------------------|-----------|-----------|
| Material consumed | 6,000 | 3,000 |
| Wages | 7,000 | 4,000 |
| Manufacturing expenses | 2,000 | 2,000 |
- 5,000 units were brought into process A, costing ₹ 5,000. The outputs were: process A - 4,700 units, process B - 4,150 units. Prepare Process Accounts showing the cost per unit of the output. *[D.U.B.Com. (Hons.) - 2007]*
- 10.2 A product passes through three distinct processes A, B and C. The normal loss of units in each process is 5%, 10% and 15% and the same is sold at ₹ 2, ₹ 4, ₹ 5 per unit respectively. Expenses for the month were as follows:
- | | A | Process B | C |
|-----------------------|-------|-----------|-------|
| | (₹) | (₹) | (₹) |
| Sundry Materials | 5,200 | 3,960 | 3,924 |
| Wages | 4,000 | 6,000 | 8,000 |
| Actual output in unit | 1,900 | 1,680 | 1,500 |
- 2000 units @ ₹ 3 per unit were put into process A. The total overheads are ₹ 18,000 which are to be recovered at 100% of wages. Prepare necessary Process Account. *[D.U.B.Com. (Hons.) - 2006]*

Preparation of Process Account, Abnormal Loss Account, Abnormal Gain Account and Normal Loss Account

- 10.3 From the following information relating to process X, prepare Process Account and Abnormal Loss Account:
 Units introduced 2000 @ ₹ 20 per unit.
 Labour cost ₹ 10,000.
 Manufacturing overheads ₹ 15,000.
 Normal loss is 10% of input. Sale of scrap @ ₹ 5 per unit.
 Units produced 1700.

[D.U.B.Com. (Hons.) - Adapted]

- 10.4 The product of a company passes through three distinct processes - A, B and C. It is ascertained that wastage in these processes is 2%, 5% and 10% respectively. In each case, the percentage of wastage is computed on the number of units entering the process concerned. The wastage of each process possesses a scrap value. The wastage of processes A and B is sold at ₹ 5 per 100 units and that of process C at ₹ 20 per 100 units. The following information is obtained:

	Process		
	A	B	C
	(₹)	(₹)	(₹)
Material consumed	4,000	2,000	1,000
Direct labour	6,000	4,000	3,000
Manufacturing expenses	1,000	1,000	1,500

20,000 units have been issued to process A at a cost of ₹ 8,000. The output of process A, B and C is 19,500, 18,800 and 16,000 units respectively. There is no stock or work-in-progress in any process. Show the Process Accounts, Abnormal Loss Account, Normal Loss Account and Abnormal Gain Account.

[C.S. (Inter) - Adapted]

- 10.5 A product is completed in two processes A and B. During a particular month, the input to process A of the basic raw material was 5,000 units at ₹ 2 per unit. Other information for the month is as follows:

Particulars	Process A	Process B
Output (units)	4,700	4,300
Normal loss (% of input)	5	10
Scrap value per unit (₹.)	1	5
Direct wages (₹)	3,000	5,000
Direct expenses	9,750	9,910

Total overheads ₹ 16,000 were recovered as percentage of direct wages.

There were no opening or closing work-in-progress stocks.

Prepare Process A and Process B Accounts, Normal Loss Account, Abnormal Loss / Gain Account.

[D.U.B.Com. (Hons.) - Adapted]

- 10.6 A product is finally obtained after it passes through three distinct processes. The following information is available from the cost records (in ₹) :

	Process I	Process II	Process III	Total
Materials	2,600	2,000	1,025	5,625
Direct wages	2,250	3,680	1,400	7,330
Production overheads	-	-	-	7,330

500 units @ ₹ 4 per unit were introduced in process I. Production overheads are absorbed as a percentage of direct wages.

10.92 Process Costing

The actual output and normal loss of the respective processes are given below:

	Output (units)	Normal loss as a percentage of input	Value of scrap (per unit)
Process I	450	10%	₹ 2
Process II	340	20%	₹ 4
Process III	270	25%	₹ 5

Prepare the Process Accounts and the Abnormal Gain / Loss Accounts. *[I.C.W.A. (Inter) - Adapted]*

- 10.7 The input to a purifying process was 16,000 kgs of basic material purchased @ ₹ 1.20 per kg. Process wages amounted to ₹ 720 and overhead was applied @ 240% of the labour cost. Indirect materials of negligible weight were introduced into the process at a cost of ₹ 336. The actual output from the process weighed 15,000 kgs. The normal yield of the process is 92%. Any difference in weight between the input of basic material and output of purified material (product) is sold @ Re 0.50 per kg. The process is operated under a licence which provides for the payment of royalty @ ₹ 0.15 per kg of the purified material produced.

Prepare: (i) Purified Process Account; (ii) Normal Wastage Account; (iii) Abnormal Wastage / Yield Account; and (iv) Royalty Payable Account. *[C.A. (Inter) - Adapted]*

- 10.8 A chemical compound is made by raw material being processed through two processes. The output of process A is passed to process B, where further material is added to the mix. The details of the process costs for the financial period number 10 were as shown below:

Process A

Direct material	2000 kgs at ₹ 5 per kg
Direct labour	₹ 7,200
Process plant time	140 hours at ₹ 60 per hour

Process B

Direct material	1400 kgs at ₹ 12 per kg
Direct labour	₹ 4,200
Process plant time	80 hours at ₹ 72.50 per hour

The departmental overhead for period 10 was ₹ 6,840 and is absorbed into the costs of each process on direct labour cost.

	Process A	Process B
Expected output was	80% of input	90% of input
Actual output was	1400 kgs	2620 kgs
Assume no finished stock at the beginning of the period and no work-in-progress at either the beginning or the end of the period.		
Normal loss is contaminated material which is sold as scrap for ₹ 0.5 per kg from Process A and ₹ 1.825 per kg from Process B, for both of which immediate payment is received.		
You are required to prepare the accounts for period 10 for:		
(i) Process A; (ii) Process B; (iii) Normal Loss/Gain; (iv) Abnormal Loss/Gain; (v) Finished Goods; (vi) Profit and Loss (Extract).		

Normal Loss Percentage has not been Given

- 10.9 Ayush Ltd. produces a herbal shampoo which is made by subjecting certain crude herbs to two successive process: A and B. The following data in respect of processing have been obtained from the accounting records of the company for a cost period:

Particulars	Process A	Process B
Inputs (units)	50,000	45,000
Normal loss	10%	?

Costs incurred:	₹	₹
Materials (Herbs)	9,00,000	1,96,000
Direct labour	4,26,000	2,47,000
Production overhead	2,84,000	1,78,000
Realisable scrap value / unit	7	20

The output of process A is transferred direct to process B. The output of process B was 43,200 units, which were sold at ₹ 60 per unit showing a profit of 20% on cost.

You are required to prepare the Process Cost Accounts assuming that there was no closing stock of WIP and finished goods.

[C.U. B.Com. (Hons.) - 2004; [D.U.B.Com. (Hons.) - 2005]

Material Added in Next Process

10.10 The following particulars related to two process X and Y for the month of January 2005:

	Process X	Process Y
Total input (units)	50,000	1,000
	@ ₹ 1.50 per unit	
Normal loss (% of input)	10	5
Additional costs incurred:		
Materials	—	3,600
Direct labour	35,000	45,000
Overheads	27,500	39,500
Realisable value of scrap per unit	₹ 0.50	₹ 2
Output (units)	43,000	43,000

The entire output of process X was transferred to process Y. The entire output of process Y was sold at ₹ 6 per unit. Assume there was no opening or closing stock of any type in process X or Y.

You are required to prepare the necessary accounts for the period.

[D.U.B.Com. (Hons.) - 2005]

Some of the Outputs are Sold

10.11 Product X in a manufacturing unit passes through three processes - A, B and C. The expenses incurred in the three processes during the year 2017 were as under:

	Process A	Process B	Process C
Units of input issued	9,000	—	—
	₹	₹	₹
Cost per unit	150	-	-
Sundry materials	23,500	25,000	15,000
Direct labour	80,000	2,07,200	26,110
Direct expenses	2,250	7,200	8,100
Selling price per unit of output	200	280	600

The actual outputs obtained vis-à-vis normal process losses from the three processes were:

	Output (units)	Process loss (%)
Process A	8,400	5
Process B	5,700	10
Process C	3,660	3

During the year, three-fourth of the output of process A and two-third of the output of process B were transferred to the next process and the balances were sold outside. The entire output of process C was,

10.94 Process Costing

however, sold outside. The losses of three processes were sold at ₹ 5 per unit for process A, ₹ 10 per unit for process B and ₹ 15 per unit for process C.

Prepare the three process accounts and a statement of income considering a total selling and distribution expenses of ₹ 45,000 which is not allocated to processes.

Preparation of Process Stock Accounts

- 10.12. The product of a manufacturing unit passes through two distinct process. From past experience the incidence of wastage is ascertained as under:

Process A : 2 per cent Process B : 10 per cent

In each case the percentage of wastage is computed on the number of units entering the process concerned. The sales realisation of wastage in Process A and B are ₹ 25 per 100 units and ₹ 50 per 100 units respectively.

The following information is obtained for the month of April 2017. 40,000 units of crude material were introduced in process A at a cost of ₹ 16,000.

	Process A	Process B
Other material	₹ 16,000	₹ 5,000
Direct Labour	9,000	8,000
Direct Expenses	8,200	1,500
	Units	Units
Output	39,000	36,500
Finished Product Stock:		
April 1	6,000	5,000
April 30	5,000	8,000
Value of Stock per unit on April 1	₹ 1.20	₹ 1.60

Stocks are valued and transferred to subsequent process at weighted average costs.

Prepare respective Process Accounts and Stock Accounts.

[I.C.W.A. (Inter) – Adapted]

Calculation of Input of Process I

- 10.13 In a manufacturing unit, raw material passes through four processes I, II, III and IV and the output of each process is the input of the subsequent process. The loss in the four processes are respectively 25%, 20%, 20% and $16\frac{2}{3}\%$ of the input. If the end product at the end of process IV is 40,000 kg, what is the quantity of the material required to be fed at the beginning of process I and the cost of the same at ₹ 5 per kg?

Find out also the effect of increase or decrease in the material cost of the end product for variation of every rupee in the cost of the raw material.

- 10.14 In a manufacturing company, a product passes through 5 operations. The output of the 5th operation becomes the finished product. The input, rejection, output and labour and overheads of each operation are as under:

Operation	Input (units)	Rejection (units)	Output (units)	Labour and Overhead (₹)
1	21,600	5,400	16,200	1,94,400
2	20,250	1,350	18,900	1,41,750
3	18,900	1,350	17,550	2,45,700
4	23,400	1,800	21,600	1,40,400
5	17,280	2,880	14,400	86,400

You are required to:

- (i) Determine the input required in each operation for one unit of final output.
- (ii) Calculate the labour and overhead cost at each operation for one unit of final output and the total labour and overhead cost of all operation for one unit of final output.

Calculation of Percentage of Wastage

- 10.15 A product passes through three process - A, B and C. 10,000 units at a cost of ₹ 1.10 were issued to process A. The other direct expenses were as follows (all figures in ₹):

	Process A	Process B	Process C
Sundry materials	1,500	1,500	1,500
Direct labour	4,500	8,000	6,500
Direct expenses	1,000	1,000	1,503

The wastage of process A was 5% and of process B 4%. The wastage of process A sold at ₹ 0.25 per unit and that of B ₹ 0.50 per unit and that of C at ₹ 1.00 per unit.

The overhead charges were 160% of the labour. The final product was sold at ₹ 10 per unit fetching a profit of 20% on sales. Find out the percentage of wastage in process C.

- 10.16 The following data are available pertaining to a product after passing through two processes A and B: Output transferred to process C from process B - 9120 units for ₹ 49,263.

Expenses incurred in process C:

	₹
Sundry materials	1,480
Direct labour	6,500
Direct expenses	1,605

The wastage of process C is sold at ₹ 1.00 per unit. The overhead charges were 168% of direct labour.

The final product was sold at ₹ 10.00 per unit fetching a profit of 20% on sales.

Find the percentage of wastage in process C and prepare Process C Account.

Preparation of Process Account When There is a By-product

- 10.17 A product is manufactured by passing through three processes A, B and C. In process C a by-product is also produced, which is then transferred to process D, where it is completed. For the first week in October actual data included:

	Process A	Process B	Process C	Process D
Normal loss of input (%)	5	10	5	10
Scrap value (₹ per unit)	1.50	2.00	4.00	2.00
Estimated sales value of by-product (₹ per unit)	-	-	8.00	-
Output (units)	5,760	5,100	4,370	-
Output of by-product (units)	-	-	510	450
	₹	₹	₹	₹
Direct materials (6000 units)	12,000	-	-	-
Direct materials added in process	5,000	9,000	4,000	220
Direct wages	4,000	6,000	2,000	200
Direct expenses	800	1,680	2,260	151

Budgeted production overhead for the week is ₹ 30,500.

Budgeted direct wages for the week is ₹ 12,200.

You are required to prepare:

- (a) Accounts for process A, B, C and D.
- (b) Abnormal Loss Account and Abnormal Gain Account.

10.96 Process Costing

Preparation of Process Account When There are Joint Products

10.18 Maybud Ltd. operates Process X which creates two joint products, A and B, in the ratio of 3:2 by volume. There is no work in progress. The following information relates to Process X for last month:

- (i) 80,000 litres of raw materials with a total cost of ₹ 1,58,800 were input into the process and conversion costs were ₹ 1,33,000.
- (ii) A normal process loss of 5% of the input was expected. An actual loss of 5,500 litres was identified at the end of the process. Losses have a realisable value of 75 paise per liter.

It is company's policy to apportion joint costs to products using the net realisable value method. After process X, both product A and product B are further processed at a cost of ₹ 2 per liter and ₹ 3 per liter respectively. The final selling prices of the products are as follows:

Product	₹ per liter
A	8
B	12

Prepare the Process Account for last month including the output volume and cost of products A and B separately.

Calculation of Normal Price and Discounted Price

10.19	Following costs were incurred in producing 800 MT of M.S. Rods:	₹
	Materials	2,80,000
	Labour	1,00,000
	Processing Charges	<u>1,00,000</u>
	Total Cost	<u>4,80,000</u>

Of the total output 10% was defective and had to be sold after a discount of 10% off the normal price. The scrap arising out of the production realised a sum of ₹ 8,760. The sale price is calculated to yield 15% profit on sales.

You are required to find out the normal price as well as the discounted price per MT of M.S. rods.

Calculation of Standard and Actual Process Cost

10.20 A product passes through two consecutive processes having relative standard output of 80% and 90% of inputs. In addition, standard yield is obtained by giving scrap allowances of 10% and 5% of outputs of Process I and II respectively. Scraps of each process are sold at ₹ 1,000 per tonne.

There was no work in process at any stage. All materials, as follows, were issued in Process I only and all scrap arising from processes were sold, excepting closing stock of 10 tonnes (opening stock was nil).

Material issues: A	100 tonnes	@ ₹ 2,000 per tonne
B	400 tonnes	@ ₹ 1,500 per tonne
C	500 tonnes	@ ₹ 1,200 per tonne

The actual outputs and scraps were 85% and 8% in Process I and 80% and 10% in Process II. Assume that there was no price variance.

You are required to find out the Standard Cost and Actual Cost per tonne of a product. (Answer to be given in the nearest ₹).

Preparation of Process Accounts When There is WIP

Equivalent Production - No Opening Stock

- 10.21 A company manufactures a product which involves two consecutive processes, viz., Pressing and Polishing. For the month of October 2017, the following information is available:

	Pressing	Polishing
Opening stock	-	-
Input of units in process	1,200	1,000
Units completed	1,000	500
Units under process	200	500
Materials cost	₹ 96,000	₹ 8,000
Conversion cost	₹ 3,36,000	₹ 54,000

For incomplete units in process, charge materials cost at 100 per cent and conversion cost at 60 per cent in the Pressing Process and 50 per cent in Polishing Process. Prepare a statement of cost and calculate selling price per unit which will result in 25 per cent profit on sale price.

- 10.22 Following data is available for a product for the month of July, 2017:

	Process I	Process II
Opening work-in-progress	Nil	Nil
Costs incurred during the month:		
Direct materials	₹ 60,000	-
Labour	₹ 12,000	₹ 16,000
Factory overheads	₹ 24,000	₹ 20,000
Units of Production:		
Received in process	40,000	36,000
Completed and transferred	36,000	32,000
Closing work-in-progress	2,000	?
Normal loss in process	2,000	1,500

Production remaining in process has to be valued as follows:

Material 100% Labour 50% Overhead 50%

There has been no abnormal loss in Process II.

Prepare Process Accounts after working out the missing figures and with detailed workings.

- 10.23 A cleansing agent is manufactured from the input of three ingredients. At 1 January there was no work-in-progress. During January the ingredients were put into the process in the following quantities:

A - 2000 kgs at ₹ 8 per kg; B - 3000 kgs at ₹ 5 per kg; C - 6000 kgs at ₹ 4 per kg

Additionally, labour working 941 hours and being paid ₹ 40 per hour was incurred and overhead recovered on the basis of 50% of labour cost. There was no loss in the process. Output was 8600 kgs

The remaining items in work-in-progress were assessed by the company's works manager as follows:

Complete so far as materials were concerned:

One quarter of the items were 60% complete for labour and overheads.

Three quarters were 25% complete for labour and overheads.

Required: A cleansing agent process account, showing clearly the cost of the output and work-in-progress carried forward.

10.98 Process Costing

- 10.24 The product manufactured by a light engineering factory undergoes two operations: Machining and Finishing. The following data are available relating to expenses incurred on production during November, 2017:

	Machining	Finishing
Units as input	90,000	60,000
Expenses incurred in process:		
Direct material	₹ 2,70,000	Nil
Direct labour	₹ 1,28,000	₹ 45,000
Overheads	₹ 64,000	₹ 1,35,000

At the end of the month there were 30,000 units lying incomplete in Machining Operation. While the full quantity of materials had been consumed for the total production, the expenditure on labour and overheads was estimated to be $66\frac{2}{3}\%$ in respect of the incomplete products.

You are required to prepare a detailed cost statement showing the final cost per unit assuming:

- (i) Completed units of Machining Operations are transferred to the Finishing Operation.
 - (ii) Finishing Operation has completed all the units received from the earlier operation during November 2017, leaving no work-in-process at the end of the month.
- 10.25 A manufacturing concern produces standardised electric meters in one of its departments. From the following particulars relating to a job of 50 meters, you are required to determine the value of the work-in-progress and the finished goods:

(a) Cost incurred as per job card:	₹
Direct materials	7,500
Direct labour	2,000
Overheads	6,000
(b) Selling price per meter	450
(c) Selling and distribution expenses: 30% of the sale value.	
(d) 25 meters are completed and transferred to the stock of finished goods.	
(e) Completion stage of work-in-progress:	
Direct materials	100%
Direct labour	60%
Overheads	60%

[I.C.W.A. (Inter) - Adapted]

- 10.26 AB Ltd. is engaged in the process engineering industry. During the month of April, 2017, 2000 units were introduced in Process X. The normal loss is estimated at 5% of input. At the end of the month 1,400 units had been produced and transferred to Process Y; 460 units were incomplete and 140 units had to be scrapped at the end of the process. The incomplete units reached the following degree of completion:

Materials	75%
Labour	50%
Overheads	50%

Following are the further details regarding Process X:

Cost of 2000 units introduced	₹ 58,000
Additional materials consumed	₹ 14,400
Direct labour	₹ 33,400
Allocated overheads	₹ 16,700

Note: The scrapped units fetched ₹ 10 each.

Required:

- (i) Statement of equivalent production; (ii) Statement of cost; (iii) Statement of evaluation; and
- (iv) Process X Account.

[I.C.W.A. (Inter) - Adapted]

Equivalent Production - FIFO Method

10.27 From the following particulars extracted from the books of Y Ltd. for the month of August, 2017 prepare the following using FIFO Method:

- (i) Statement of Equivalent Production;
- (ii) Statement of Apportionment of Cost; and
- (iii) Process Account.

Particulars

(a)	Opening stock as on 1st August	:	200 units @ ₹ 4 per unit
	Degree of completion		Materials 100%
			Labour and Overheads 40%
(b)	Inputs introduced during August	:	1,050 units
(c)	Outputs transferred to the next process	:	1,100 units
(d)	Closing stock as on 31st August	:	150 units
	Degree of completion	:	Materials 100%
			Labour and Overheads 70%
(e)	Other relevant information regarding the process are:	₹	
	Materials		3,150
	Labour		4,500
	Overheads		2,250

FIFO Method — Losses in Process

10.28 Prepare a statement of Equivalent Production, Cost Statement, Statement of Valuation and Process Account from the following particulars using FIFO method:

- (a) Opening work-in-progress - 900 units at ₹ 4,500
Degree of completion: Materials - 100%; Labour and overheads - 60%.
- (b) Input of materials - 9,100 units at ₹ 27,300.
Expenses: Labour - ₹ 12,300; Overheads - ₹ 8,200.
- (c) Units scrapped - 1,200 units.
Degree of completion: Material - 100%; Labour and overheads - 70%.
- (d) Closing work-in-progress - 1000 units
Degree of completion: Materials - 100%; Labour and overheads - 80%.
- (e) Finished units transferred to next process - 7,800.
- (f) Normal scrap - 10% of input: Scrap realisation @ ₹ 3 per unit.

If the above statements are prepared under Average Cost Method do you need any more details?

10.29 The manufacturing of one of the products of A Ltd. requires three separate processes. In the last of the three processes, costs, production and stock for the month just ended were:

1. Transfers from Process 2 - 1,80,000 units at a cost of ₹ 3,94,200.
2. Process 3 costs : Materials ₹ 1,10,520; conversion costs ₹ 76,506.
3. Work-in-progress at the beginning of the month: 20,000 units at a cost of ₹ 55,160 (based on FIFO pricing method). Units were 70% complete for materials and 40% complete for conversion costs.
4. Work-in-progress at the end of the month: 18,000 units which were 90% complete for materials and 70% complete for conversion costs.
5. Product is inspected when it is complete. Normally no losses are expected, but during the month 60 units were rejected and sold for ₹ 1.50 per unit.

Required:

- (a) Prepare the Process 3 Account for the month just ended.
- (b) Explain how and why, your calculations would be affected if the 60 units lost were treated as normal losses.

10.100 Process Costing

- 10.30 Adam, the management accountant of Mark Limited, has on file the costs per equivalent unit for the company's process for the last month but the input costs and quantities appear to have been mislaid. Information that is available to Adam for last month is as follows:

Opening work-in-progress	100 units, 30% complete
Closing work-in-progress	200 units, 40% complete
Normal loss	10% of input valued at ₹ 2 per unit
Output	1,250 units

The losses were as expected and Adam has a record of there being 150 units scrapped during the month. All materials are input at the start of the process. The cost per equivalent unit for materials was ₹ 2.60 and for conversion cost was ₹ 1.50.

Mark Limited uses the FIFO method of stock valuation in its process account.

Required:

- Calculate the units input into the process.
- Calculate the equivalent units for materials and conversion costs.
- Using your answer from (b) calculate the input costs.

FIFO Method — Abnormal Gains

- 10.31 The following data pertain to Process I for March 2017 of Beta Limited:

Opening work-in-progress : 1,500 units at ₹ 15,000

Degree of completion: Materials: 100%; Labour and overheads : $33\frac{1}{3}\%$

Input of materials : 18,500 units at ₹ 52,000.

Direct labour ₹ 14,000

Overheads ₹ 28,000

Closing work-in-progress : 5,000 units

Degree of completion: Materials : 90%; Labour and overheads : 30%.

Normal process loss is 10% of total (units representing opening work-in-progress + units put in).

Scrap value ₹ 2.00 per unit.

Units transferred to the next process - 15,000 units.

You are required to:

- Compute equivalent units of production.
- Compute cost per equivalent unit for each cost element, i.e., materials, labour and overheads.
- Compute the cost of finished output and closing work-in-progress.
- Prepare the process and other accounts.

Assume:

- FIFO method is used by the company.
- The cost of opening work-in-progress is fully transferred to the next process.

[C.A. (Inter) - Adapted]

- 10.32 Partlet Ltd. makes a product that passes through two manufacturing processes. A normal loss equal to 8% of the raw material input occurs in Process I but no loss occurs in Process II. Losses have no realisable value.

All the raw materials required to make the product is input at the start of Process I. The output from Process I each month is input into Process II in the same month. Work-in-Progress occurs in Process II only.

Information for last month for each process is as follows:

Process I

Raw material input	50,000 litres at a cost of ₹ 3,65,000
Conversion costs	₹ 2,56,000
Output to Process II	47,000 litres

Process II

Closing Work-in-progress : 5,000 litres (40% complete for conversion costs) valued at ₹ 80,000

Conversion costs : ₹ 3,92,000

Closing Work-in-Progress : 2,000 litres (50% complete for conversion costs)

Required:

- (a) Prepare the Process I Account for last month.
- (b) Calculate in respect of Process II for last month:
 - (i) the value of the completed output; and
 - (ii) the value of closing work-in-progress.
- (c) If the losses in Process I were toxic and the company incurred costs in safely disposing of them, state how the disposal costs associated with the normal loss would have been recorded in the Process I Account. No calculations are required.

- 10.33 A company operates several production processes involving the mixing of ingredients to produce bulk animal feedstuff. One such product is mixed in two separate process operations. The information below is of the costs incurred in, and output from, Process 2 during the period just completed:

Costs incurred:

	₹
Transfers from Process 1	1,87,704
Raw materials costs	47,972
Conversion costs	63,176
Opening work-in-progress	3,009

Production:

	Units
Opening work-in-progress	1,200
(100% complete, apart from Process 2 conversion costs which were 50% complete)	
Transfers from Process 1	1,12,000
Completed output	1,05,400
Closing work-in-progress	1,600
(100% complete, apart from Process 2 conversion costs which were 75% complete)	

Normal wastage of materials (including product transferred from process I), which occurs in the early stages of Process 2 (after all materials have been added), is expected to be 5% of input. Process 2 conversion costs are all apportioned to units of good output. Wastage materials have no saleable value. Prepare the Process 2 Account for the period, using FIFO principles.

- 10.34 From the following information for the month ending October 2017, prepare Process Cost Accounts for Process III. Use FIFO method to value equivalent production.

Direct material added in Process III (Opening WIP) 2,000 units at ₹ 25,750

Transfer from Process II	53,000 units at ₹ 4,11,500
Transferred to Process IV	48,000 units
Closing Stock of Process III	5,000 units
Units Scrapped	2,000 units
Direct material added in Process III	₹ 1,97,600
Direct Wages	₹ 97,600
Production Overheads	₹ 48,800

Degree of Completion :	Opening Stock	Closing Stock	Scrap
Materials	80%	70%	100%
Labour	60%	50%	70%
Overheads	60%	50%	70%

The normal loss in the process was 5% of production and scrap was sold at ₹ 3 per unit.

10.102 Process Costing

Equivalent Production – Weighted Average Method

- 10.35 Process 2 receives units from Process 1 and after carrying out work on the units transfers them to Process 3. For the accounting period the relevant data were as follows:

Opening WIP 200 units (25% complete) valued at	₹ 5,000
800 units received from Process I valued at	₹ 8,600
840 units were transferred to Process 3	
Closing WIP 160 units (50% complete)	

The costs of the period were ₹ 33,160 and no units were scrapped.

Required: Prepare the Process Account for Process 2 using the Average Cost method of valuation.

[C.A. (Inter) – Adapted]

- 10.36 A company produces a component, which passes through two processes. During the month of April 2006, materials for 40,000 components were put into Process I of which 30,000 were completed and transferred to Process II. Those not transferred to Process II were 100% complete as to materials cost and 50% complete as to labour and overheads cost. The Process I costs incurred were as follows:

Direct Materials	₹ 15,000
Direct Wages	₹ 18,000
Factory Overheads	₹ 12,000

Of those transferred to Process II, 28,000 units were completed and transferred to finished goods stores. There was a normal loss with no salvage value of 200 units in Process II. There were 1,800 units, remained unfinished in the process with 100% complete as to materials and 25% complete as regard to wages and overheads.

No further process material costs occur after introduction at the first process until the end of the second process, when protective packing is applied to the completed components. The process and packing costs incurred at the end of the Process II were :

Packing Materials	₹ 4,000
Direct Wages	₹ 3,500
Factory Overheads	₹ 4,500

Required:

- (i) Prepare Statement of Equivalent Production, Cost per unit and Process I Account.
(ii) Prepare Statement of Equivalent Production, Cost per unit and Process II Account.

[C.A. (PE-II) – May, 2006]

- 10.37 A company operates expensive process plant to produce a single product from one process. At the beginning of October, 3,400 completed units were still in the process plant, awaiting transfer to finished stock. They were valued as follows:

	₹
Direct material	25,500
Direct wages	10,200
Production overhead (200% of direct wages)	20,400

During October 37,000 further units were put into process and the following costs charged to the process:

	₹
Direct materials	2,76,340
Direct wages	1,12,000
Production overhead	2,24,000

36,000 units were transferred to finished stock and 3,200 units remained in work-in-progress at the end of October, which were complete as to material and half complete as to labour and production overhead. A loss of 1,200 units being normal occurred during the process.

The average method of pricing is used.

You are required to prepare, for the month of October, a statement (or statements) showing:

- (i) production cost per unit in total and by element of cost
- (ii) the total cost of production transferred to finished stock
- (iii) the valuation of closing work-in-progress in total and by element of cost.

- 10.38 Chemical Processors manufacture Wonderchem using two processes, mixing and distillation. The following details relate to the distillation process for a period.

No opening work-in-progress (WIP)	₹
Input from mixing 36,000 kg at a cost of	1,66,000
Labour for period	43,800
Overheads for period	29,200
Closing WIP of 8,000 kg which was 100% complete for materials and 50% complete for labour and overheads. The normal loss in distillation is 10% of fully complete production. Actual loss in the period was 3,600 kg fully complete, which were scrapped.	

Required:

- (a) Calculate whether there was a normal or abnormal loss or abnormal gain for the period.
- (b) Prepare the Distillation Process Account for the period, showing clearly weights and values.

- 10.39 SG Ltd. produces a product which passes through two processes namely CRA and REF. The particulars for May 2017 are as under:

	Units	₹	₹
(i) Stock as on 1st May, 2017			
Raw materials			25,000
Work-in-process - CRA	5,000		
Direct materials, 100% complete		62,500	
Direct labour, 50% complete		15,000	
Overheads, 50% complete		<u>18,000</u>	95,500
Work-in-process - REF	1,000		
Direct materials, 100% complete		1,00,000	
Direct labour, 25% complete		3,250	
Overheads, 25% complete		<u>2,600</u>	1,05,850
(ii) Cost and output for May, 2017			
Raw material purchased			3,50,000
Raw materials issued to:			
Process CRA		2,61,450	
Process REF		<u>67,150</u>	3,28,600
Other costs of Process CRA:			
Direct labour		1,16,250	
Overheads		<u>1,32,690</u>	2,48,940
Other costs of Process REF:			
Direct labour		76,750	
Overheads		<u>61,114</u>	1,37,864
(iii) Finished output of process CRA transferred to process REF : 20,000			
Finished output of process REF transferred to stock of finished goods : 20,200			
(iv) On 31st May, 2017 the stocks of work-in-progress are:			
Process CRA	4,000 Units		
Degree of completion:			
Raw materials	100%		
Labour and overheads	25%		

10.104 Process Costing

Process REF	800
Degree of completion:	
Raw materials	100%
Labour and overheads	50%
You are required to prepare statements showing the following for both the processes:	
(a) Cost per unit of equivalent production; (b) Value of closing stock as on 31st May, 2017; and	
(c) Process Cost Accounts.	

Inter-process Profit

- 10.40 A certain product passes through three processes before it is transferred to finished stock. The following information is obtained for the month of January (all figures in ₹):

Process	I	II	III	Finished stock
Opening stock	20,000	24,000	16,000	60,000
Direct material	40,000	42,000	60,000	-
Direct wages	30,000	30,000	32,000	-
Production overheads	28,000	12,000	80,000	-
Closing stock	10,000	12,000	8,000	30,000
Profit on cost of each process	33-1/3%	25%	25%	-
Inter-process Profit for opening stock	-	4,000	4,000	22,000

Stock in processes are valued at **prime cost** and finished stock has been valued at price at which it is received from Process II. Sales during the period were ₹ 7,00,000.

[I.C.W.A. (Inter) - Adapted]

- 10.41 A Limited produces a product which passes through two processes before it is completed and transferred to finished stock. The following data relate to September, 2017 (all figures in ₹):

	Process I	Process II	Finished Stock
Opening stock	3,000	3,600	9,000
Direct materials	6,000	6,300	-
Direct wages	4,480	4,500	-
Factory Overheads	4,200	1,800	-
Closing Stock	1,480	1,800	4,500
Inter-process profit including in opening stock-		600	3,300

Output of Process I is transferred to Process II at 25% profit on transfer price and output of Process II is transferred to finished stock at 20% profit on the transfer price. Stocks in process are valued at **prime cost**. Finished stock is valued at the price at which it is received from Process II. Sales during the period were ₹ 56,000.

You are required to prepare Process Cost Accounts and Finished Stock Account showing the profit element at each stage.

[C.A. (Inter) - Adapted]

Guide to Answers

- 10.1 **Process A** : Abnormal loss : 50 units; cost of abnormal loss : ₹ 210 (50 @ ₹ 4.202 approx.)
 Cost of goods transferred to process B : ₹ 19,750 (4,700 @ ₹ 4.202 approx.)
Process B : Abnormal loss : 80 units ; cost of abnormal loss : ₹ 542 (80 @ ₹ 6.774)
 Cost of goods transferred to finished stock : ₹ 28,114 (4,150 @ ₹ 6.774)
- 10.2 **Process A** : Cost per unit : ₹ 10; Cost of goods transferred to Process B : ₹ 19,000.
Process B : Cost per unit : ₹ 20; Cost of abnormal loss : ₹ 600 (30 @ ₹ 20); Cost of goods transferred to Process C : ₹ 33,600 (₹ 1,680 @ ₹ 20)
Process C : Cost per unit : ₹ 38; Cost of abnormal loss : ₹ 2,736 (72 @ ₹ 38); Cost of goods transferred to finished stock : ₹ 57,000 (1,500 @ ₹ 38)

- 10.3 Cost per unit : 35.56 (approx.) Cost of abnormal loss = ₹ 3,556 (100 units @ ₹ 35.56). Abnormal loss debited to costing Profit and Loss Account = ₹ 3,056. Cost of goods transferred to next process : ₹ 60,444 (1,700 units @ ₹ 35.56).
- 10.4 **Process A** : Abnormal loss : 100 units; Cost per unit : ₹ 0.97. Cost of abnormal loss : ₹ 97. Cost of goods transferred to Process B : ₹ 18,883 (19,500 @ ₹ 0.97).
Process B : Abnormal Gain : 275 units. Cost per unit : ₹ 1.395 (approx.); Value of abnormal gain : ₹ 384; Cost of goods transferred to Process C : ₹ 26,218 (18,800 @ ₹ 1.395 approx.).
Process C : Abnormal loss : 920 units. Cost per unit : ₹ 1.852 (approx.); Cost of abnormal loss : ₹ 1,704. Cost of goods transferred to finished stock : ₹ 29,638 (16,000 @ ₹ 1.852).
 Abnormal loss debited to Costing Profit and Loss Account = ₹ 1,612 (92 + 1,520). Abnormal gain credited to Costing Profit and Loss Account ₹ 370.
- 10.5 **Process A** : Abnormal loss : 50 units; Cost per unit : ₹ 6. Cost of abnormal loss : ₹ 300. Cost of goods transferred to process B : ₹ 28,200 (4,700 × ₹ 6).
Process B : Abnormal gain : 70 units. Cost per unit : ₹ 12. Value of abnormal gain : ₹ 840. Cost of goods transferred to finished stock : ₹ 51,600 (4,300 @ ₹ 12).
 Abnormal loss debited to Costing Profit and Loss Account = ₹ 250.
 Abnormal gain credited to Costing Profit and Loss Account = ₹ 490.
- 10.6 **Process I** : Cost per unit : ₹ 20; Cost of goods transferred to Process II : ₹ 9,000 (450 @ ₹ 20).
Process II : Cost per unit : ₹ 50; Abnormal loss : 20 units; Cost of abnormal loss : ₹ 1,000. Cost of goods transferred to Process III : ₹ 17,000 (340 units @ ₹ 50).
 Process III : Cost per unit : ₹ 80. Abnormal gain : 15 units. Value of abnormal gain : ₹ 1,200. Cost of goods transferred to finished stock : ₹ 21,600 (270 units @ ₹ 80).
 Abnormal loss debited to Costing Profit and Loss Account ₹ 920; Abnormal gain credited to Costing Profit and Loss Account ₹ 1,25.
- 10.7 Cost per unit : ₹ 1.60; Abnormal yield ₹ 280 units. Value of abnormal yield = ₹ 448. Abnormal yield credited to Costing Profit and Loss Account = ₹ 260 [₹ 448 - ₹ 140 (scrap value) - ₹ 92 (royalty payable on abnormal yield)].
- 10.8 **Process A** : Cost per unit = ₹ 18.575. Cost of abnormal loss = ₹ 3,715. Cost of goods transferred to Process B = ₹ 26,005.
Process B : Cost per unit = ₹ 21.75. Abnormal gains 100 units. Value of abnormal gain = ₹ 2,175. Cost of goods transferred to finished stock = ₹ 56,989 (2,620 @ ₹ 21.75). Abnormal loss debited to Costing Profit and Loss Account = ₹ 3,615.
 Abnormal gain credited to costing profit and loss Account = ₹ 1,993.
- 10.9 **Process A** : Cost per unit = ₹ 35. Cost of goods transferred to Process B = ₹ 15,75,000.
Process B : Cost per unit = ₹ 50. Cost of goods transferred to Finished Stock = ₹ 21,60,000.
 Normal Loss 4%.
- 10.10 **Process X** : Abnormal wastage = 2,000 units. Cost of abnormal loss = ₹ 6,000 (2,000 @ ₹ 3).
Process Y : Abnormal Gain = ₹ 1,200 units. Value of abnormal gain = ₹ 6,106. Net abnormal loss debited to Costing Profit and Loss Account = ₹ 5,000. Net abnormal gain credited to Costing Profit and Loss Account = ₹ 3,706. Net Profit = ₹ 37,900.
- 10.11 **Process A** : Abnormal loss : 150 units. Cost of abnormal loss = ₹ 25,500. Cost per unit = ₹ 170. Cost of goods transferred to Process B = ₹ 10,71,000.
Process B : Cost per unit : ₹ 230. Abnormal gain 30 units @ ₹ 230. Cost of goods transferred to Process C = ₹ 8,74,000.
Process C : Cost per unit : ₹ 250. Abnormal loss = 26 units. Cost of abnormal loss = ₹ 6,500 (25 × 250).
 Net Profit = ₹ 13,69,740.

10.106 Process Costing

- 10.12 **Process A** : Cost per unit : ₹ 1.25. Abnormal loss = 200 units. Cost of Abnormal loss = ₹ 250. Cost of goods transferred to Process B : ₹ 49,733 (40,000 units @ ₹ 1.2433 approx.).
Process B : Cost per unit : ₹ 1.7287. Abnormal gain = 500 units. Value of abnormal gain ₹ 864 (500 @ ₹ 1.7287). Cost of goods transferred to Finished Stock Account = ₹ 57,392 (33,500 units @ ₹ 1.7132).
- 10.13 **Input in Process 1** : 1,00,000 kg. Cost of raw materials required = ₹ 5,00,000 (1,00,000 × ₹ 5).
Effect: The input is 2.5 times of the final output. Therefore, for variation of every rupee in the cost of raw materials, the final effect will be ₹ 2.50.
- 10.14 **Input required for final output** : Operation 1 – 2.20; Operation 2 – 1.50; Operation 3 – 1.40; Operation 4 – 1.30; Operation 5 – 1.20. Total labour and overhead cost of all operations for one unit of final output = ₹ 60.50.
- 10.15 **Process A** : Cost per unit : ₹ 2.639. Cost of goods transferred to Process B : ₹ 25,075.
Process B : Cost per unit : ₹ 5.283. Cost of goods transferred to Process C = ₹ 48,185.
Process C : Cost per unit : ₹ 8.00 Cost of goods transferred to Finished Stock = ₹ 67,392. Percentage of wastage = 7.63%.
- 10.16 Percentage of normal loss in Process C : $[(456 \text{ units} / 9,120 \text{ units}) \times 100] = 5\%$.
Cost of goods transferred to Finished Stock = ₹ 69,312.
- 10.17 **Cost per unit** : Process A : ₹ 5.50, Process B : ₹ 12, Process C : ₹ 16, and Process D : ₹ 11.
Cost of goods transferred to next Process or Finished Stock : A ₹ 31,680; B ₹ 61,200; C ₹ 69,920; and D ₹ 4,950.
Abnormal Loss (Net) debited to Costing Profit and Loss Account : ₹ 921.
Abnormal Gain (Net) credited to Costing Profit and Loss Account : ₹ 660.
- 10.18 **Total Joint Production Cost** (A + B) = 74,500 litres @ ₹ 3.80 = ₹ 2,83,100.
Net Realisable Value of A : ₹ 2,68,200. Net Realisable Value of B : ₹ 2,68,200.
Production : A 44,700 litres; B : 29,800 litres. **Share of Joint Production Cost** : A ₹ 1,41,550, B ₹ 1,41,550.
Abnormal Loss : 1,500 litres. Cost of Abnormal Loss : ₹ 5,700.
Total of Process Account X = ₹ 2,91,800.
- 10.19 **Net cost of production** = ₹ 4,71,240. Equivalent good units sold = 792 MT. Price per MT (5,54,400 ÷ 792) = ₹ 700 per MT. Discounted price per MT = ₹ 630 per MT.
- 10.20 **Consumption of materials** : ₹ 13,90,000. Standard Production : 615.60 tonnes. Actual Production : 563.04 tonnes. Cost of Finished Product per tonne : Standard = ₹ 2,092 (approx.). Actual = ₹ 2,255 (approx.).
Sale of Scrap : Standard – ₹ 1,02,400. Actual – ₹ 1,20,560.
- 10.21 **Pressing Process** : Equivalent Production : Materials = 1,200 units. Labour and Overhead = 11,20 units. Cost of units completed = ₹ 3,80,000. Value of WIP = ₹ 52,000.
Polishing Process : Equivalent Production : Materials = ₹ 1,000 units. Labour and Overhead = 750 units. Cost per unit = ₹ 460. Cost of units completed = ₹ 2,30,000. Value of WIP = ₹ 2,12,000.
Selling Price per unit = ₹ 613.33.
- 10.22 **Process 1** : (a) Equivalent Production : Materials = 38,000 units. Labour and Overhead = 37,000 units. (b) Cost per Equivalent unit = ₹ 2.5519. (c) Cost of goods transferred to Process II = ₹ 91,869. Value of WIP = ₹ 4,131.
Process II : (a) Equivalent Production : Materials = 34,500 units. Labour and Overhead = 33,250 units. (b) Cost per Equivalent unit = ₹ 3.7456. (c) Cost of goods transferred to Finished Stock = ₹ 1,19,859. Value of Closing Stock = ₹ 8,010.
- 10.23 It is to be noted that 11,000 kg were put into process. 8,600 kg were completed and transferred. Therefore, WIP is 2,400 kg consisting of two batches, one of 600 kg, 60% complete and another 1,800 kg, 25% complete.
(i) **Cost per kg of completed production** = ₹ 11.00 (₹ 5 + ₹ 4 + ₹ 2).
(ii) **Value of WIP** : Batch (1) = ₹ 5,160 + Batch (2) = ₹ 11,700 = **Total** = ₹ 16,860.

- 10.24 **Machining Operations** : (a) Equivalent production : Materials = 90,000 units. Labour = 80,000 units; and Overhead = 80,000 units. (b) Cost per equivalent unit = ₹ 5.40. (c) Cost of goods transferred to Finished Operation = ₹ 3,24,000. Value of closing WIP = ₹ 1,38,000.
Finishing Operation : (a) Equivalent production = 60,000 units after all element of cost. (b) Cost per equivalent unit = ₹ 8.40.
- 10.25 **Equivalent production** : Direct Materials = 50 units. Direct labour and overhead = 40 units. Total cost per meter is ₹ 350. **Finished Stock is valued** at NRV or Cost whichever is lower : (i) NRV (Net Realisable Value) = 450 – 135 = 315. (ii) Cost per metre = ₹ 350.
 (a) **Value of finished goods** will be : $25 \times ₹ 315 = ₹ 7,875$.
 (b) **Value of WIP** :

Direct Materials = $25 \times ₹ 150$	3,750
Direct Labour and Overheads = $15 \times ₹ 200$	<u>3,000</u>
Total	<u>6,750</u>
- 10.26 (a) **Equivalent Production** : Material = 1,785 units. Labour and Overhead = 1,670 units.
 (b) Cost per equivalent unit = ₹ 70.
 (c) Cost of goods transferred to Process 'Y' ($1,400 \times ₹ 70$) = ₹ 98,000
Cost of Abnormal Loss = ₹ 2,800. **Value of Closing WIP** = ₹ 20,700
- 10.27 (a) **Equivalent production** : Materials = 1,050 units. Labour and Overhead = 1,125 units.
 (b) Cost per equivalent unit = ₹ 9.00
 (c) Cost of goods transferred to next Process = ₹ 9,620. Value of Closing WIP = ₹ 1,080.
- 10.28 (a) **Equivalent production** : Materials = 8,100 units. Labour and Overhead = 8,200 units.
 (b) Cost per equivalent unit = ₹ 5.50.
 (c) Cost of goods transferred to next Process = ₹ 43,350.
 Cost of Abnormal Loss = ₹ 950. Value of Closing WIP = ₹ 5,000.
- 10.29 (a) **Equivalent production** :
 Material (1) = 1,80,000 units, Material (2) = 1,84,200 units. Conversion cost = 1,86,600 units.
 (b) Cost per equivalent unit = ₹ 3.20.
 (c) Cost of completed production = ₹ 5,81,888.
Value of Closing WIP = ₹ 54,306. **Cost of Abnormal Loss** = ₹ 192.
- 10.30 (a) **Units input into the process** = 1,500 units. (b) Equivalent units : Materials = 1,350 units; Conversion Cost = 1,300 units. (c) Cost incurred in period : Materials = ₹ 3,810. Conversion cost = ₹ 1,950.
- 10.31 (a) **Equivalent production** : Materials = 16,000 units. Labour and Overhead = 14,000 units.
 (b) Cost per equivalent unit = ₹ 6.
 (c) Cost of output transferred to next Process = ₹ 99,000.
Value of Closing WIP = ₹ 18,000. **Value of Abnormal Gain** = ₹ 12,000.
- 10.32 (a) **Process I** : Cost of output transferred to Process II = ₹ 6,34,500. Abnormal Gain = ₹ 13,500.
 (b) **Process II** : Cost per equivalent litre = ₹ 8. (i) Value of completed output = ₹ 10,71,500. (iii) Value of Closing WIP = ₹ 35,000. (c) Disposal Cost would be debited to the Process Account.
- 10.33 It is assumed that the normal loss occurs at the beginning of the process and shall be allocated to completed production and closing WIP. It is also assumed that Process 2 conversion cost are not incurred when losses occur. Therefore, loss should not be allocated to Conversion Costs.
 (a) Equivalent production : Materials = ₹ 1,06,400 units; Conversion cost = ₹ 1,06,000 units.
 (b) Cost per equivalent unit = ₹ 2,215.
 (c) Cost of output transferred to Finished Stock = ₹ 2,96,273. Cost of Abnormal Loss = ₹ 1,329. Value of Closing WIP = ₹ 4,259.

10.108 Process Costing

- 10.34 (a) **Equivalent production** : Material (1) = 50,500 units, Material (2) ₹ 49,400 units. Labour and Overhead = 48,800 units.
(b) Cost per equivalent unit = ₹ 15.
(c) Cost of goods transferred to Process IV = ₹ 7,19,750.
Value of Abnormal Gain = ₹ 7,500.
Value of Closing WIP = ₹ 61,500.
- 10.35 **Equivalent production** : Materials = 920 units. Labour and Overhead = 920 units.
Average Cost per completed unit = ₹ 50.826
Cost of output transferred to Process 3 = ₹ 42,694.
Value of Closing WIP = ₹ 4,066.
- 10.36 **Process 1** : (a) Equivalent production : Materials = 40,000 units. Labour and Overhead = 35,000 units.
(b) Cost per equivalent unit : Material = ₹ 0.375; Labour and Overhead = ₹ 0.8571 each.
(c) Cost of output transferred to Process II = ₹ 36,964.
Value of Closing WIP = ₹ 8,036.
Process 2 : (a) Equivalent production : Materials = 29,800 units. Labour and Overhead = 28,450 units.
(b) Cost per equivalent unit : Material = ₹ 1.24; Labour and Overhead = ₹ 0.2812 each.
(c) Cost of output transferred to Finished Stock = ₹ 46,605.
Value of Closing WIP = ₹ 2,359.
- 10.37 The question does not indicate at what stage in the production process the normal loss is detected. It is assumed that the normal loss is detected at the end of the production process, consequently it is not allocated to WIP. Therefore, total cost of production transferred to Finished Stock is ₹ **6,29,416**.
(a) Equivalent production : Material = 40,400 units; Conversion Cost = 38,800 units.
(b) Cost per unit : Material = ₹ 7.47; Conversion Cost = ₹ 9.45; **Total = ₹ 16.92**.
- 10.38 In this problem, normal loss has been allocated between completed units, abnormal loss and WIP.
(a) Equivalent Process Cost = 33,200 units. Conversion Cost = 29,200 units.
(b) Cost per equivalent unit : ₹ 7.50 each.
(c) Cost of finished output transferred = ₹ 1,83,000
Cost of Abnormal Loss = ₹ 6,000.
Value of WIP = ₹ 50,000.
- 10.39 **Process CRA** :
(a) Equivalent production : Material = 19,000 units; Labour and Overhead = 18,500 units.
(b) Cost per equivalent unit = ₹ 27.217 (13.761 + 6.284 + 7.172).
(c) Cost of finished output transferred to Process REF = ₹ 5,37,390.
Value of Closing WIP = ₹ 68,500.
Process REF :
(a) Equivalent production : Material = 20,000 units; Labour and Overhead = 20,350 units.
(b) Cost per equivalent unit = ₹ 37.16 (30.2270 + 3.7715 + 3.0031).
(c) Cost of finished output transferred to Finished Stock = ₹ 8,21,362.
Value of Closing WIP = ₹ 26,892.
- 10.40 **Process I** : Transferred to process II : Total ₹ 1,44,000. Cost = ₹ 1,08,000; Profit = ₹ 36,000
Process II : Transferred to process III : Total ₹ 3,00,000. Cost = ₹ 2,02,000; Profit = ₹ 98,000
Process III ; Transferred to Finished Stock : Total ₹ 6,00,000. Cost = ₹ 3,80,000; Profit = ₹ 2,20,000
Actual Profit = ₹ 3,01,000.
- 10.41 **Process I** : Transferred to Process II : Total = ₹ 21,600; Cost = ₹ 16,200; Profit = ₹ 5,400.
Process II : Transferred to Finished Stock : Total = ₹ 45,000; Cost = ₹ 30,300; Profit = ₹ 14,700.
Actual Profit = ₹ 23,000.