Cost Accounting

Paper – I

[B.Com. (Accounting and Finance) Programme at Semester I with Effect from the Academic Year 2013-2014]

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Preface

We are happy to present this book ***"Cost Accounting"*** Paper – I to the students of F.Y. BAF. In this edition, an effort has been made to incorporate professional examination questions at relevant places in the book.

The syllabus contains a list of topics covered in each chapter which will avoid controversies regarding the exact scope of the syllabus. The text follows the term-wise chapter topics pattern prescribed in the syllabus. We have preferred to leave the text of the section and rules as it is and thereafter, added the comments with the intention of explaining the subject to the students in a simplified language. While making an attempt to explain in a simplified language, any mistake of interpretation might have crept in. This book is an unique presentation of subject matter in an orderly manner. This is a student-friendly book and tutor at home. We hope the teaching faculty and students community will find this book of great use.

We are extremely grateful to students of F.Y. BAF and Mr. K.N. Pandey of Himalaya Publishing House Pvt. Ltd., for their devoted and untiring personal attention accorded by them to this publication. I gratefully acknowledge and express my sincere thanks to the following people without whose inspiration, support and constructive suggestions, this book would not have been possible.

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- ***Dr. Chaitaly Chakraborty*** *(Principal, Thakur College)*
- ***Mrs. Janki Nishikhant Jha***

We welcome suggestions from students and teachers for further improvement of the book.

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Syllabus

Modules at a Glance

Sr. No.	Modules/Units	No. of Lectures
1	Introduction to Cost Accounting	12
2	Material Cost	14
3	Labour Cost	12
4	Overheads	12
	Total	50

Sr. No.	Modules/Units
1.	**Introduction to Cost Accounting**
	Evolution Objectives and Scope of Cost Accounting Importance and Advantages of Cost Accounting Difference between Cost Accounting and Financial Accounting Limitations of Financial Accounting Definitions: Cost, Costing and Cost Accounting Classification of Cost on Different Bases Cost Allocation and Apportionment Coding System Essentials of Good Costing System
2.	**Material Cost**
	Material Cost: The Concept Material Control Procedure Documentation Stock Ledger, Bin Card Stock Levels Economic Order Quantity (EOQ)
3.	**Labour Cost**
	Labour Cost: The Concept Composition of Labour Cost Labour Cost Records Overtime/Idle Time/Incentive Schemes
4.	**Overheads**
	Overheads: The Concept Classification of Overheads on Different Bases Apportionment and Absorption of Overheads

QUESTION PAPER PATTERN
External (Semester End) Examination

Maximum Marks: 75

Questions to be Set: 05

Duration: 2.5 Hrs.

All Questions are Compulsory Carrying 15 Marks each.

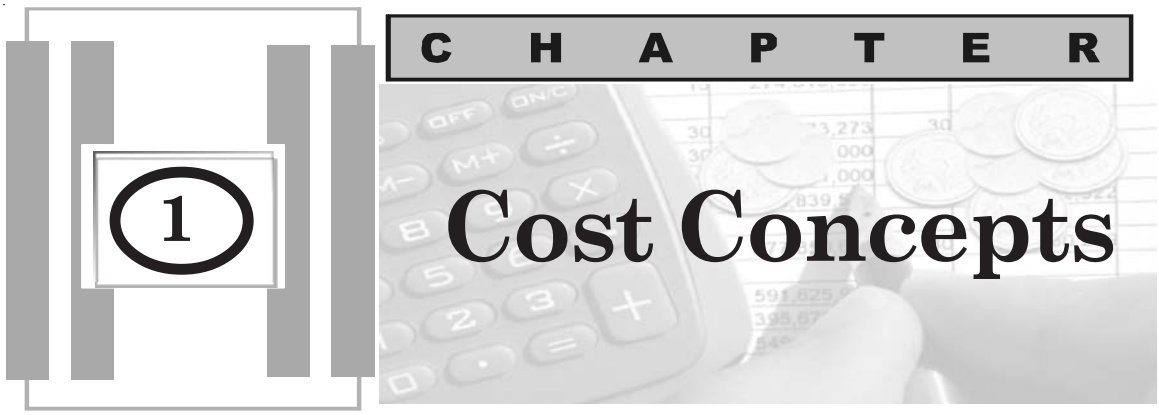
Q.1	Full Length Practical Question	15 Marks
	OR	
Q.1	Full Length Practical Question	15 Marks
Q.2	Full Length Practical Question	15 Marks
	OR	
Q.2	Full Length Practical Question	15 Marks
Q.3	Full Length Practical Question	15 Marks
	OR	
Q.3	Full Length Practical Question	15 Marks
Q.4	Full Length Practical Question	15 Marks
	OR	
Q.4	Full Length Practical Question	15 Marks
Q.5	Full Length Practical Question	15 Marks
	OR	
	Full Length Practical Question	15 Marks

Note: Full Length Question of 15 Marks may be Divided into Two Sub Questions of 08 and 07 Marks.

Internal Examination
Periodical Class Test (20 Marks)

1.	Objective Questions* (1/2 Marks each) (*Multiple Choice/True or False/Match the Columns/Fill in the Blanks)	05 Marks
2.	Answer in one or Two lines (Concept Based Questions) (1 Marks each)	05 Marks
3.	Answer in Brief (Attempt Any Two of Three)	10 Marks

Contents



INTRODUCTION

Cost may be defined as the amount of expenditure (actual or notional) incurred on or attributable to a given item. Cost represents the resources that have been or must be sacrificed to attain a particular objective. These resources can be either direct or indirect.

Objective and Scope of Cost Accounting

Cost information can be used for the following purposes:

- The analysis of profitability of individual products, services or jobs.
- The analysis of profitability of different departments or operations.
- The analysis of cost behaviour of various items of expenditure in the organisation can be done.
- It is used to locate differences between actual results and expected results. Such differences can also be traced to the individual cost center with the efficient cost system.
- It can be used in setting the prices so as to cover cost and generate an acceptable level of profit.

Costing

It means classifying, recording and appropriate allocation of expenditure for the determination of the cost of goods or services and present action of suitably arranged data for the purposes of control and guidance of the management.

Cost Accounting

Cost accounting system is used to record, summarise and report cost information. Some cost information is reported to external users such as shareholders and creditors in the form of income statements and balance sheets. From the cost accounting system, cost accounting information and management accounting information are segregated. Cost accounting information is used for the preparation of balance sheet and income statement whereas management accounting information is used for the purpose of helping managers in their decision making process.

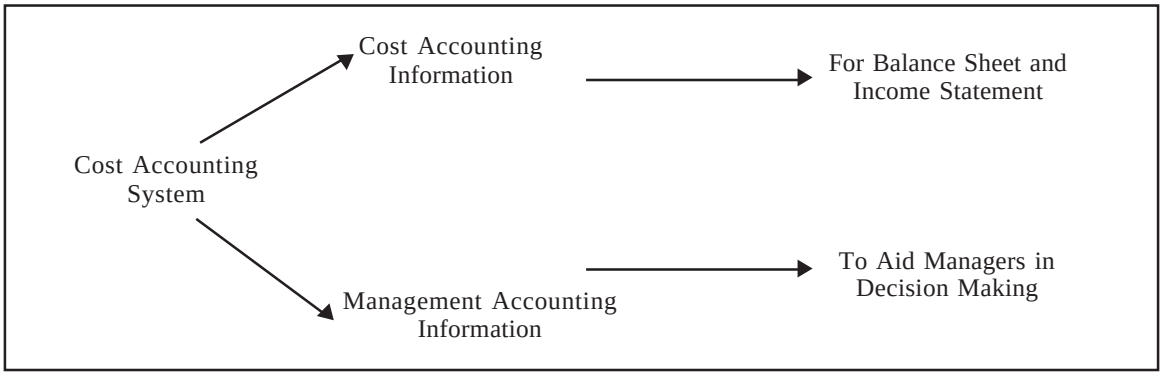


Fig. 1.1

Difference between Financial and Cost Accounting

Sr. No.	Basis	Financial Accounting	Cost Accounting
1	Objective	Financial performance and position	Ascertain cost and cost control
2	Cost and Profit	Shows overall cost and profit/loss	Shows details for each product process, job contract, etc.
3	Control/Report	Emphasis on reporting	Emphasis on control and reporting
4	Decision Making	Limited use	Designed for decision making
5	Responsibility	Does not fix responsibility	Can effectively fix responsibility
6	Time Frame	Focus on historical data	Focus on present and future
7	Type of Reports	General reports like P&L Account, Balance Sheet, Cash Statement	Can generate special reports and analysis
8	Legal Need	Statutory requirement	Voluntary, except for some cases
9	Transactions	Records external transactions	Records internal and external transactions
10	Reader	Everybody	Internal management
11	Formats	Standard, as per law	Tailor-made
12	Access	Everybody, except for some	Very limited access
13	Unit of Value	Monetary	Monetary and physical

TYPES OF COSTS OR COST CLASSIFICATION

The bases of classifying costs are the nature of cost, function, direct/indirect variability, controllability, normality, capital/revenue, time planning and control, managerial decisions, etc. The classification of cost is done based on these factors. The concept of cost center refers to the smallest segment of activity or area of responsibility for which costs are accumulated. A cost unit is nothing but a unit of output in the production of which the costs are incurred. The techniques of costing can be classified as historical costing, absorption costing, marginal costing, direct costing, standard costing and uniform costing.

Different Basis for Classification of Cost

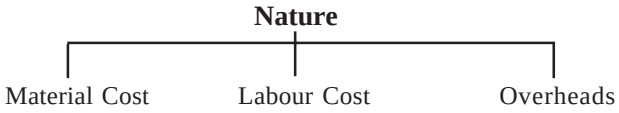
Cost classification is the process of grouping costs according to their common characteristics. A suitable classification of costs is very helpful in identifying a given cost with cost centers or cost units.

Cost may be classified according to their nature, i.e., material, labour and expenses and a number of other characteristics. Depending upon the purpose to be achieved and requirements of a particular concern, the same cost figures may be classified into different categories. The classification of costs can be done in the following ways:

1. By Nature or Element
2. By Functions
3. As Direct and Indirect
4. By Variability
5. By Controllability
6. By Normality
7. By Capital and Revenue
8. By Time
9. According to Planning and Control
10. For Managerial Decisions
11. Others

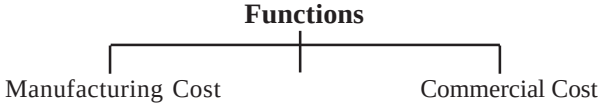
1. By Nature or Element or Analytical Classification

The cost are divided into three categories, i.e., materials, labour and expenses. Further subclassification of each element can be done, for example, material into raw material components, and spare parts, consumable stores, packing material, etc.



2. By Functions

It leads to grouping of costs according to the broad divisions of functions of a business undertaking or basic managerial activities, i.e., production, administration, selling and distribution. According to this classification, cost are divided as follows:



Manufacturing and Production Cost: This category includes the total costs incurred in manufacture, construction and fabrication of units of production.

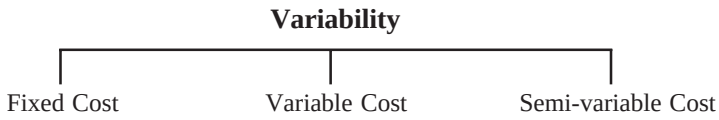
Commercial Costs: This category includes the total cost incurred in the operation of a business undertaking other than the costs of manufacturing and production. Commercial cost may further be subdivided into: *(a)* administrative cost and *(b)* selling and distribution cost.

3. As Direct and Indirect

According to this classification, total cost is divided into direct costs and indirect costs. Direct costs are those costs which are incurred for and may be conveniently identified with a particular cost center or cost unit. The common example of direct costs are materials used and labour employed in manufacturing an article or in a particular process of production. Indirect costs are those costs which are incurred for the benefit of a number of cost centers or cost units and cannot be conveniently identified with a particular cost center or cost units. Examples of indirect costs include rent of building, management salaries, machinery depreciation, etc. The nature of the business and the cost unit chosen will determine the costs as direct and indirect. For example, the hire charges of a mobile crane used on site by a contractor would be regarded as a direct cost since it is identifiable with the project/site on which it is employed, but if the crane is used as a part of the services of a factory, the hire charges would be regarded as indirect cost because it will probably benefit more than one cost center or department. The distinction between direct and indirect cost is essential because the direct cost of product or activity can be accurately identified with the cost object while the indirect costs have to be apportioned on the basis of certain assumptions about their incidence.

4. By Variability

The basis for this classification is the behaviour of costs in relation to changes in the level of activity or volume of production. On this basis, costs are classified into three groups, *viz.*, fixed, variable and semi-variable.



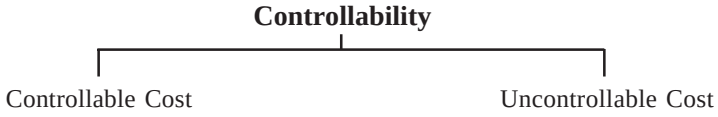
Fixed (or Period) Costs: Fixed costs are those which remain fixed in total with increase or decrease in the volume of output or activity for a given period of time or for a given range of output. Fixed costs per unit vary inversely with the volume of production, that is, fixed cost per unit decreases as production increases and increases as production decreases. Examples of fixed costs are rent, insurance of factory building, factory manager's salary, etc. These costs are constant in total amount but fluctuate per unit as production changes. These costs are known as period costs because these are mostly dependent on time rather than on output. These costs are also termed as capacity costs.

Variable or Product Costs: Variable costs are those which vary in total directly in proportion to the volume of output. These costs per unit remain selectively constant with changes in volume of production on activity. Thus, variable costs fluctuate in total amount but tend to remain constant per unit as production activity changes. Examples are direct material costs, direct labour costs, power, repairs etc. Such costs are known as product costs because they depend on the quantity of output rather on time.

Semi-variable Costs: Semi-variable costs are those which are partly variable. For example, telephone expenses include a fixed portion of monthly charge plus variable charge according to the number of calls made thus total telephone expenses are semi-variable. Other examples of such costs are depreciation, repairs and maintenance of building and plant etc.

5. By Controllability

On this basis, costs are classified into two categories:



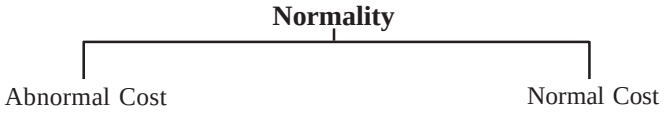
Controllable Costs: If the costs are influenced by the action of a specified member of an undertaking, that is to say, costs which are at least partly within the control of management, they are called controllable costs. An organisation is divided into a number of responsibility centers and controllable costs incurred in a particular cost center can be influenced by the action of the manager responsible for the center. Generally speaking, all direct costs including direct material, direct labour and some of the overhead expenses are controllable by lower level of management.

Uncontrollable Costs: If the costs are influenced by the action of a specified member of an undertaking, that is to say, which are not within the control of management, they are called uncontrollable costs. Most of the fixed costs are uncontrollable. For example, rent of the building is not controllable and so is managerial salaries. Overhead cost which is incurred by one service, section or department and is apportioned to another which receives the service is also not controllable by the latter.

Controllability of costs depends on the level of management (top, middle or lower) and the period of time (long-term or short-term).

6. By Normality

On this basis, the costs are classified into two categories:



Normal Cost: It is the cost which is normally incurred at a given level of output in the conditions in which that level of output is normally attained. It is not a part of cost of production.

Abnormal Cost: It is the cost which is not normally incurred at a given level of output in the conditions in which that level of output is normally attained. It is not a part of cost of production and charged to Costing Profit and Loss Account.

7. By Capital and Revenue or Financial Accounting Classification

If the cost is incurred in purchasing assets either to earn income or increase the earning capacity of the business is called capital cost, for example, the cost of a rolling machine in case of steel plant. Through the cost incurred at one point of time, the benefit accruing from it are spread over a number of accounting years. Revenue expenditure is any expenditure done in order to maintain the earning capacity of the concern such as cost of maintaining an asset or running a business. Example, cost of material used in production, labour charges paid to convert the material into production, salaries, depreciation, repairs and maintenance charges, selling and distribution charges, etc. While calculating cost revenue, items are considered whereas capital items are completely ignored.

8. By Time

Costs can be classified as: *(i)* Historical costs and *(ii)* Predetermined costs.

Time

Historical Cost — Predetermined Cost

Historical Cost: The costs ascertained after being incurred are called historical costs. Such costs are available only when the production of a particular thing has already been done. Such costs are only of historical value and not at all helpful for cost control purposes.

Predetermined Costs: Such costs are estimated costs, i.e., computed in advance of production taking into consideration the previous periods, costs and the factors affecting such costs. If they are determined on scientific basis, they become standard cost. Such costs when compared with actual costs will give the variances and reasons of variance and will help the management to fix the responsibility and take remedial action to avoid its recurrence in future.

9. According to Planning and Control

Cost Accounting furnishes information to the management which is helpful in discharging the two important functions of management, i.e., planning and control. For the purpose of planning and control, costs are classified as budgeted costs and standard costs.

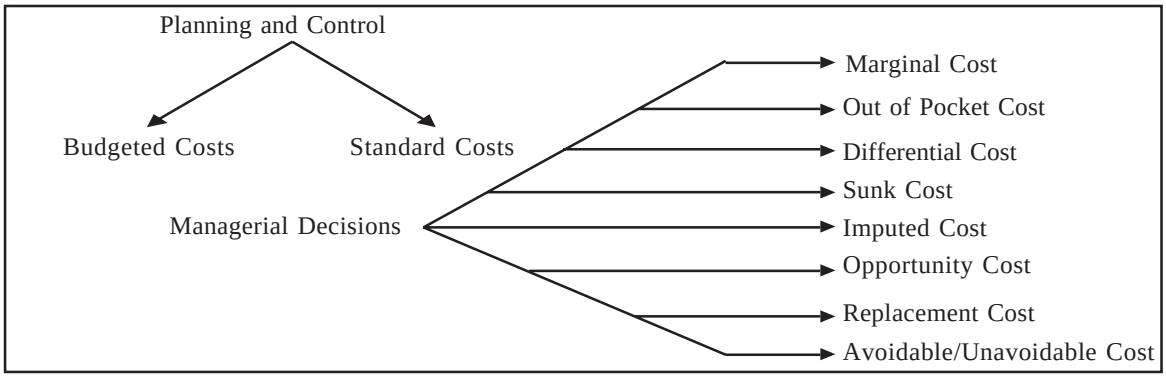


Fig. 1.2

Budgeted Cost: Budgeted costs represent an estimate of expenditure for different phases or segments of business operations, such as manufacturing, administration, sales and research and development for a period of time in future which subsequently becomes the written expression of managerial targets to be achieved. Various budgets are prepared for different phases/segments of business, such as sales budget, raw material cost budget, labour cost budget, cost of production budget, manufacturing overhead budget and office and administration overhead budget. Continuous comparison of actual performance (i.e., actual cost) with that of the budgeted cost is made so as to report the variations from the budgeted cost of the management for corrective action.

Standard Costs: The Institute of Cost and Management Accountants, London defines standard cost as "the predetermined cost based on a technical estimate for materials, labour and overhead for a

selected period of time and for a prescribed set of working conditions." Thus, standard cost is a determination, in advance of production, of what should be its cost under a set of condition.

Budgeted costs and standard costs are similar to each other to the extent that both of them represent estimates of cost for a period of time in future. In spite of this, they differ in the following respects:

- Standard costs are scientifically predetermined costs of every aspect of business activity whereas budgeted costs are mere estimates made on the basis of past actual financial accounting data adjusted to future trends. Thus, budgeted costs are projection of financial accounts whereas standard costs are projection of cost accounts.
- The primary emphasis of budgeted costs is on the planning function of management whereas the main thrust of standard costs is on control.
- Budgeted costs are extensive whereas standard costs are intensive in their application. Budgeted costs represent a macro approach of business operations because they are estimated in respect of the operations of a department. Contrary to this, standard costs are concerned with each and every aspect of business operation carried in department, budgeted costs are calculated for different functions of the business, i.e., production, sales, purchase, etc., whereas standard costs are compiled for various elements of costs, i.e., materials, labour and overhead.

10. For Managerial Decisions

On this basis, costs may be classified into the following categories:

Marginal Cost: Marginal cost is the additional cost incurred if an additional unit is produced. In other words, marginal cost is the total of variable costs, i.e., prime cost plus variable overheads. It is based on the distinction between fixed and variable costs.

Out-of-pocket Costs: This is that portion of the cost which involves payment, i.e., gives rise to cash expenditure as opposed to such costs as depreciation, which do not involve any cash expenditure. Such costs are relevant for price fixation during recession or when make or buy decision is to be made.

Differential Costs: If there is a change in costs due to change in the level of activity or pattern or methods of production, they are known as differential costs. If the change increases the cost, it will be called incremental cost and if the change results in the decrease in cost, it is known as decremental cost.

Sunk Costs: Sunk cost is another name for historical cost. It is a cost that has already been incurred and is irrelevant to the decision making process. A good example is depreciation on a fixed asset. Depreciation on a given asset is a sunk cost because the cost (of purchasing the asset) has already been incurred (when it was purchased) and it cannot be affected by any future action. Though we allocate the depreciation cost to future period, the original cost of the asset is unavoidable. What is relevant in this context is the salvage value of the asset not the depreciation. Thus, sunk costs are not relevant for decision making and are not affected by increase or decrease in volume.

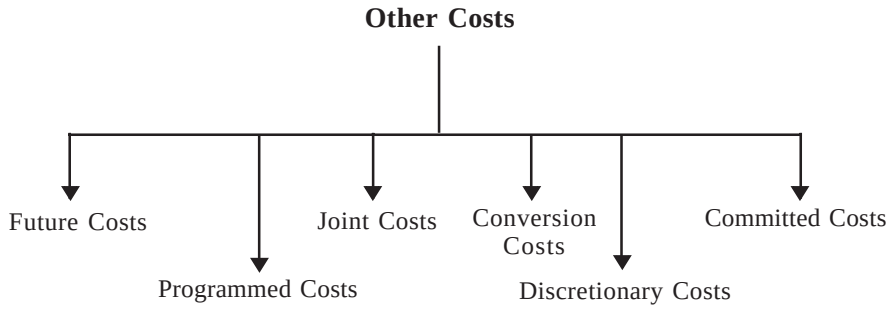
Imputed (or Notional) Costs: These costs appear in cost accounts only. For example, notional rent charged on business premises owned by the proprietor, interest on capital for which no interest has been paid. When alternative capital investment projects are being evaluated, it is necessary to consider the imputed interest on capital before a decision is arrived as to which is the most profitable project.

Opportunity Cost: It is the maximum possible alternative earning that will be foregone if the productive capacity or services are put to some alternative use. For example, if an owned building is proposed to be used for a project, the likely rent of the building is the opportunity cost which should be taken into consideration while evaluating the profitability of the project.

Replacement Cost: It is the cost at which there could be purchase of an asset or material identical to that which is being replaced or revalued. It is the cost of replacement at current market price.

Avoidable and Unavoidable Cost: Avoidable costs are those which can be eliminated if a particular product or department with which they are directly related to, is discontinued. For example, salary of the clerks employed in a particular department can be eliminated, if the department is discontinued. Unavoidable cost is that cost which will not be eliminated with the discontinuation of a product or department. For example, salary of factory manager or factory rent cannot be eliminated even if a product is eliminated.

Other Types of Costs



Future Cost: Future costs are those costs that are expected to be incurred at a later date.

Programmed Cost: Certain decisions reflect the policies of the top management which results in periodic appropriations and these costs are referred to as programmed cost. For example, the expenditure incurred by the company under the Jawahar Rojgar Yojana programme initiated by the Prime Minister is a programmed cost which reflects the policy of the top management.

Joint Cost: Joint cost is the cost of manufacturing joint products up to or prior to the split-off point. Cost incurred after the split-off point is called separable cost. Joint cost is common to the processing of joint products and by-products till the point of separation and cannot be traced to a particular product before the point of split-off.

Conversion Cost: Conversion cost is the cost incurred in converting the raw material into finished product. It can be calculated by deducting the cost of direct materials from the production cost.

Discretionary Costs: Discretionary costs are those costs which do not have obvious relationship to levels of capacity or output activity and are determined as part of the periodic planning process. In each planning period, the management decides on how much to spend on certain discretionary items such as advertising, research and development, employee training. These costs are amenable for alteration by the management.

Committed Cost: Committed cost is fixed cost which results from the decision of the management in the prior period and is not subject to the management control in the present on a short-run basis. They arise from the possession of production facilities, equipment, an organisation set-up, etc. Some examples of committed costs are plant and equipment depreciation, taxes, insurance premium and rent charges.

COST UNIT

Managers are often interested in knowing the cost of something. The 'something' for which the cost has to be ascertained is known as cost objective or cost object or cost unit. Examples of cost units include products, activities, department, number of patients treated, sales regions, etc.

For example, if a factory produces motor cars, then the cost unit would be motor car because the costs are all incurred in producing motor cars.

Let us take up a more complex situation. Consider a bus operator providing bus services to the public between most of the major cities of the country. Suppose the bus operator wants to fix a cost unit, what is it?

Note that here there is no production, what is provided is a service.

Each trip between two cities may be taken as a cost unit. Alternatively, cost per kilometre of travel may be taken as a cost unit. However, neither of the above cost units relates to the passenger who buys the service.

If the operator wants to fix a price to be charged to each passenger, the above cost units would have to be adjusted further.

Assume that a bus cover a distance of 700 km per day carrying 30 passengers on an average, the output is 700 × 30 = 21,000 passenger kilometres per day. On an average, the passenger kilometres covered by each bus per week is 1,00,000. The total cost of operation per bus per week is ₹ 80,000. The cost per passenger kilometre is = ₹ 0.80.

$$\text{Cost per passenger kilometre} = \frac{80{,}000}{1{,}00{,}000} = ₹\ 0.80$$

The implication is that the bus operator must charge, on an average, over ₹ 0.80 per kilometre to each passenger in order to make a profit.

COST CENTERS

The smallest segment of activity or area of responsibility for which costs are accumulated. In the manufacture and sale of a product or in the rendering of a service, several activities may have to be performed. These activities are usually carried out by different departments or sections of the company. For example, in a pharmaceutical company, the raw materials may be purchased by a purchase department, stocked up in a store, processed in one or more processing departments, packed in a packing department and sold by a sales and distribution department. Hence, cost statistics are conveniently accumulated for each department. In cost accounting, each department would be called a Cost Center. Typically, cost centers are departments, but in some instance, one department may contain several cost centers. For

example, a machining department may contain several cost centers. For example, a machining department may be under one foreman but it may contain various groups of machines, such as lathes, milling machines, etc.

As each department is managed by a departmental manager, the cost of a department would be a measure of how the department's manager is performing. In fact, by reporting departmental costs to the concerned managers, they will understand better the cost consequences of their actions so that departmental performance becomes more cost-effective.

Characteristics of Cost Information

1. Cost accounting provides information that helps in planning, control and decision making.
2. Planning is future-oriented. Hence, cost information generated from historical record has to be attuned to future changes in the organisation and its environment.
3. Analysis and comparison of the actual and expected results indicate whether there is any need for control. Hence, costs have to be broken down into various elements and each element of cost has to be compared with a "norm" or "standard".
4. Decision making is a future-oriented activity because the impacts of current decisions are experienced in terms of future costs and benefits. Decision making considers only relevant costs. But a cost that changes depending upon the alternative chosen is a relevant cost.
5. Cost data is gathered from the information about the operations to determine the costs which are related to each cost center. The financial accounting system provides the data on expenses, and these are now treated as costs.
6. General or common costs like depreciation on factory building have to be distributed among the various cost centers on an equitable basis.
7. The costs accumulated in each cost center are then "loaded" or distributed over the cost units produced by them.

Cost Allocation

Many costs are incurred in an organisation as a result of activities performed in several responsibility centers or subunits of the organisation. A collection of costs to be assigned to different subunits is called a cost pool. The responsibility centers, products or services to which costs are to be assigned are called cost objects. The process of assigning the costs in the cost pool to the cost objects is called cost allocation or cost distribution.

Cost on Financial Statement

Generally Accepted Accounting Principles (GAAP) determines how costs are to be classified for financial reporting. These financial statements are for users outside the organisation and the rules underlying the classification of costs for reporting in financial statements are not likely to be the rules that should be used for internal decision making. The main problem in financial reporting is determining when costs become expensed in the income statement. The calculation of the cost of a product for planning and cost control purposes may be different from the calculation of the cost of a product for financial reporting purposes.

Product costs are identified with goods manufactured or purchased for resale. Product cost on financial statements include all manufacturing costs, i.e., direct material, direct labour and overheads. Period costs are identified with a time period rather than a product — selling, administrative and interest costs are treated as period costs for presenting financial statements.

Techniques of Costing

In addition to the different methods of costing, the following techniques are used to ascertain costs:

1. **Historical Costing:** By this approach, actual costs are ascertained after they have been incurred. This is a conventional method of cost ascertainment.
2. **Absorption Costing:** This approach considers all indirect manufacturing costs (also called factory overheads), fixed and variable, as inventoriable or product cost, and treats them as expense only when the products are sold.
3. **Marginal Costing:** Marginal costing differentiates between fixed and variable costs. Under marginal costing, fixed costs are not treated as part of the product cost but are treated as period costs. Marginal cost of a product is its variable cost. And the fixed costs of the period are written off in full against the revenue of that period. This technique assists and guides management in taking various policy decisions under different conditions of business, such as, pricing decisions in times of competition, recession, make or buy decisions, suspension or continuance of product/product department, selecting profitable product-mix etc.
4. **Direct Costing:** The ascertainment of direct costs in respect of department, process or product. This is marginal costs plus fixed cost which is directly chargeable to the department, process or product. Under absorption costing, all fixed costs — allocable or unallocable (which are apportioned) are charged to department, product, etc., which more often than not complicate decision making and therefore, direct costing is an improvement over absorption costing in decision making.
5. **Standard Costing:** The ascertainment and use of standard costs and measurement and analysis of variances. Standard cost is a scientifically predetermined cost which is fixed in advance of production for each element of cost, *viz.*, material, labour and overheads and actual costs are compared against the standard costs to measure the variances and for exercising control.
6. **Uniform Costing:** The use of the same costing principles, methods and/or practices by several undertakings with a view to achieving uniformity in approach and system.

Cost Treatment

- Cost Ascertainment is the process of determining actual costs after they have been incurred.
- Cost Estimation is the process of determining future costs in advance before production starts, on the basis of actual past cost adjusted for anticipated future changes.
- Cost Allocation is the process of charging the full amount of an individual item or cost directly to the cost center for which the item of cost was incurred.
- Cost Apportionment is the process of charging the proportion of common items of cost to two or more cost centers on some equitable basis.
- Cost Absorption is charging cost from cost centers to products or services by means of a predetermined absorption rate.

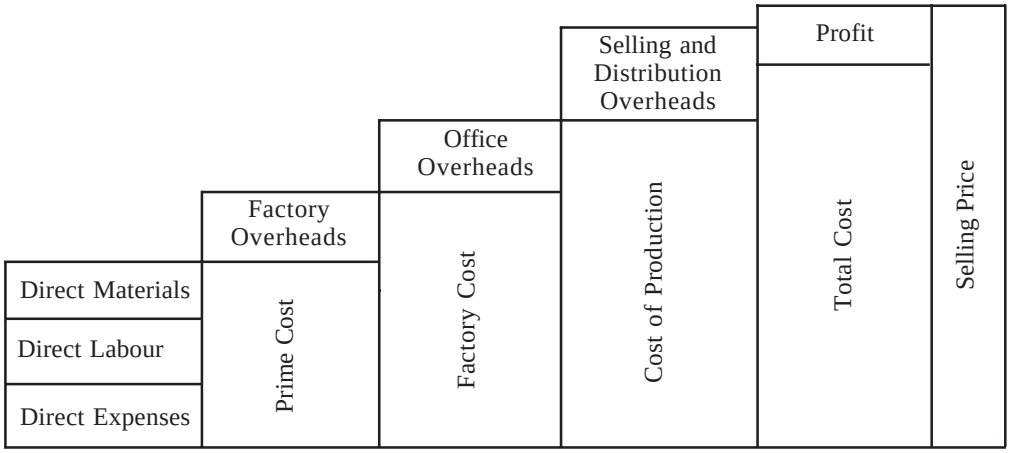


Fig. 1.3: Composition of Selling Price

Nature/Features/Characteristics of Cost

1. Cost is an expense incurred, actual or notional.
2. Cost may be notional costs also. A notional cost is a cost which is taken into consideration. Example, depreciation on fixed assets, but which is actually not paid to anyone.
3. A cost may be cash cost, example, salary paid, rent paid, etc., or it may be a non-cash cost such as depreciation on fixed assets.
4. A non-cash cost does not result in actual cash outflows from the business firm; whereas a cash cost results in actual cash outflows immediately or at a later date from a business firm.
5. All costs have to be taken into account in order to determine the total costs.

Cost Object/Objectives of Cost

The objectives of cost are as follows:

1. **Determination of total cost:** To determine the total cost of manufacturing a product or providing a service.
2. **Helps to fix selling price:** On knowing the total cost, a manufacturer will be able to add the desired profit margin and fix an appropriate selling price.
3. **Helps to monitor and control costs:** Understanding the costs helps to monitor the costs periodically as well as reduce the unwanted controllable costs. Thus, it helps in cost control.
4. **Helps in comparisons:** Costs help to compare the actual costs with the standard predetermined costs and cut down any excessive costs. Thus, the actual costs can be constantly compared with the predetermined costs.

Objectives of Cost Accounting

1. Ascertainment of cost.
2. Determination of selling price.

3. Cost control and cost reduction.
4. Ascertaining the profit of each activity.
5. Assisting management in decision making.
6. To frame various budgets.

Need/Importance/Advantages of Cost Accounting

1. **Determination of total cost:** Cost accounting helps to account for all the costs incurred in manufacturing a product or providing a service.
2. **To fix selling price:** Cost accounting helps to fix the selling price for a product/service after considering a reasonable profit margin.
3. **Cost classification:** Cost accounting helps in classifying the costs into Fixed costs and Variable costs; Direct costs and Indirect costs, Factory costs, Administration costs and Selling and Distribution costs, etc.
4. **Helps to earn profits:** Cost accounting classifies the total cost into department-wise, product-wise and thus, helps to focus on cost reduction areas as well as profitable areas.

Importance of Cost Accounting

1. Control of material cost
2. Control of labour cost
3. Control of overheads
4. Measuring efficiency
5. Budgeting
6. Price determination
7. Curtailment of loss during the off-season
8. Expansion
9. Arriving at decisions

Advantages of Cost Accounting

1. Cost reduction
2. Profit improvement
3. Helps in arriving at decisions

Uses/Benefits/Advantages of Costing

1. **Product mix:** Costing helps to determine a suitable product mix which will earn reasonable profits for the firm.
2. **Sales mix:** Costing helps in determining a suitable sales mix of the products for the firm.
3. **Price:** Costing helps in determining the total cost and thereby fix an appropriate price for the product which helps in earning reasonable returns for the organisation.

4. **Managerial decision making**: Costing facilitates several types of managerial decision making in an organisation.

Various Decisions that a Cost and Management Accountant has to Furnish to the Management

1. Choosing the best budget when there are limiting factors restricting production or sales.
2. Make or buy decisions.
3. Accepting or rejecting orders.
4. Extra shift decisions.
5. Cost indifferent point.
6. Profit planning.
7. Differential cost analysis.
8. Adding or deleting departments (or products).
9. Exploring foreign markets.
10. Plant replacement decisions.
11. Shutdown decisions.
12. Preventive maintenance vs. Breakdown maintenance.
13. Further processing of joint products.

ALLOCATION OF OVERHEADS

[Note: Same Concept is Required for Chapter 4 Overhead Cost. Therefore, we have not explained these concept there.]

Allocation of overheads is to assign the entire item of cost if it is directly related to a cost center.

Apportionment of Overheads

Apportionment means distribution. To apportion means to distribute. Apportionment of overheads is distribution of overheads on an equitable basis to more than one cost centers. Overheads are to be apportioned to different cost centers based on following two principles:

(a) Cause and Effect: In this case, it is guided by the relationship between cost object and cost. It is a more rational method. Cause is the process or operation or activity and effect is the incurrence of cost.

(b) Benefits Received: In this case, overheads are to be apportioned to the various cost centers in proportion to the benefits received by them.

Primary Distribution of Overheads

Following the above two principles, basis of primary apportionment of items of production overheads is to be selected to distribute them among the cost centers. The basis of apportionment used to distribute overheads must be rational. Once the base is selected, it is to be followed consistently and uniformly. However, in circumstances such as change in technology, degree of mechanisation, product mix, etc., the change in the basis for apportionment can be adopted.

Table 1.1: Primary Distribution

Sr. No.	Items of Overheads	Basis of Apportionment
1.	Amenities to Employees	No. of Employees
2.	Canteen Expenses	No. of Workers
3.	Depreciation	Value of Assets
4.	Electricity	Light Points
5.	Employer's Insurance Liability	Wages
6.	General Overheads	Direct Wages Paid
7.	Insurance	Value of Stock
8.	Insurance	Value of Machinery
9.	Labour Welfare	No. of Employees
10.	Lighting	No. of Light Points
11.	Lighting	Floor Area
12.	Motive Power	Units
13.	Overheads	Wages
14.	Power	KWh
15.	Power	Value of Plant
16.	Power of Machinery	Horse Power of the Machines
17.	Rent	Area Occupied
18.	Rent and Taxes	Area Occupied
19.	Rent, Rates, etc.	Floor Area
20.	Repairs and Maintenance	Value of Assets
21.	Stores Overheads	Direct Materials Consumed
22.	Supervision	No. of Workers

Secondary Distribution of Overheads

Secondary distribution of overheads can be done by following the reciprocal basis or non-reciprocal basis.

1. **Reciprocal Basis:** In reciprocal secondary distribution, the cost of service cost centers are apportioned to production cost centers as well as to other service cost centers since the services rendered by certain service cost centers are also utilised by other service cost centers. In this case, any one of the following three methods may be followed:

(a) Repeated Distribution Method

Steps

(i) The proportion at which the costs of a service cost centers are to be distributed to production cost centers and other service cost centers are determined.

(ii) The costs of first service cost centers are to be apportioned to production cost centers and service cost centers in the proportion as determined in step *(i)*.

(iii) Similarly, the cost of other service cost centers is to be apportioned.

(iv) The process as stated in *(ii)* and *(iii)* are to be continued till the figures remaining undistributed in the service cost centers are negligible and very insignificant. Such negligible small amount left with service center may be distributed to production cost centers.

(b) Trial and Error Method

This method is followed when the question of distribution of costs of service cost centers which are interlocked among them arises. Firstly, gross cost of services of service cost centers are determined and then the costs of service centers are apportioned to production cost centers.

Distinguish between Direct Cost and Indirect Cost

	Direct Cost		Indirect Cost
1.	Direct cost means that cost which can be identified with and allocated to cost centers or cost units.	1.	Indirect cost means that cost which cannot be allocated but which can be absorbed by, or apportioned to cost centers or cost units.
2.	Those cost which can be directly identified with cost centers, production units or processes are regarded as direct costs.	2.	Those cost which cannot be identified with cost centers or cost units and therefore they are to be distributed on some equitable basis are termed as indirect costs.
3.	Costs which can be conveniently associated wholly with a particular unit of a final product is termed as direct costs.	3.	Costs which cannot be associated or connected with a particular unit of the final product is termed as indirect costs.
4.	**Examples are:** (a) Materials which form part of the finished product. (b) Wages payable to worker who is directly involved in production, etc.	4.	**Examples are:** (a) Cost of consumable stores. (b) Salaries of factory manager, supervisor, foreman. (c) Rent, rates, telephone expenses, printing and stationery expenses, etc.

Overheads

Overheads means indirect costs. Overheads are also termed as "On costs". Overheads is an aggregate of indirect materials, indirect labour and indirect expenses.

(a) Factory overheads,

(b) Administrative overheads, and

(c) Selling and distribution overheads.

1. Factory Overheads: Also known as manufacturing overheads or production overheads or works overheads or factory burden. Factory overheads is defined as the cost of indirect materials, indirect labour and indirect expenses.

(a) Indirect Materials: Refers to materials that are needed for the completion of the product but whose consumption with regard to the product is so small that it would be inappropriate to treat it as an item of direct materials.

Examples: Cotton waste, lubricants, oil, grease, hand tools, stores and spares, works stationery, cost of nails, fevicol and glue in case of furniture making, cost of buttons and thread in case of garment industry, etc.

(b) Indirect Labour: Is the labour cost of production-related activities that cannot be conveniently traced to specific products via physical observation.

Examples: Salaries and wages paid to supervisors, foremen, shop clerks, general helpers, cleaners, material handlers, factory watchmen, plant guards, timekeeper, drawing and design office, toolroom department, employees engaged in maintenance work or other service work, etc.

(c) Indirect Expenses: Covers all expenditure incurred by manufacturing enterprise from the time production has commenced to its completion and its transfer to the finished goods store.

Examples: Rent, rates and taxes of factory building, depreciation on factory assets, heat, light, power, plant repairs and maintenance, medical aid to workers, etc.

2. Administrative Overheads: Also known as office overheads. They are the cost of indirect materials, indirect labour and indirect expenses which are incurred in the course of administration of the enterprise. Administrative overheads includes all costs which cannot be charged either to production department or sales department. Administrative overheads includes the costs of planning and controlling the general policies and operations of a business enterprise.

(a) Indirect Materials: Refers to the materials that are needed for office and administration activities.

Examples: Office stationery like pen, pencil, writing pad, computer printer cartridge, typewriter ribbon, etc.

(b) Indirect Labour: Is the labour cost incurred towards office staff.

Examples: Salaries to office staff — clerks, officers, executives and manager.

(c) Indirect Expenses: Covers all expenditure incurred by office.

Examples: Office rent, rates, taxes and insurance, depreciation and repairs of office furniture and building, lighting of office, audit fees, director's fees, etc.

3. Selling and Distribution Overheads: Such expenses are generally incurred when the product is in saleable condition. It covers the cost of making sales and delivering/despatching products. Selling and distribution overheads includes the cost of all indirect materials, indirect labour and indirect expenses incurred in sales and in delivering goods from warehouse to customers. Selling and distribution overheads includes:

(i) Selling Cost: Refers to the cost incurred in securing orders.

(ii) Publicity Cost: Represents the cost incurred in advertising and promotion.

(iii) Distribution Cost: Refers to the cost incurred in warehousing saleable products and in delivering products to customers.

(a) Indirect Materials: Refers to all materials that are required for selling and distribution activities.

Examples: Secondary packing materials like wooden boxes, sales stationery, advertising materials, catalogues, etc.

(b) Indirect Labour: Is the labour cost related to selling and distribution activities.

Examples: Salesmen's salaries and commissions, salary to sales manager, sales clerical staff, delivery staff, wages to drivers of delivery vehicles, etc.

(c) Indirect Expenses: Covers all expenditure incurred by selling and distribution department.

Examples: Advertising in newspapers, radio, TV and Internet, rent, rates, taxes and insurance of sales office, fuel, maintenance and depreciation of delivery vehicles, etc.

Cost Center	**Cost Unit**
1. Cost Center is a department, a location, a person or an equipment for which cost is ascertained.	1. Cost unit is per unit for which costs are ascertained.
2. All costs are collected cost center wise in order to study the profitability of the respective cost center.	2. Cost unit is the actual output, which may be tangible or intangible as the case may be, for which costs are identified.
Areas of applicability	**Selection of cost units**
1. Passenger Transport	1. Cost per passenger per kilometre
2. Goods Transport	2. Cost per tonne per kilometre
3. Restaurants	3. Cost per dish
4. Electricity company	4. Cost per kilowatts
5. Hospitals	5. Cost per patient/per bed/per operation
6. Hotels	6. Cost per guest/per room
7. Coaching classes	7. Cost per student

Cost Statement (Cost Sheet)

	Units Produced = xxx **Units Sold = xxx**		**Total (₹)**	**Per Unit (₹)**
A.	Direct Material:			
	Opening Stock of Raw Material	x		
	Add: Purchase Raw Material	x		
	Add: Carriage Inward	x		
	Less: Closing Stock of Raw Material	x	xx	x
B.	Direct Wages		xx	x
C.	Direct Expenses		xx	x
D.	**Prime Cost [A + B + C]**		xxx	x_1
E.	Work Overheads/Factory			
	Overheads/Production Overheads	x		
	Less: Net Value of Normal Scrap of	x		
	Indirect Material			
	Adjustment on Account of Stock of WIP:			
	Add: Opening Stock of Work-in-progress	x		
	Less: Closing Stock of Work-in-progress	x	xx	x
F.	**Work Cost [D + E]**		xxx	x_1
G.	**Add:** Office and Administration Overheads		xx	x_1
H.	**Cost of Goods Produced [F + G]**		xx	x_1

I.	Adjustment on Account of Stock of Finished Goods:			
	Add: Opening Stock of Finished Goods	xx		
	Less: Closing Stock of Finished Goods	xx	xx	
	$\frac{\text{Cost of Goods Produced}}{\text{No. of Units Produced}} \times \text{Closing Stock (Units)}$			x
J.	**Cost of Goods Sold [H + I]**		xxx	x_2
K.	**Add:** Selling and Distribution Overheads		xx	x_2
L.	Cost of Sales [J + K]		xx	x_2
M.	**Add:** Profit		xx	x_2
N.	Sales [L + M]		xxx	x_2

1. These amounts are ascertained by dividing the respective total by the number of units produced.
2. These amounts are ascertained by dividing the respective total by the number of units sold.

Notes:

(i) Unless otherwise stated, closing stock of finished goods should be valued at current cost of production assuming that the first-in-first-out method of inventory valuation is in use.

(ii) Items of financial nature like Income Tax, Cash Discount, Interest on Capital/Bank Overdraft, Donations, Dividend, Preliminary Expenses/Goodwill w/o, Provision for Doubtful Debts, Transfer to Reserves, etc., are ignored while preparing Cost Sheet/Production Statement/Account.

[**Note:** As such cost statement is not there in the syllabus of F.Y.BAF Sem I but tit understand cost classification: few Illustration on cost statement is required.]

Illustration 1

The accounts of Zeneeth Ltd. for the year ended 31st December, 2014, shows the following:

Particulars	**(₹)**
Work Office Salaries	6,500
Administrative Office Salaries	12,600
Cash Discounts allowed	2,900
Carriage Outward	4,300
Carriage Inward	7,150
Bad debts written off	6,500
Repairs to Plant and Machinery	4,450
Rent, rates, taxes, Insurance etc.	
Factory	8,500
Office	2,000
Sales	4,61,000

Stock of Raw materials:	
1st Jan., 2014	48,000
31st Dec., 2014	62,800
Materials Purchased	1.85,00
Travelling Expenses	2,100
Traveller's Salaries and Commission	7,700
Productive Wages	1,26,000
Depreciation on Plant and Machinery	6,500
Depreciation on Office Furniture	300
Director's Fees	6,000
Gas and Water (Factory)	1,200
Gas and Water (Office)	400
Manager's Salary (1/4 Office and 3/4 Factory)	10,000
General Expenses	3,400

You are required to prepare a cost statement for the year ended 31st December, 2010.

[MU, T.Y.B.Com., Modified]

Solution

Zeneeth Ltd.

Cost Statement for the year ended 31st December, 2014

Particulars	₹	₹
Raw Materials Consumed:		
Stock of Raw Materials as on 1st Jan., 2014	48,000	
Add: Materials Purchased	1,85,000	
Add: Carriage Inward	7,150	
Less: Stock of Raw Materials as on 31st Dec., 2014	(62,800)	
Raw Materials Consumed		1,77,350
Productive Wages		1,26,000
PRIME COST		3,03,350
Add: Works/Factory Overheads:		
Work Office Salaries	6,500	
Repairs to Plant and Machinery	4,450	
Rent, Rates, Taxes, Insurance etc. – Factory	8,500	
Depreciation on Plant and Machinery	6,500	
Gas and Water (Factory)	1,200	
Manager's Salary (3/4)	7,500	
Works or Factory Overheads		34,650
WORKS/FACTORY COST		3,38,000

Add: Office and Administration Overheads:		
Administrative Office Salaries	12,600	
Rent, Rates, Taxes, Insurance etc. – Office	2,000	
Depreciation on Office Furniture	300	
Director's Fees	6,000	
Gas and Water (Office)	400	
Manager's Salary (1/4)	2,500	
General Expenses	3,400	
Office and Administration Overheads		27,200
COST OF PRODUCTION/COST OF GOODS SOLD		3,65,200
Add: Selling and Distribution Overheads:		
Carriage Outward	4,300	
Travelling Expenses	2,100	
Traveller's Salaries and Commission	7,700	
Selling and Distribution Overheads		14,100
TOTAL COST OF SALES		3,79,300
Add: Profit (Balancing Figure)		81,700
SALES		4,61,000

Illustration 2

From the following data, prepare a cost sheet for the year 2014.

Particulars	**₹**
Opening Stock of Raw Materials	3,00,000
Purchases	8,00,000
Closing Stock of Raw Materials	4,00,000
Carriage Outward	50,000
Wages: Direct	7,00,000
Indirect	1,00,000
Chargeable Expenses	2,00,000
Rent and Rates: Factory	40,000
Office	5,000
Indirect Materials	15,000
Drawing Office Salaries	10,000
Depreciation: Plant	5,000
Office Furniture	1,000
Salary: Office	25,000
Salesmen	20,000
W.I.P.: 1-1-2014	20,000
31-12-2014	10,000

Sale of by Product	10,000
Other Factory Expenses	57,000
Other Office Expenses	9,000
Managing Director's Remuneration	1,20,000
Other Selling Expenses	10,000
Art Work Charges	40,000
Stock of Finished goods: 1-1-2014	10,000
31-12-2014	50,000
Traveling Expenses of Salesmen	11,000
Carriage Inward	10,000
Sales	30,00,000
Advance Income Tax paid	1,50,000
Advertisement	20,000

M.D.'s remuneration to be allocated as ₹ 40,000 to factory, ₹ 20,000 to office and ₹ 60,000 to sales. ***[MU, T.Y.B.Com., Modified]***

Solution

Cost Statement for the year ended 2014

Particulars	**₹**	**₹**
Rew Materials Consumed:		
Opening Stock of Raw Materials	3,00,000	
Add: Purchases	8,00,000	
Add: Carriage Inward	10,000	
Less: Closing Stock of Raw Materials	(4,00,000)	
Raw Materials Consumed		7,10,000
Wages Direct		7,00,000
Chargeable Expenses		2,00,000
PRIME COST		16,10,000
Add: Works/Factory Overheads:		
Wages – Indirect	1,00,000	
Rent and Rates – Factory	40,000	
Indirect Materials	15,000	
Drawing Office Salaries	10,000	
Depreciation – Plant	5,000	
Other Factory Expenses	57,000	
Managing Director's Remuneration	40,000	
Add: W.I.P. as on 1-9-2014	20,000	
Less: W.I.P. as on 31-12-2014	10,000	
Less: Sale of By-product	10,000	

Works or Factory Overheads		2,67,000
WORKS/FACTORY COST		18,77,000
Add: Office and Administration Overheads:		
Rent and Rates – Office	5,000	
Depreciation – Office Furniture	1,000	
Salary – Office	25,000	
Other Office Expenses	9,000	
Managing Director's Remuneration	20,000	
Office and Administration Overheads		60,000
COST OF PRODUCTION		19,37,000
Add: Stock of Finished Goods as on 1-1-2014		10,000
		19,47,000
Less: Stock of Finished Goods as on 31-12-2014		50,000
COST OF GOODS SOLD		18,97,000
Add: Selling and Distribution Overheads:		
Carriage Outward	50,000	
Salary – Salesmen	20,000	
Other Selling Expenses	10,000	
Art Work Charges	40,000	
Travelling Expenses of Salesmen	11,000	
Advertisement	20,000	
Managing Director's Remuneration	60,000	
Selling and Distribution Overheads		2,11,000
TOTAL COST OF SALES		21,08,000
Add: Profit		8,92,000
Sales		30,00,000

Illustration 3

Hindustan Machine Tools Ltd., furnishes for March, 2014 the following information for a department:

Deluxe wristwatches manufactured 1,000 pieces.

Cost and other data	**₹**
Opening stock	
Raw materials	4,50,000
Finished goods (200 pieces)	3,30,000
Closing stock	
Raw materials	5,00,000
Finished goods (300 pieces)	?
Purchases of raw material	7,00,000

Direct labour	4,00,000
Indirect labour factory	1,00,000
Consumption of stores and spares	90,000
Sales	21,60,000

Other overheads	Factory ₹	Office ₹	Sales Depot ₹
Salary	1,00,000	2,00,000	1,50,000
Electricity	25,000	2,000	10,000
Stationery and Printing	10,000	25,000	20,000
Travelling expenses	3,000	10,000	50,000
Rent	5,000	5,000	5,000
Showroom and Exhibition expenses	-	-	10,000
Miscellaneous expenses	15,000	25,000	20,000

The stock of finished goods is valued at current month's cost of production.

(a) You are required to prepare a cost sheet for the month of March, 2014 and ascertain the amount of profit.

(b) What should be the selling price in order to earn additional profit on sales?

[MU, T.Y.B.Com., Modified]

Solution

Cost Statement for the Month of March, 2014

Particulars	Units	Total ₹	Total ₹	Cost Per Unit ₹
Raw Materials Consumed:				
Opening Stock of Raw Materials		4,50,000		450.00
Add: Purchase of Raw Materials		7,00,000		700.00
Less: Closing Stock of Raw Materials		(5,00,000)		500.00
Raw Materials Consumed			6,50,000	650.00
Direct Labour			4,00,000	400.00
PRIME COST	1,000		10,50,000	1,050.00
Add: Works/Factory Overheads:				
Indirect Labour Factory		1,00,000		100.00
Consumption of Stores and Spares		90,000		90.00
Salary		1,00,000		100.00
Electricity		25.000		25.00
Stationery and Printing		10,000		10.00
Travelling Expenses		3,000		3.00
Rent		5,000		5.00
Miscellaneous expenses		15,000		15.00

Works or Factory Overheads	1,000		3,48,000	348.00
WORKS/FACTORY COST	1,000		13,98,000	1,398.00
Add: Office and Administration Overheads:				
Salary		2,00,000		200.00
Electricity		2,000		2.00
Stationery and Printing		25.000		25.00
Travelling Expenses		10.000		10.00
Rent		5,000		5.00
Miscellaneous expenses		25,000		25.00
Office and Administration Overheads	1,000		2,67,000	267.00
COST OF PRODUCTION	1,000		16,65,000	1,665.00
Add: Opening Stock of Finished Goods	200		3,30,000	1,650.00
	1,200		19,95,000	1,662.50
Less: Closing Stock of Finished Goods				
(Valued at Cost of Production)	(300)		(4,99,500)	1,665.00
COST OF GOODS SOLD	900		14,95,500	1661.66
Add: Selling and Distribution Overheads:				
Salary		1,50,000		166.66
Electricity		10,000		11.11
Stationery and Printing		20,000		22.22
Travelling expenses		50,000		55.55
Rent		5,000		5.55
Show room and Exhibition expenses		10,000		11.11
Miscellaneous expenses		20,000		22.22
Selling and Distribution Overheads	900		2,65,000	294.44
TOTAL-COST OF SALES	900		17,60,500	1,956.11
Add: Profit (Balancing figure)	900		3,99,500	443.89
Sales	900		21,60,000	2400.00

Illustration 4

From the following date, prepare a Cost Sheet for the year 2014. Number of Units produced: 10,000 units.

Particulars	**₹**
Opening Stock of Raw Materials	3,00,000
Purchase of Raw Materials	8,00,000
Closing Stock of Raw Materials	1,00,000
Carriage Outward	8,000
Wages Indirect	20,000

Salary:	
Office	50,000
Sales Office	40,000
Other Factory Expenses	50,000
Trade Fair Expenses	20,000
Depreciation:	
Factory	30,000
Office	20,000
Selling	20,000
Direct Salary	50,000
Advance Interest Received	40,000
Custom Duty Paid for Purchase of Raw Material	5,00,000
Debenture Interest Paid	50,000
Freight Inward	20,000
Custom Duty Paid for Purchase of Plant	50,000
Direct Wages	2,00,000
Other Direct Charges	50,000
Goodwill Written-off	5,000

Number of units sold 8,000 units at cost plus 18% Profit.

Direct Salary is to be allocated to factory. Office and Selling in the ratio of 2:1:2.

[MU, T.Y.B.Com., Modified]

Solution:

Cost Statement for the year ended 2014

Particulars	Units	Total ₹	Total ₹	Cost Per Unit ₹
Raw Materials Consumed:				
Opening Stock of Raw Materials		3,00,000		30.0
Add: Purchase of Raw Materials		8,00,000		80.0
Add: Custom Duty Paid for Purchase of Raw Materials		5,00,000		50.0
Add: Freight Inward		20,000		2.0
Less: Closing Stock of Raw Materials		1,00,000		10.0
Raw Materials Consumed			15,20,000	152.0
Direct Wages			2,00,000	20.0
Other Direct Charges			50,000	5.0
PRIME COST	10,000		17,70,000	177.0
Add: Works/Factory Overheads:				
Wages Indirect		20,000		2.0
Other Factory Expenses		50,000		5.0

Depreciation – Factory		30,000		3.0
Direct Salary – Factory (2/5)		20,000		2.0
Works or Factory Overheads	10,000		1,20,000	12.0
WORKS/FACTORY COST	10,000		18,90,000	189.0
Add: Office and Administration Overheads:				
Office Salary		50,000		5.0
Depreciation – Office		20,000		2.0
Direct Salary – Office (1/5)		10,000		1.0
Office and Administration Overheads	10,000		80,000	8.0
COST OF PRODUCTION	10,000		19,70,000	197.0
Less: Closing Stock of Finished Goods (Valued as per AS -2)	2,000		3,78,000	189.0
Cost of Goods Sold	8,000		15,92,000	199.0
Add: Selling and Distribution Overheads:				
Carriage Outward		8,000		1.0
Salary – Sales Office		40,000		5.0
Trade Fair Expenses		20,000		2.5
Depreciation – Selling		20,000		2.5
Direct Salary – Sales(2/5)		20,000		2.5
Selling and Distribution Overheads	8,000		1,08,000	13.5
TOTAL COST OF SALES	8,000		17,00,000	212.5
Add: Profit @ 18%			3,06,000	38.25
Sales Value	8,000		20,06,000	250.75
			20,06,000	

Illustration 5

The following particulars are extracted from the books of a company relating to commodity Alpha for the half year ending 30th June, 2014.

	₹
Purchase of raw materials	1,30,000
Direct wages	1,00,000
Rent, rates, insurance and works on cost	45,000
Carriage inward	1,500
Stock on 1-1-2014	
Raw materials	20,000
Finished products (1,600 tonnes)	17,600
Stock on 30-6-2014	
Raw materials	25,000
Finished products (3,200 tonnes)	37,600
Work-in-progress on 1-1-2014	4,500

Work-in-progress on 30-6-2014	16,000
Factory supervision	10,000
Sales – Finished product	3,00,000

Advertising discount allowed and selling cost at Re. 0.50 per tonne sold. 25,000 tonnes of commodity was sold during the period.

You are required to ascertain:

1. Prime Cost
2. Factory Cost
3. Cost of Sales
4. Profit
5. No. of tonnes of the commodity sold.

Solution

Cost Sheet of Commodity Alpha for the period ending 30-6-2014

Particulars	₹	₹
Raw Materials Consumed		
Opening stock	20,000	
Add: Purchases	1,30,000	
	1,50,000	
Add: Carriage Inwards	25,000	
	1,25,000	
Less: Closing stock	1,500	
Raw Materials Consumed		1,26,500
Direct wages		1,00,000
Prime cost		2,26,500
Rent, rates, insurance and works	45,000	
Cost of factory supervision	10,000	
		55,000
Add: Opening Work-in-progress		4,500
Less: Closing Work-in-progress		16,000
Factory Cost		2,70,000
Add: Opening stock of finished goods (1,600 tonnes)		17,600
Less: Closing stock of finished goods (3,200 tonnes)		37,600
Cost of goods sold		2,50,000
Add: Advertising and selling cost @ ₹ 0.50 per tonne on 25,000 tonnes		12,500
Cost of sales		2,62,500
Profit (Balancing figure)		37,500
Sales		**3,00,000**

Illustration 6

Prepare a cost sheet showing the total and per tonne cost of paper manufactured by Times Paper Mills Ltd., For the month of March, 2014. There were 26 working days in the month. Also find the profit earned by the company. The details are as under:

Direct Raw materials:	
Paper pulp	6,000 tons @ ₹ 900 per tonne
Direct labour:	
280 Skilled workmen	₹ 250 per day
300 Semiskilled workmen	₹ 150 per day
470 Unskilled workmen	₹ 100 per day
Direct expenses:	
Special equipment hire charges	₹ 12,000 per day
Special dyes	₹ 250 per tonne of total raw material input
Work overheads: Variable	@ 50% of direct wages
Fixed	₹ 2,70,000 p.m.
Administration overheads	@ 12% of works cost
Selling and distribution overheads	₹ 80 per tonne sold.
Opening stock of paper	500 tonnes valued @ ₹ 2,501.60 per tonne
Closing stock of paper	300 tonnes valued at cost of production

The paper is sold @ ₹ 3,000 per tonne.

[CS Modified]

Solution

Times Paper Mills Ltd.
[Working Days: 26]
Cost Sheet for the month of March, 2014

Particulars	Tons	Total		Cost per Unit (₹)
		₹	₹	
Direct Raw Materials:				
Paper Pulp	6,000		54,00,000	900.00
Direct Labour:				
Skilled Workmen (280 × 250 × 26)		18,20,000		303.33
Semiskilled Workmen (300 × 150 × 26)		11,70,000		195.00
Unskilled Workmen (470 × 100 × 26)		12,22,000		203.66
Direct Labour			42,12,000	702.00
Direct Expenses:				
Special Equipments Hire Charges (12,000 × 26)		3,12,000		52.00
Special Dyes	6,000	15,00,000		250.00
Direct Expenses			18,12,000	302.00

PRIME COST	6,000		1,14,24,000	1,904.00
Add: Works/Factory Overheads:				
Variable		21,06,000		351.00
Fixed		2,70,000		45.00
Works/Factory Overheads			23,76,000	396.00
Works or Factory Cost	6,000		1,38,00,000	2,300.00
Add: Office and Administration Overheads:				
Administration Overheads			16,56,000	276.00
Cost of Production	6,000		1,54,56,000	2,576.00
Add: Opening Stock of Paper	500		12,50,800	2,501.60
	6,500		1,67,06,800	2,570.27
Less: Closing Stock of Paper	300		7,72,800	2,576.00
Cost of Goods Sold	6,200		1,59,34,000	2,655.66
Add: Selling and Distribution Overheads	6,200		4,96,000	80.00
Total Cost of Sales	6,200		1,64,30,000	2,650.00
Add: Profit (Balance figure)	6,200		21,70,000	350.00
Sales Value	6,200		1,86,00,000	3,000.00

Illustration 7

Dunkel Ltd. started a factory in Navi Mumbai on 1st April, 2013. Following details are furnished about its activity during the year ended 31st March, 2014.

Raw Material consumed – 40,000 units @ ₹ 7 per unit.

Direct Wages:

(a) Skilled worker ₹ 9 per unit.

(b) Unskilled worker ₹ 6 per unit.

Royalty (On raw material consumed) @ ₹ 3 per unit.

Works overheads @ ₹ 8 per machine hour.

Machine Hours Worked 25,000.

Office Overheads at 1/3rd of works cost

Sales Commission @ ₹ 4 per unit.

Units produced 40,000.

Stock of units at the end 4,000 units to be valued at cost of production per unit.

Sale price is ₹ 60 per unit.

Prepare Cost sheet showing the various elements of cost, both in total and per unit.

[CA Modified]

Solution

Dunkel Ltd.

Cost Sheet for the year ended 31st March, 2014

Particulars	Units	Total		Cost per Unit (₹)
		₹	₹	
Raw Materials Consumed	40,000		2,80,000	7
Direct Wages:				
Skilled Workers Wages		3,60,000		9
Unskilled Workers Wages		2,40,000		6
Total Direct Wages			6,00,000	15
Direct Expenses:				
Royalty on Raw Material Consumed			1,20,000	3
Prime Cost			10,00,000	25
Add: Works/Factory Overheads:				
Works Overheads 8 × 25,000			2,00,000	5
Works/Factory Cost			12,00,000	30
Add: Office and Administration Overheads:				
Office Overheads			4,00,000	10
Cost of Production	40,000		16,00,000	40
Less: Closing Stock	4,000		1,60,000	40
Cost of Goods Sold	36,000		14,40,000	40
Add: Selling and Distribution Overheads				
Sales Commission	36,000		1,44,000	4
Total Cost of Sales	36,000		15,84,000	44
Add: Profit (Balance figure)	36,000		5,76,000	16
Sales Value	36,000		21,60,000	60

Illustration 8

Indicate whether the following materials are direct or indirect with reference to the final product:

(a) Oil used for lubricating machines.

(b) Wire for making electric motors.

(c) Bottles used for filling in a soft drink.

(d) Gunny bags used for filling in sugar.

(e) Ingots used by a foundry making castings.

(f) Cushion seats to be fixed in a passenger car.

(g) Sugarcane used for making sugar.

(h) Speakers in a radio set.

(i) Paper used for printing a book.

(j) Nails used in a shoe.

(k) Milk used for making ice-cream.

Solution

Direct materials: (b), (c), (d), (e), (f), (g), (h), (i), (j) and (k)

Indirect materials: (a)

Illustration 9

State whether the following items should be classified as direct or indirect labour:

(a) Overtime premium paid for specific jobs.

(b) Wages paid to piece workers.

(c) Wages paid to maintenance workers.

(d) Directors' fees.

(e) Salesmen's commission.

(f) Salaries paid to sweepers.

Solution

Direct wages – (a) and (b)

Indirect wages – (c), (d), (e) and (f).

Illustration 10

(a) Define the terms — cost center and cost unit.

(b) Given below is a list of ten industries. Give the method of costing and the unit of cost against each industry:

(i) Nursing home

(ii) Road transport (goods)

(iii) Steel

(iv) Coal

(v) Bicycles

(vi) Bridge construction

(vii) Interior decoration

(viii) Advertising

(ix) Furniture

(x) Sugar company having its own sugarcane fields

(xi) Road transport (passenger)

(xii) Electricity boards

(xiii) Canteen.

Solution

(a) Cost Center: The term cost center is defined "as a location, person or an item of equipment or a group of these for which costs may be ascertained and used for the purposes of cost control." Cost centers can be personal cost centers, impersonal cost centers, operation cost centers and process cost centers.

(b) Cost Unit: The term unit is defined "as a unit of quantity of product, service or time (or a combination of these) in relation to which costs may be ascertained or expressed. It can be for a job, batch, or product group."

	Industry	Method of Costing	Unit of Cost
(i)	Nursing home	Operating	Per bed per week or per day
(ii)	Road transport (Goods)	Operating	Per tonne Kilometer or per mile
(iii)	Steel	Process	Per tonne
(iv)	Coal	Single	per tonne
(v)	Bicycles	Multiple	Each unit
(vi)	Bridge construction	Contract	Each contract
(vii)	Interior decoration	Job	Each job
(viii)	Advertising	Job	Each job
(ix)	Furniture	Multiple	Each unit
(x)	Sugar company having its own sugarcane fields	Process	Per quintal/tonne
(xi)	Road transport (passenger)	Operating	Per passenger-km
(xii)	Electricity boards	Operating	Per KWH or per unit
(xiii)	Canteens	Operating	Per dish or per meal

Illustration 11

State which method of costing you would recommend for use in the following industries: (a) Chemical works, (b) Steel owning iron ore mines, (c) Constructional engineer, (d) Cement, (e) Soap, (f) Railways, (g) Shipbuilders, (h) Readymade garments, (i) Telephone, (j) Cotton Textiles, (k) Hospital, (l) Aluminium, (m) Hosiery mill, (n) Paper mill, (o) Oil refinery, (p) Furniture manufacturer, (q) Meat packing, (r) Air-conditioners, (s) Baby food, (t) Locomotives, (u) Tyres and tubes, (v) Leather, (w) Pianos, (x) Toys and novelties, (y) Radio receivers.

Solution

(a) Process, (b) Process, (c) Contract, (d) Process, (e) Process, (f) Operating, (g) Contract, (h) Batch, (i) Operating, (j) Process, (k) Operating, (l) Process, (m) Batch, (n) Process, (o) Process, (p) Job, (q) Process, (r) Multiple, (s) Batch, (t) Multiple, (u) Process, (v) Process, (w) Batch, (x) Batch, (y) Multiple.

Illustration 12

Suggest the method of costing and the unit of cost against each of the following industries: (a) Building, (b) Chemical, (c) Cement, (d) Automobile, (e) Cable, (f) Gas, (g) Power, (h) Brewery, (i) Soft drinks, (j) Oil extraction.

Solution

Statement Showing the Method of Costing and Unit of Cost

	Industry	Method of Costing	Unit of Cost
(a)	Building	Job	Per square foot
(b)	Chemical	Process	Per tonne, per kg
(c)	Cement	Process	Per tonne
(d)	Automobile	Process	Each unit
(e)	Cable	Process	Per metre
(f)	Gas	Process	Per cubic foot/metre
(g)	Power	Operating	Per Kwh/per unit
(h)	Brewery	Process	Per dozen bottle/per gallon of drought brew
(i)	Soft drinks	Process	Per bottle/per can
(j)	Oil extraction	Process	Per gallon/litre/tonne

Illustration 13

(a) 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 costs 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 products
(x)	Budgeted cost	10.	Added value of a new product

(b) Indicate whether the following statements are True or False

(i) All costs are controllable.

(ii) Conversion cost is equal to direct wages pus factory overhead.

(iii) Variable cost per unit varies with the increase or decrease in the volume of output.

(iv) Depreciation is an out-of-pocket cost.

(v) An item of cost that is direct for one business may be indirect for another.

(vi) Fixed cost per unit remains fixed.

Solution

(a) Correct matchings are indicated as below

(i) Total fixed cost: Remains constant in total. ....(7)

(ii) Total variable cost: Increases in proportion to output. ....(3)

(iii) Unit variable cost: Remains constant per unit. ....(8)
(iv) Unit fixed cost: Decreases with rise in output. ....(6)
(v) Standard cost: What cost should be. ....(1)
(vi) Period cost: Cost not assigned to products. ....(9)
(vii) Actual cost: Incurred cost. ....(2)
(viii) Labour and overhead: Cost of conversion. ....(4)
(ix) Incremental cost: Added value of a new product. ....(10)
(x) Budgeted cost: What costs are expected to be. ....(5)

(b) (i) False, (ii) True, (iii) False, (iv) False, (v) True, (vi) False.

Illustration 14

Classify the following items on the basis of cost

(a) On the basis of functions:

(i) Trade Fair Expenses
(ii) Lawyer's Fees
(iii) Fuel and Oil
(iv) Market Research Expenses

(b) On the basis of traceability to the product:

(i) Customs duty on purchases
(ii) Bank charges
(iii) Carriage expenses on raw materials
(iv) Secondary packaging material

(c) On the basis of relation to change in the level of activity:

(i) Telephone charges of ₹ 1,500
(ii) Factory Insurance
(iii) Depreciation of plant
(iv) Cost of raw materials

Solution

(a) (i) Selling and Distribution Cost
(ii) Office and Administration Cost
(iii) Works or Factory Cost
(iv) Selling and Distribution Cost

(b) (i) Direct Cost
(ii) Indirect Cost
(iii) Direct Cost
(iv) Indirect Cost

(c) (i) Semi-fixed Cost
(ii) Fixed Cost
(iii) Fixed Cost
(iv) Variable Cost

Illustration 15

(a) Classify the following items on the basis of traceability to product

(i) Cost of cotton in textile industry.
(ii) Carriage expenses for raw material.
(iii) Cost of gunny bags in cement manufacturing unit.
(iv) Factory security staff wages.

(b) Classify the following on the basis of behaviour to change in level of activity

(i) Office insurance charges
(ii) Customs duty on raw materials
(iii) Cost of raw material
(iv) Manager's salary

Solution

(a) (i) Direct Cost
(ii) Direct Cost
(iii) Direct Cost
(iv) Indirect Cost

(b) (i) Fixed Cost
(ii) Variable Cost
(iii) Variable Cost
(iv) Fixed Cost

Illustration 16

Classify the following on the basis of functions

(i) Salesmen's salary
(ii) Printing and stationery
(iii) Exhibition expenses
(iv) Depreciation on furniture

Solution

(i) Selling and Distribution Cost
(ii) Office and Administration Cost

(iii) Selling and Distribution Cost

(iv) Office and Administration Cost

Illustration 17

(a) Classify the following items into Direct and Indirect Cost

(i) Advertisement

(ii) Overtime wages

(iii) Productive wages

(iv) Carriage inward

(b) Classify the following items into Fixed Cost or Variable Cost or Semi-fixed Cost or Semi-variable Cost

(i) Manager's salary ₹ 24,000

(ii) Direct labour ₹ 8,250

(iii) Sales travelling expenses ₹ 600

(iv) Electricity expenses ₹ 9,000

(c) Classify the following items into Factory Overheads, Office and Administration Overheads and Selling and Distribution Overheads

(i) Depreciation to delivery van

(ii) Bank charges

(iii) Counting house wages

(iv) Drawing office salary

Solution

(a)	(i) Advertisement	Indirect Cost
	(ii) Overtime wages	Direct Cost
	(iii) Productive wages	Direct Cost
	(iv) Carriage inward	Direct Cost
(b)	(i) Manager's salary ₹ 24,000	Fixed Cost
	(ii) Direct labour ₹ 8,250	Variable Cost
	(iii) Sales travelling expenses ₹ 600	Fixed Cost
	(iv) Electricity expenses ₹ 9,000	Semi-variable Cost
(c)	(i) Depreciation to delivery van	Selling and Distribution Overheads
	(ii) Bank charges	Office and Administration Overheads
	(iii) Counting house wages	Office and Administration Overheads
	(iv) Drawing office salary	Factory Overheads

Illustration 18

(a) Classify the following items into Direct and Indirect Cost

(i) Cost of cotton in a textile unit
(ii) Lighting and heating
(iii) Postage
(iv) Carriage inwards

(b) Classify the following items into Fixed or Variable or Semi-variable Cost

(i) Direct Material
(ii) Phone Charges
(iii) Foremen's Wages
(iv) Works Manager's Salaries

(c) Classify the following items into Factory or Office and Administration or Selling and Distribution Cost

(i) Office Rent ₹ 600
(ii) Audit Fees ₹ 1,200
(iii) Depreciation of Delivery Van ₹ 400
(iv) Salesmen's Commission ₹ 850

Solution

(a)	(i) Cost of cotton in a textile unit	Direct Cost
	(ii) Lighting and heating	Indirect Cost
	(iii) Postage	Indirect Cost
	(iv) Carriage inwards	Direct Cost
(b)	(i) Direct Material	Variable Cost
	(ii) Phone Charges	Semi-variable Cost
	(iii) Foremen's Wages	Wages Fixed Cost
	(iv) Works Manager's Salaries	Fixed Cost
(c)	(i) Office Rent ₹ 600	Office and Administration Cost
	(ii) Audit Fees ₹ 1,200	Office and Administration Cost
	(iii) Depreciation of Delivery Van ₹ 400	Selling and Distribution Cost
	(iv) Salesmen's Commission ₹ 850	Selling and Distribution Cost

QUESTIONS FOR SELF-PRACTICE

(I) Theory Questions

1. Describe in brief Classification of Overheads.
2. Which are the different ways by which the cost can be analysed?

3. Explain the essentials of classifications of cost in cost accounting.
4. How is the cost analysed?
5. Explain Fixed and Variable cost.
6. What is cost? How would you classify cost?
7. What is meant by elements of cost and divisions of cost?
8. Give examples of each of factory overheads and office overheads.
9. What are chargeable expenses? Give three examples.
10. What do you understand by variable cost, fixed cost and semi-variable cost?
11. Distinguish between product cost and period cost.
12. Write short notes on:
    (a) Controllable Cost.
    (b) Conversion Cost.
    (c) Avoidable Cost.

(II) Multiple Choice Questions

1. Product cost means
    (i) Variable cost (ii) Fixed cost
    (iii) Prime cost (iv) Indirect cost
2. Notional cost is also known as
    (i) Imputed cost (ii) Opportunity cost
    (iii) Out-of-pocket cost (iv) Variable cost
3. Cost which can be identified with the output is called as
    (i) Product cost (ii) Direct cost
    (iii) Fixed cost (iv) Variable cost
4. Cost of designing is
    (i) Production cost (ii) Indirect cost
    (iii) Direct material (iv) Direct charges
5. Interest on capital is
    (i) Imputed cost (ii) Sunk cost
    (iii) Direct cost (iv) Indirect cost
6. Payment to other parties is called as
    (i) Out-of-pocket cost (ii) Book cost
    (iii) Future cost (iv) Postponable cost
7. Cost which is relevant for decision making is
    (i) Relevant cost (ii) Past cost
    (iii) Opportunity cost (iv) Imputed cost

8. Overheads which are incurred in connection with factory are
   (i) Factory overheads (ii) Office overheads
   (iii) Selling overheads (iv) Prime cost
9. Cost which does not require current cash payment is
   (i) Book cost (ii) Product cost
   (iii) Cash cost (iv) Opportunity cost

[Ans. 1. (i), 2. (i), 3. (ii), 4. (iv), 5. (i), 6. (i), 7. (i), 8. (i), 9. (i)]

(III) Objective Questions

A. State whether the following statements are True or False.

1. Direct cost cannot be allocated to the cost unit.
2. Indirect cost can be allocated to the cost unit.
3. Marginal cost is variable cost.
4. Overheads are direct cost.
5. Direct material is an indirect cost.
6. Conversion cost is equal to direct wages and factory overheads.
7. Interest on capital is an imputed cost.
8. Fixed cost changes according to the level of activity.
9. Lubricants are direct materials.
10. Packing charges are distribution cost.
11. Trial run cost is called as pre-production cost.
12. Replacement cost is the cost of replacing an asset.
13. Relevant cost helps the manager in taking a right decision.
14. Depreciation is a book cost.
15. Maintenance of building is a postponable cost.

[Ans. True: (2, 3, 6, 7, 10, 11, 12, 13, 14, 15). False: (1, 4, 5, 8, 9)]

B. State whether the following statements are True or False. Give Reason in one sentence only.

1. Variable cost per unit varies with the increase in the volume of output.
2. Depreciation is a non-cash cost.
3. Fixed cost per unit remains constant.
4. Freight on raw materials purchased is an indirect cost.
5. A cost statement is also termed as cost sheet.
6. Material accounts for a major portion of cost of production in a manufacturing concern.
7. Labour turnover can be reduced.

8. Break-even point helps to break the costs into variable and fixed costs.
9. Indirect costs are termed as overheads.
10. There is no difference between a cost sheet and an income statement.

[Ans. True: (2, 5, 6, 7, 9). False: (1, 3, 4, 8,10)]

C. Match the Following

	Column 'A'		**Column 'B'**
1.	Wages of machine operator	(a)	Direct costs
2.	Wages of foreman	(b)	Indirect labour
3.	Overheads	(c)	Distribution
4.	Semi-finished Goods	(d)	Direct labour
5.	Apportionment	(e)	Work-in-progress
		(f)	Indirect costs

[Ans. 1. (d), 2. (b), 3. (f), 4. (e), 5. (c)]

	Group A		**Group B**
1.	Direct material	(i)	Variable Cost
2.	Marginal Cost	(ii)	Indirect Cost
3.	Overheads	(iii)	Benefit forgone by selection of one alternative
4.	Relevant Cost	(iv)	Cost actually incurred
5.	Opportunity Cost	(v)	Direct Cost
6.	Sunk Cost	(vi)	Important for decision-making
7.	Book Cost	(vii)	Depreciation
8.	Direct Expenses	(viii)	Administrative Cost
9.	Staff Salary	(ix)	Sales Commission
		(x)	Cost of Production

[Ans. 1. (v), 2. (i), 3. (ii), 4. (vi), 5. (iii), 6. (iv), 7. (vii), 8. (x), 9. (viii)]

Practical Questions

1. The following figures are extracted from the Trial Balance of Gogetter Co. on 30th September, 2012. **[15 Marks]**

Particulars	**₹**
Inventories	
Finished goods	80,000
Raw Materials	1,40,000
Work-in-progress	2,00,000
Office Appliances	17,400
Plant & Machinery	4,60,500
Buildings	2,00,000

Sales	7,68,000
Sales Return & Rebates	14,000
Materials Purchased	3,20,000
Freight Incurred on Materials	16,000
Purchase Returns	4,800
Direct Labour	1,60,000
Indirect Labour	18,000
Factory Supervision	10,000
Repairs & Unkeep – Factory	14,000
Heat, Light, & Power	65,000
Rates & Taxes	6,300
Miscellaneous Factory Expenses	18,700
Sales Commission	33,600
Sales Travelling	11,000
Sales Promotion	22,500
Distribution Dept. Salaries & Expenses	18,000
Office Expenses	8,600
Interest on Borrowed Funds	2,000

Further details are available as follows:

(i) Closing Inventories:

Finished Goods	1,15,000
Raw Materials	1,80,000
Work-in-progress	1,92,000

(ii) Accrued Expenses on:

Direct Labour	8,200
Indirect Labour	1,200
Interest on Borrowed Funds	2,000

(iii) Depreciation to be provided on:

Office Appliances – 5%, Plant and Machinery – 10%, Buildings – 4%.

(iv) Distribution of the following costs:

Heat, Light and Power to Factory, Office and Distribution in the ratio 8 : 1 : 1.

Rates and Taxes two-third to Factory and one-third to office.

Depreciation on Building Factory, Office and Selling in the ratio 8 : 1 : 1.

With the help of the above information, you are required to prepare cost sheet for Gogetter Co. for the year ended 30th September, 2014.

[Ans.: Total Cost: 7,14,220 Net Profit: 39,780]

2. From the following data, relating to the manufacturing of a standard product during September 2014, prepare a statement showing cost and profit per unit:

	₹
Raw material used	1,20,000
Direct wages	72,000
Man hours worked	10,000 hours
Man hours rate for recovering works overheads	₹ 10 per hour
Office overheads	25% on work cost
Selling overheads	₹ 1.50 per unit

Unit produced 42,000; units sold 40,000 @ ₹ 25 per unit.

[Ans.:(i) Total Cost – ₹ 4,07660; Cost per Unit – 10.17,

(ii) Net profit – ₹ 5,92,380; Cost per Unit – 14.83]

3. X, Y and Z carry on business as engineers in partnership, sharing profits and losses equally, Z devotes to the business only so much time as he thinks fit. Y acts as works manager and X as office manager. The following figures for the month of March, 2014 are available:

[MU, T.Y.B.Com., Modified]

Particulars		₹
Purchases of materials		74,250
Works wages	Direct	48,000
	Indirect	6,000
Office salaries		14,085
Carriages inward		450
Carriages outward		42,000
Sales		2,40,000
Opening stock of Materials		26,250
Finished goods (600 units)		6,750
Work-in-progress		9,750
Travelling expenses (25% administrative: 75% sales)		1,800
Interest on capital (equally to X, Y and Z)		4,500
Advertising		4,500
Power		1,575
Income tax		14,250
Agent's commission		6,750
Plant maintenance		5,490
Lighting (90% for factory, 10% for sale)		1,500
Discount received		450
Bad debts		750

Sundry expenses	(Factory)	2,100
	(Office)	3,900
Factory Building's repairs		750
Partner's salaries	X	1,500
	Y	1,800
Depreciation	Plant	2,850
	Factory	1,200
Building		600
Sale of Scrap		

On 31st March 2014 Materials on hand totaled ₹ 24,000 where as the work-in-progress was estimated as ₹ 8,500. 1800 units were produced out of which 650 remained unsold. Prepare cost sheet and show the profit earned. ***[Ans.: 70,001]***

4. From the following information, prepare a cost statement showing maximum possible break up of cost and total profit:

	₹
Sales for January 2014	30,00,000
Cost of goods sold	24,80,000
Administration expenses	1,80,000
Selling expenses	40,000

	1.1.10 ₹	**31.1.10** ₹
Raw material stock	3,20,000	4,00,000
Work-in-progress	3,20,000	4,80,000
Finished goods	4,20,000	3,40,000

Direct wages were 30% of prime cost

Raw materials consumed were 50% of prime cost

Direct expenses were 20% of prime cost

Factory overheads were 20% of prime cost. ***[MU, T.Y.B.Com., Modified]***

[Ans.: (i) Total Cost – ₹ 25,20,000
(ii) Net Profit – ₹ 4,80,000]

5. The following particulars relating to the year 2014 are taken from the book and records of a chemical works manufacturing and selling a standardised mixture:

		Kgs.	**₹**
Stock in 1-1-2014 (Opening)	Raw Materials	2,000	2,000
	Finished Mixtures	500	1,750
	Factory Stores		7,250
	Raw Materials	1,60,000	1,80,000

Purchase			
	Factory Stores		24,250
	Finished Mixtures	1,53,050	9,18,000
Sales	Factory Scrap		8,170
Factory wages			1,78,650
Mixtures			
Power			30,400
Machinery depreciation			18,200
Salaries	Factory		72,220
	Office		37,220
	Selling		41,500
Expenses	Direct		18,500
	Office		18,200
	Selling		18,000
Interest on capital	Factory		7,000
	General		3,000
Advertising			1,40,000
Cash discount on sales			14,500
Bank Interest paid			1,250
Stock on 31-12-2009	Raw Materials	1,200	?
	Finished Mixtures	450	?
	Factory Stores		5,550

The wastage in raw material is normal. The purchase price of raw materials remained unchanged through 2009. The stock of finished mixture at the end of the year is to be valued at factory cost. Raw materials are consumed on FIFO basis. From the above information, you are required to prepare a cost statement shoeing the prime cost, works cost and total cost of the mixture produced during the year. ***[CA Modified]***

[Ans: Prime Cost – ₹ 3,77,800; Works Cost – ₹ 5,16,200; Total Cost – ₹ 16,89,797]

6. The following figures are extracted from the Trial Balance of Gogetter Co. on 30th September, 2014.

Particulars	**₹**
Inventories	
Finished goods	80,000
Raw Materials	1,40,000
Work-in-progress	2,00,000
Office Appliances	17,400
Plant & Machinery	4,60,500
Buildings	2,00,000
Sales	7,68,000

Sales Return & Rebates	14,000
Materials Purchased	3,20,000
Freight incurred on Materials	16,000
Purchase Returns	4,800
Direct Labour	1,60,000
Indirect Labour	18,000
Factory Supervision	10,000
Repairs & Unkeep – factory	14,000
Heat, Light, & Power	65,000
Rates & Taxes	6,300
Miscellaneous Factory Expenses	18,700
Sales Commission	33,600
Sales Travelling	11,000
Sales Promotion	22,500
Distribution Dept. Salaries & Expenses	18,000
Office Expenses	8,600
Interest on Borrowed Funds	2,000

Further details are available as follows:

(i) Closing Inventories:

Finished Goods	1,15,000
Raw Materials	1,80,000
Work-in-progress	1,92,000

(ii) Accrued Expenses on:

Direct Labour	8,200
Indirect Labour	1,200
Interest on Borrowed Funds	2,000

(iii) Depreciation to be provided on: Office Appliances 5%, Plant & Machinery 10%, Building 4%

With the help of the above information, you are required to prepare cost sheet for Gogetter Co. for the year ended 30th September, 2012. ***[MU, T.Y.B.Com., Modified]***

[Ans.: (i) Total Cost – ₹ 7,14,220; (ii) Net Profit – ₹ 39,780]

7. The following is the trading and profit and loss account of a manufacturing company for the quarter ended 30th June, 2009:

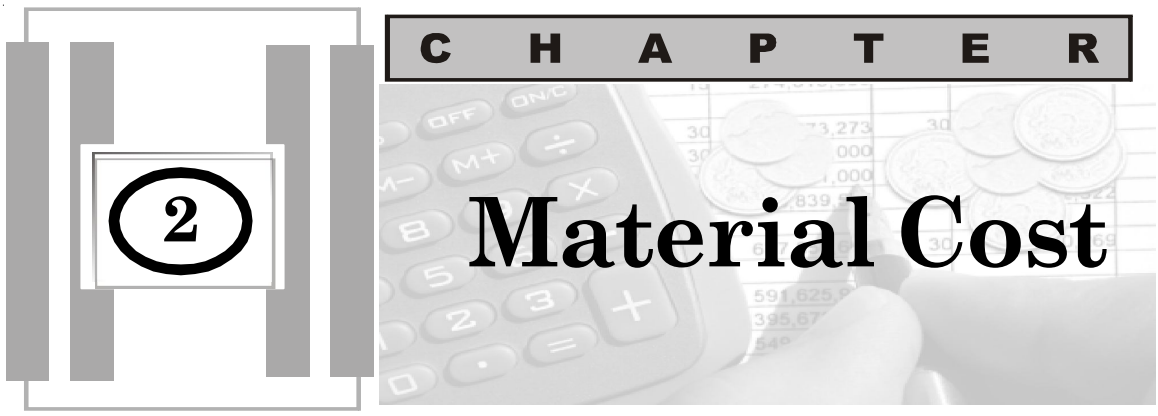
		₹		₹
To Opening stock			By Sale of finished goods	2,75,000
Raw materials	5,000		By Sale of factory scrap	5,000
Work-in-progress	10,000		By Income from Investments	10,000

Finished goods	25,000	40,000	By Closing stock		
To Purchase of raw Materials		1,00,000	Raw material	15,000	
			Work-in-progress	20,000	
To Wages (75% direct & 25% indirect)		60,000	Finished goods	10,000	45,000
To Factory expenses		20,000			
To Administrative expenses		15,000			
To Selling & distribution expenses		30,000			
To Interest		20,000			
To Income tax		25,000			
To Net Profit		25,000			
		3,35,000			3,35,000

Finished goods costing ₹ 5,000 were used for free samples and those costing ₹ 10,000 were donated to a charitable institution, however, no accounting entries have been passed for the same. Further no accounting entry has been passed for the material costing ₹ 5, 000 destroyed by fire while it was being worked in the factory. You are required to prepare a cost sheet.

[Ans.: Total Cost – ₹ 2,25,000 and Profit – ₹ 50,000]

❄ ❄ ❄



MATERIALS COST: THE CONCEPT

Meaning of the Word 'Material'

Material refers to all commodities that are consumed in the process of manufacture. Material can be defined "anything that can be stored, stacked or stockpiled."

It constitutes an important part of the cost of production of commodity. They account for nearly 60% of the cost of production of large number of organisations.

Types of Materials

The materials can be categorised into two:

(a) Direct Materials: The materials which can be identified with the individual units are known as direct materials. These materials form part of the finished product. All costs which are incurred to obtain direct material are known as 'direct material cost.' Leather used in the manufacture of shoes and yarn required for production of cloth are examples of direct materials.

(b) Indirect Materials: Indirect materials do not form part of the finished products. Indirect material cannot be accurately allocated to a particular unit of product. Examples of such materials are consumable stores, cotton waste and lubricating oils, required for the maintenance of machines, etc.

Objectives of Material Control

The following are the main objectives of material control.

(a) All types of raw materials should be available throughout. This ensures uninterrupted production schedule.

(b) There should be no understocking, which generally hampers the production process.

(c) There should be no overstocking, which makes the capital dearer.

(d) The purchaser is able to make a valuable contribution to reduction in cost by purchasing raw materials at the most favourable prices.

(e) Purchase of material should be of the right quality consistent with the standards prescribed in respect of the finished goods.

(f) Proper storage conditions should be provided to different types of raw material in order to minimise the loss of material.

(g) There should be a system to give complete and up-to-date accounting information about the availability of material.

Procedures for Materials Procurement and Use

Although production process and material requirements vary, the cycle of **procurement and use of material** usually involves the following steps:

(1) Engineering and planning: Determine the design of the product, the material specification and the requirements at each stage of operations. Engineering and planning not only determine the maximum and minimum quantities to run and the bill of materials for given products and quantities but also cooperate in developing standards where applicable.

(2) The production budget: Provides the master plan from which details concerning material requirements are eventually developed.

(3) The purchase requisition: Informs the purchasing agent concerning the quantity and type of materials needed.

(4) The purchase order: Contracts for appropriate to be delivered at specified dates to assure uninterrupted operations.

(5) The receiving report: Certifies quantities received and may report results of inspection and testing for quality.

(6) The materials requisition: Notifies the storeroom or warehouse to deliver specified time or is the authorisation for the storeroom to issue material to departments.

(7) The materials ledger cards: Record the receipt and the issuance of each class of materials provide a perpetual inventory record.

Purchase of Supplies, Services and Repairs

The procedure followed in purchasing productive materials should apply to all departments and division of a business. Purchase requisitions, purchase orders, and receiving reports are appropriate for accounting department supplies and equipment, the company cafeteria, the first aid unit, the treasurer's office, the building service department and the public relations, personnel, sales and engineering department, as well as all other departments. If for example, the accounting department needs new forms printed, a requisition should be sent to the purchasing department in the usual manner, and a purchase order should be prepared and sent to the printer.

In the case of magazine subscriptions, trade and professional associations, memberships for company officials, and similar services, the official or department head may send in a requisition in a usual manner. A requisition, an order, and an invoice for all goods and services purchased are necessity in properly controlling purchases.

Repair contracts on an annual basis for typewriters, calculators, electronic data processing (EDP) equipment, and some types of factory equipment may be requisitioned and ordered in the usual manner. In order cases, a department head or other employee may telephone for service and shortly thereafter may have a machine repaired and back in operation. In such cases, the purchasing agent issues a so-called blanket purchase order that amounts to approval of all repair and service costs of a specific type without knowing the actual amount charged. When the repair bill is received, the invoice clerk checks the amount of the bill with the head of the department where the repairs took place and the approves the invoices for payment.

Purchase Requisition Form

The **purchase requisition** originates with (1) stores or where house clerk who observes that quantity on hand is at a set ordering minimum, (2) a materials ledger clerk who may be responsible for notifying the purchasing agent when to buy, (3) a works manager who foresees the need for special materials or unusual quantities (4) a research or engineering department employee who needs materials or supplies of a special nature, or (5) a computer that has been programmed to produce replenishment advice for the purchasing department. For standard material, little information other than the stock number may be needed, and the purchasing agent uses judgment concerning where to buy and the quantity to order. For other purchase requests, it may be necessary to give meticulous description, blueprints, catalog numbers, weights, standards, brand names, exact quantities to order, and suggested price. Below is an example of the purchase requisition:

Example/Sample of Purchase Requisition Form

Purchase Requisition **No. 07615**

Mth/Day/Yr

To Purchasing Department

Deliver to ——————— Date Required ———————

Dept. No. ———————

Acct. No. ———————

Suggested

Supplier ———————

———————

Qty	Item No.	Description	Unit Price	Amount

Budget Control

Allowance for	Balance	Ordered
Period_____	Available____	By _____
	Amt This	Approved
Purchase _____	By _____	
Remaining		
Balance_____		

One copy remains with the originating employee, and the original is sent to the purchasing department for execution of the request.

RECEIVING MATERIALS

The function of the receiving department is to unload and unpack incoming materials; check quantities received against the shipper's packing list; identify goods received with description on the purchase order; prepare a receiving report; notify the purchasing department of description discovered; arrange for inspection when necessary; notify the traffic department and the purchasing department of any damage in transit; and route accepted materials to the appropriate factory location.

Invoice approval is an important step in materials control procedure, since it certifies that the goods have been received as ordered and the payment can be made. The invoice approval information is often built into a rubber stamp and each invoice is stamped.

The voucher data are entered first in the **purchases journal** and are posted to the subsidiary records. They are then entered in the cash payments journal according to the due date for payment. The original voucher and two copies are sent to the treasurer for issuance of the cheque. The treasurer mails the cheque with the original voucher to the vendor, files a voucher copy and returns one voucher copy to the accounting department for the vendor's file. Purchase transaction entered in the purchases journal affect the control accounts and the subsidiary records as shown in the chart below:

General Ledger Control

Transaction	Debit	Credit	Subsidiary Records
Materials purchased for stock	Materials	Accounts payable	Entry in the received section in the materials ledger card
Materials purchased for a particular job or department	Work-in-process	Accounts payable	Entry in the direct material section of the production or the job order
Materials and supplies purchased for factory overhead purposes	Materials	Accounts payable	Entry in the received section of the material ledger card
Supplies purchased for marketing and administrative office	Material Marketing expense control Administrative expenses control	Accounts payable	Entry in the received section of the materials ledger card or in the proper columns of the marketing or administrative expenses analysis sheets
Purchase of service or repairs	Factory overhead Marketing expenses control Administrative expenses control	Accounts payable	Entry in the proper account columns of the expenses analysis sheet
Purchase of equipment	Equipment	Accounts payable	Entry on the equipment ledger card

CORRECTING INVOICES

When the purchase order, receiving report and invoice are compared, various adjustments may be needed as a result of the circumstances described below.

1. Some of the materials ordered are not received and are not entered in the invoice. In this case, no adjustment is necessary, and the invoice may be approved for immediate payment. On the purchase order, the invoice clerk will make a notation of the quantity received in place of the quantity ordered. If the vendor is out of stock or otherwise unable to deliver specified merchandise, an immediate ordering from other sources may be necessary.
2. Items ordered are not received but are entered in the invoice. In this situation, the shortage is noted in the invoice and is deducted from the total before payment is approved. A letter to the vendor explaining the shortage is usually in order.
3. The seller ships a quantity larger than called for in the purchase order. The purchaser may keep the entire shipment and add the excess to the invoice, if not already invoiced; or the excess may be returned or held, pending instruction from the seller. Some companies issue a supplementary purchase order that authorises the invoice clerk to pay the overshipment.
4. Materials of a wrong size and quality, defective parts, and damaged items are received. If the items are returned, a correction in the invoice should be made before payment is approved. It may be advantageous to keep damaged or defective shipments if the seller makes adequate price concessions, or the items may be held subject to the seller's instructions.
5. It may be expedient for a purchase to pay transportation charges, even though delivered prices are quoted and purchases are not made on the basis. The amount paid by the purchaser is deducted on the invoice, and the paid freight bill is attached to the invoice as evidence of payment.

Electronic Data Processing System (EDP System) for Materials Received and Issued

In an electronic data processing system (EDP System), the computer to a great extent replaces the clerk. Upon receipt of the invoice (the source document), the accounts payable clerk enters the account distribution on the invoice. The data are then directly inputted from the invoice to the computer data bank via a terminal device. The data are edited, audited, and merged with the purchase order and the receiving order data, both of which have been stored in the purchase order number. Quantities, monetary values, due dates, terms, and unit prices are matched. When in agreement, the cost data are entered in the accounts payable computer file with a date for later payment.

COST OF ACQUIRING MATERIALS/MATERIALS ACQUISITION COST

A guiding principle in accounting for the cost of materials is that all costs incurred in entering a unit of materials into factory production should be included.

Acquisition costs: Acquisition costs such as the vendor's invoice price and transportation charges are visible costs of the purchased goods. Less obvious costs of materials entering factory operations are costs of purchasing, receiving, unpacking, inspecting, insuring, storing, and general and cost accounting.

Applied acquisition costs: If it is decided that the materials cost should include incoming freight charges and other acquisition costs, and applied rate might be added to each invoice and to each item instead of charging these costs directly to factory overhead.

STORES RECORDS

The records of stores may be maintained in three forms:

1. Bin Cards
2. Stock Control Cards
3. Stores Ledger

The first two forms of accounts are records of quantities received, issued and those in balance but the third one is an account of their cost also. Usually, the account is kept in the forms, the quantitative in the stores and quantitative-cum-financial in the cost department.

Bin Cards and Stock Control Cards

These are essential similar, being only quantitative records of stores. The latter contains further information as regards stock on order. Bin cards are kept attached to the bins or receptacles or quite near thereto so that these also assist in the identification of the stock. The stock control cards, on the other hand, are kept in cabinets or trays or loose binders.

Swadeshi Company Limited

BIN CARD

Bin Card No.	Bin Card No. .....
Name of the Article	Maximum Quantity .....
Code No.	Minimum Quantity .....
Store Ledger Folio	Ordering Quantity .....

Receipts		Issues		Balance				Goods on Order		
Date	Goods Received Note No.	Quan-tity	Stores Requisition Note No.	Quantity	Quantity	Date of Check-ing	Remark	No. of Date of Order	Quantity	Date of Goods Received

Advantages of Bin Cards

1. There would be less chances of mistakes being made as entries would be made at the same time as goods are received or issued by the person actually handling the materials.
2. Control over stock can be more effective in as much as comparison of the actual quantity in hand at any time with the book balance is possible.

Stores Ledger

A modern stores ledger is a collection of cards or loose leaves specially ruled for maintaining a record of both quantity and cost of stores received, issued and those in stock. Being a subsidiary ledger to maintain the main cost ledger, it is maintained by a Cost Accountant. It is posted from the Goods Received Note and the Materials Requisition.

Issuing and Costing Materials into Production

To control the quantity and cost of materials, supplies and services requires a systematic and efficient system of purchasing, recording and storing. Equally necessary is a systematic and efficient procedure for issuing materials and supplies.

Materials Ledger Card – Perpetual Inventory

As purchased materials go through the systematic verification of quantities, prices, physical condition, and other checks, the crux of the accounting procedure is to establish a **perpetual inventory**—maintaining for each type of materials, a record showing quantities and prices of materials received, issued and on hand.

Materials ledger cards or stock ledger sheets constitutes a subsidiary materials ledger controlled by the materials are inventory accounts in the general ledger or in the factory ledger.

Stock Ledger Cards commonly show the account number, description or type of material, location, unit measurement, and maximum and minimum quantities to carry. These cards are the materials ledger with new cards prepared and old ones discarded as changes occur in the types of materials carried in stock. The ledger card arrangement is basically the familiar debit, credit, and balance columns under the description of received, issued, and balance. Following is an example of material ledger card.

Example/Sample of Materials Ledger Cards

Piece or Part No. Reorder Point_____

Description Reorder Quantity_____

Maximum Quantity_____

Received				Issue			Balance			
Date	Res.	Qty No.	Amount	Date	Res.	Qty No.	Amount	Qty	Unit Cost	Amount

MATERIALS COSTING METHODS

- First-In-First-Out (FIFO) Costing Methods
- Average Costing Methods
- Last-In-First-Out (LIFO) Costing Methods

- Other Materials Costing Methods — Month end average cost, last purchase price or market price at date of issue and standard cost.

First-In-First-Out (FIFO)

This method assumes that the goods purchased first or manufactured first are issued/sold first. That is the goods issued or sold currently are those which represent the earliest purchases amongst the goods held in inventory. This would mean that the goods which remain in stock after the sales are those which represent the most recent purchases.

Last-In-First-Out (LIFO)

This method is just the opposite of FIFO method. This method assumes that the goods issued or sold out of the inventory are the ones most recently purchased/manufactured. Therefore, the goods held in stock represent the earlier purchases/productions.

Weighted Average Method (WAM)

This method assumes that all inventory available are best represented by a weighted average cost. The average cost of goods held in inventory is recalculated every time a fresh purchase is made and goods issued or sold out of inventory are priced at such average price till such time as the next lot is purchased.

Illutration: 1

Brid's Drills Co. has Following Transaction in the Month of February 2014

	February 2014
(1)	Beginning balance: 800 units @ ₹ 6 per unit.
(4)	Received 200 units @ ₹ 7 per unit.
(10)	Received 200 units @ ₹ 8 per unit.
(11)	Issued 800 units.
(12)	Received 400 units @ ₹ 8 per unit.
(20)	Issued 500 units.
(25)	Returned 100 excess units from the factory to the storeroom to be recorded at the latest issued price.
(28)	Received 600 units @ ₹ 9 per unit.

Calculation for the Above Transactions would be as Follows
FIFO Method

February:			
01. Beginning balance	800 units @ ₹ 6	₹4,800	
04. Received	200 units @ ₹ 7	₹1,400	
10. Received	200 units @ ₹ 8	₹1,600	₹7,800
11. Issued	800 units @ ₹ 6		₹4,800
Balance	**200 units @ ₹ 7**	**₹ 1,400**	
	200 units @ ₹ 8	**₹ 1,600**	**₹ 3,000**

12. Received	400 units @ ₹ 8	₹ 3,200	₹ 6,200
20. Issued	200 units @ ₹ 7	₹ 1,400	
300 units @ ₹ 8	₹ 2,400	₹ 3,800	
Balance	**300 units @ ₹ 8**	**₹ 2,400**	
25. Returned to storeroom	100 units @ ₹ 8	₹ 800	
28. Received	600 units @ ₹ 9	₹ 5,400	8,600
Balance	**400 units @ ₹ 8**	**₹ 3,200**	
	600 units @ ₹ 9	**₹ 5,400**	**₹ 8,600**

Illustration: 2

The following is the record of receipts of certain material during the month of February 2014:

Feb. 1 Received 400 units for job no. 12 @ ₹ 10 per unit

Feb. 4 Received 300 units for job no.13 @ ₹ 11 per unit

Feb. 16 Received 200 units for job no. 14 @ ₹ 12 per unit

Feb. 25 Received 400 units for job no. 15 2 ₹ 13 per unit.

During February 2014 following issue of material are made.

Feb. 10 Issued 200 units to job no.12

Feb. 15 Issued 100 units to job no.13

Feb. 17 Issued 200 units to job no. 12

Feb. 20 Issued 200 units to job no 14

Feb. 26 Issued 100 units to job no. 13

Feb. 28 Issued 200 units to job no. 15

Show how these transaction will appear in the stores ledger by FIFO Method and state the amount of inventory of Feb. 28, 2014.

Solution

FIFO Method

Receipts					**Issues**						**Balance**	
Date	**Job no.**	**Qty**	**Rate**	**Amt**	**Date**	**Job no.**	**Qty**	**Due**	**Rate**	**Amt**	**Qty**	**Amt**
2014					2014							
Feb. 1	12	400	10	4,000	Feb.						400	4,000
Feb. 4	13	300	11	3,300	Feb.						700	7,300
					Feb. 10	12	200	200	10	2,000	500	5,300
					Feb. 15	13	100	200	11	1,100	400	4,200
Feb. 16	16	200	12	2,400							600	6,600
					Feb. 17	12	200		10	2,000	400	4,600
					Feb. 20	14	200		12	2,400	200	2,200

Feb. 25	15	400	13	5,200							600	7,400
					Feb. 26	13	100	100	11	1,100	500	6,300
					Feb. 28	15	200	200	13	2,600	300	3,700
Total		**1,300**		**14,900**			**1000**			**11,200**	**300**	**51,600**

Illustration: 3

From the following details calculate value of closing stock on 31-12-2014 according to (a) FIFO Method and (b) weighted average method.

Date	Transaction	No. of units	Rate per unit ₹
1-12-2014	Opening stock	4000	30.00
4-12-2014	Purchased	8000	32.10
8-12-2014	Issued	9000	
12-12-2014	Purchased	7000	32.50
16-12-2014	Issued	6000	
20-12-2014	Purchased	9000	32.30
23-12-2014	Issued	8000	
25-12-2014	Purchased	6000	33.25
27-12-2014	Issued	9000	
29-12-2014	Purchased	10000	32.50
31-12-2014	Issued	7000	32.50

Solution

FIFO Method

	Purchases			Issued			Balance		
Date	**Units**	**₹**	**Total**	**Units**	**₹**	**Total**	**Units**	**₹**	**Total**
1.12.14	Opening						4000	30	1,20,000
4.12.14	8000	32.10	2,56,800				4000	30	1,20,000
							8000	32.1	2,56,800
8.12.14				4000	30	12,0,000			
				5000	32.1	1,60,500	3000	32.1	96,300
12.12.14	7000	32.5	2,27,500				3000	32.1	96,300
							7000	32.5	2,27,500
16.12.14				3000	32.1	96,300			
				3000	32.5	97,500	4000	32.5	1,30,000
20.12.14	9000	32..3	2,90,700				4000	32.5	1,30,000
							9000	32.3	2,90,700
23.12.14				4000	32.5	1,30,000			
				4000	32.3	1,29,200	5000	32.3	1,61,500
25.12.14	6000	33.25	1,99,500				5000	32.3	1,61,500
							6000	33.25	1,99,500

27.12.14				5000	32.3	1,61,500			
				4000	33.25	1,33,000	2000	33.25	66,500
29.12.14	10000	32.5	3,25,000				2000	33.25	66,500
							10000	32.5	325000
31.12.14				2000	33.25	66,500			
				5000	32.5	1,62,500	5000	32.5	1,62,500

The Closing Stock 5000 Units Amount into ₹ 1,62,500

Weighted Average Method

Receipts				Issued			Balance	
Date	**Units**	**₹**	**Total**	**Units**	**₹ cost avg.**	**Total**	**Units**	**Value**
1.12.14	Opening						4000	1,20,000
4.12.14	8000	32.1	2,56,800				12000	3,76,800
8.12.14				9000	31.4	2,82,600	3000	94,200
12.12.14	7000	32.5	2,27,500				10000	3,21,700
16.12.14				6000	32.17	1,93,020	4000	1,28,680
20.12.14	9000	3.3	2,90,700				13000	4,19,380
23.12.14				8000	32.26	2,58,080	5000	1,61,300
25.12.14	6000	33.25	1,99,500				11000	3,60,800
27.12.14				9000	32.8	2,95,200	2000	65,600
29.12.14	10000	32.5	3,25,000				12000	3,90,600
31.12.14				7000	32.55	2,27,850	5000	1,62,750

The Closing Stock 5000 Units Amounting to ₹ 1,62,750.

Illustration: 4

(MU, DFM, Modified 2001)

Followint date pertains to Raw Material 'Timmy' during the minthe September 2014

01/09/2014 Openint Balance 100kg. @ ₹ 15 per kg.

04/09/2014 GRN 903 900 kg. @ ₹ 16 per kg.

07/09/2014 M.R. 95 800 kg.

11/09/2014 GRN 908 2000 kg. @ ₹ 17 per kg.

14/09/2014 M.R. 959 1500 kg.

20/09/2014 GRN 923 200 kg. @ ₹ 25 per kg

24/09/2014 M.R. 963 1000 kg.

29/09/2014 GRN 942 500 kg. @ ₹ per kg.

From the above details. You are reuired to find out:

Quantity and value of closing stock under

(i) Weighted average

(ii) FIFO

Solution

Stock Register (Weighted Average Method)

Date April	Doc Ref.	Receipts			Issue			Balance		
2014		Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
1								1000	15.00	15,000
4	GRN 903	900	16	14,400				1900	15.47	29,400
7	MR 951				800	15.47	1,276	1100	15.47	17,024
11	GRN 908	2000	17	34,000				3100	16.46	51,024
14	MR959				1,500	16.46	24,690	1600	16.46	26,334
20	GRN923	200	25	5,000				1800	17.41	31,334
24	MR963				1,000	17.41	17,410	800	17.41	13,924
29	GRN942	500	16	8,000				1300	16.86	21,924
		3600		61,400	3,300		43,376			

Stock Register (FIFO Methog)

Date April	Doc Ref.	Receipts			Issue			Balance		
2014		Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
1								1000	15	15,000
4	GRN 903	900	16	14,400				1000	15	15,000
								900	16	1,44,000
								1900		29,400
7	MR 951				800	15.00	12,000	200	15	3,000
								900	16	14,400
								1100		17,400
11	GRN 908	2000	17	34,000				200	15	3,000
								900	16	14,400
								2000	17	34,000
								3100		51,400
14	MR959				200	15.00	3,000			
					900	16.00	14,400	1600	17	27,200
					400	17.00	6,800			
					150		2,420			
20	GRN923	200	25	5,000				1600	17	27,200
								200	25	5,000
								180		3,220

24	MR963				1000	17.00	17,000	600	17	10,200
								200	25	5,000
								800		15,200
29	GRN942	500	16	8,000				600	17	10,200
								200	25	5,000
								500	16	8,000
								1300		23,200
		3600		61,400	3450		55,620			

Illustration 5

The following transaction took place in respect of a materialns.

Date	Receipt Quantity (Units)	Rate (₹)	Issue Quantity (Units)
02/03/2014	200	2.00	–
10/03/2014	300	2.40	–
15/03/2014	–	–	250
18/03/2014	250	2.60	–
20/03/2014	–	–	300

Prepare a Stock register as per: (a) Simple Average Method and (b) Weighted Average Method.

(ICWA, Adapted)

Solution

Stock Register (Simple Average Method)

Date	Receipts			Issues			Balance		
	Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
02/03/2014	200	2.00	400	–	–	–	200	2.00	400
10/03/2014	300	2.40	720	–	–	–	500*	–	1,120*
15/03/2014	–	–	–	250	2.20*2	550	250	–	570
18/03/2014	250	2.60	650	–	–	–	500*3	–	1,120*3
20/03/2014	–	–	–	300	2.50*4	750	200	–	470

Working Notes

* Quantity balance and amount balance as on 10/03 are calculated as follows: $200 + 300 = 500 \rightarrow Q$

$400 + 720 = 1,120 \rightarrow A$

*2 Issue price is simple average of above two purchases = $\frac{2.00 + 2.40}{2} = 2.20$

*3 Quantity balance and amount balance = $250 + 250 = 500 \rightarrow Q$

$570 + 650 = 1,220 \rightarrow A$

*4 Issue price is simple average of above two purchases = $\frac{2.40 + 2.60}{2} = 2.50$

Stock Register (Weighted Average Method)

Date	Receipts			Issues			Balance		
	Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
02/03/2014	200	2.00	400	–	–	–	200	2.00	400
10/03/2014	300	2.40	720	–	–	–	500	2.24	1,120
15/03/2014	–	–	–	250	2.24	560	250	2.24	560
18/03/2014	250	2.60	650	–	–	–	500	2.42	1,120
20/03/2014	–	–	–	300	2.42	726	200	2.42	484

Illustration 6

Following purchases were made of pipe 6".

Receipts	Issues			
04/06/2014	20 pipes	@ ₹ 15.00 each	20/06/2014	25 pipes
17/06/2014	30 pipes	@ ₹ 14.00 each	05/07/2014	40 pipes
02/07/2014	40 pipes	@ ₹ 14.50 each	31/07/2014	45 pipes
30/07/2014	30 pipes	@ ₹ 13,00 each		

On 28th July, 2014, 2 pipes issued on 20/06/2014 were received back, out of which one pipe was found damaged on 28th July, 2014 and had to be discarded. Calculate the value of closing stock as per LIFO method.

Stock Register (LIFO Basis)

Date	Particulars	Receipts			Issues			Balance		
		Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
04/06/2014	Receipts	20	15	300	–	–	–	20	15	300
17/06/2014	Receipts	30	14	420	–	–	–	30	14	420
								50	–	**720**
								20	15	300
20/06/2014	Issue	–	–	–	25	14	350	5	14	70
								20	15	300
								5	14	70
02/07/2014	Receipts	40	14.50	580	–	–	–	40	14.50	580
05/07/2014	Issue	–	–	–	40	14.50	580	20	15	300
								5	14	70
								20	15	300
28/07/2014	Returned	2	14	28	–	–	–	5	14	70
								2	14	28
28/07/2014	Damaged Pipe				1	14	14	20	15	300
	Discarded							5	14	70
								1	14	14

								20	15	300
30/07/2014	Receipts	30	13	390				5	14	70
								1	14	14
								30	13	390
31/07/2014	Issue				30	13	390			
					1	14	14			
					5	14	70	11	15	165
					9	15	135			

∴ The value of closing stock as per LIFO method is 11 units @ ₹ 15 = ₹ 165

Illustration 7

From the following data, you are required to compile a valued stock card in respect of material 'Mikytoya' for the month of April 2014 and value the closing stock by: (a) Weighted average method and (b) First-In-First-Out method.

April 1	Opening stock 100 units @ ₹ 15 per unit
April 4	Received 90 units under GRN No. 301 @ ₹ 16 per unit
April 7	Issued 80 units under Issue Note No. 501
April 11	Received 200 units under GRN No. 302 @ ₹ 17 per unit
April 14	Issued 150 units under Issue Note No. 502
April 21	Received 20 units under GRN No. 303 @ ₹ 25 per unit
April 25	Issued 100 units under Issue Note No. 503
April 27	Received 50 units under GRN No. 304 @ ₹ 16 per unit

Solution

Stock Card (Weighted Average Method)

Date April 2014	Doc. Ref.	Receipts			Issues			Balance		
		Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
1								100	15	1,500
4	GRN 301	90	16	1,440				190	15.47	2,940
7	IN 501				80	15.47	1,238	110	15.47	1,702
11	GRN 302	200	17	3,400				310	16.46	5,102
14	IN 502				150	16.46	2,496	160	16.46	2,633
21	GRN 303	20	25	500				180	17.41	3,133
25	IN 503				100	17.41	1,741	80	17.40	1,392
27	GRN 304	50	16	800				130	16.86	2,192
	Total	360		6,140	330		5,448			

∴ The value of closing stock as per weighted average method is 130 units @ ₹ 16.86 = ₹ 2,192.

FIFO Method

Date April 2014	Doc. Ref.	Receipts			Issues			Balance		
		Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
1								100	15	1,500
4	GRN 301	90	16	1440				100	15	1,500
								90	16	1,440
7	IN 501				80	15	1200	20	15	300
								90	16	1,140
								20	15	300
11	GRN 302	200	17	3400				90	16	1,140
								20	17	3,400
14	IN 502				20	15	300			
					90	16	1,440			
					40	17	680			
					150		2,420	160	17	2,720
21	GRN 303	20	25	500				160	17	2720
								20	25	500
25	IN 503				100	17	1700	60	17	1,020
								20	25	500
27	GRN 304	50	16	800				60	17	1,020
								20	25	500
								50	16	800
			360	6,140	330		5,320			

∴ The value of closing stock as per FIFO method is 60 units @ ₹ 17 = 1,020
20 units @ ₹ 25 = 500
50 units @ ₹ 16 = 800
130 units = ₹ 2,320

Illustration 8

From the data given below, answer the following:

(a) What is the simple average price of the four week's receipts of material A?

(b) What is the weighted average price of the four week's receipts of material B?

(c) What is the value of the balance of material A in stock at the close of the fourth week if issues are priced on LIFO basis?

(d) What is the value of the stock at the end of fourth week with respect to material B if they are priced on FIFO basis?

Raw Materials

Weeks	Received		Issued		Balance	
	A		B		Issues	
	Kgs.	₹	Kgs.	₹	A	B
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	960	1,600	2,400	300	1,100
Stores Opening Stock: A -	200 kgs	₹ 720				
B -	2,000 kgs	₹ 2,900				

Solution

Material A (LIFO Method)											
Date Weeks	Doc. Ref.	Receipts			Issues			Balance			
		Qty	Rate*	Amt	Qty	Rate	Amt	Qty	Rate*	Amt	
								200	3.6	720	
								200	3.6	720	
I		250	4.0	100				250	4.0	1000	
								450		1720	
								200	3.6	720	
					175	4.0	700	75	4.0	300	
								275		1020	
II		300	4.2	1260				200	3.6	720	
								75	4.0	300	
								300	4.2	1260	
								575		2280	
								200	3.6	720	
					250	4.2	1050	75	4.0	300	
								50	4.2	210	
								325		1230	
								200	3.6	720	
								75	4.0	300	
III		200	4.4	880				50	4.2	210	
								200	4.4	880	
								525		2110	
					200	4.4	880	200	3.6	720	
					50	4.2	210	25	4.0	100	
					50	4.0	200				
					300		1290	225		820	

IV		250	3.84	960				200	3.6	720
								25	4.0	100
								250	3.84	960
								475		1,780
					250	3.84	960			
					25	4.0	100			
					25	3.6	90	175	3.6	630
					300		1150			
		1000	-	4,100	1,025	-	4190			

* Rate is calculated by dividing amount with quantity.

(a) Simple Average Price Material "A" $= \frac{4 + 4.2 + 4.4 + 3.84}{4} = 4.11$

(b) Weighted Average Price Material "A" $= \frac{\text{Total Value}}{\text{Total Quantity}} = \frac{4100}{1000} = 4.1$

(c) Value of Stock LIFO (Material "A") Basis: $175 \times 3.6 = ₹\ 630$

Material B (FIFO Basis)										
Date Weeks	**Doc. Ref.**	**Receipts**			**Issues**			**Balance**		
		Qty	**Rate**	**Amt**	**Qty**	**Rate**	**Amt**	**Qty**	**Rate**	**Amt**
								2000	1.45	2900
I		1250	1.352	1690				2000	1.45	2900
								1250	1.352	1690
								3250		4590
								500	1.45	725
					1500	1.45	2175	1250	1.352	1690
								1750		2415
								500	1.45	725
II		1400	1.4	1960				1250	1.352	744
								1400	1.4	1690
								3150		4375
					500	1.45	725	550	1.325	744
					700	1.352	946	1400	1.4	1960
					1200		1671	1950		2704
								550	1.352	700
								1400	1.4	1960

III		750	1.4		1050			750	1.4	1050
								2700		3754
					550	1.352	744	650	1.4	910
					750	1.4	1050	750	1.4	1050
					1300		1794	1400		1960
IV		1600	1.5	2400				650	1.4	910
								750	1.4	1050
								1600	1.5	2400
								3000		4360
					650	1.4	910	300	1.4	420
					450	1.4	630	1600	1.5	2400
					1100		1540	1900		2820
		5000	–	7100	5100	–	7180			

$$\text{Simple Average Method} = \frac{1.352 + 1.4 + 1.4 + 1.5}{4} = 1.413$$

$$\text{Weighted Average Method} = \frac{\text{Total Value}}{\text{Total Quantity}} = \frac{7100}{5000} = 1.42$$

Illustration 9

From the following information about a gear used in manufacturing of an assembly, complete the receipts and issues valuation based on FIFO, LIFO and weighted average methods and also tabulate the values chargeable to the two production orders WO 01 and WO 02.

Opening stock		Nil
Purchases	Jan 1	100 units @ ₹ 1 per unit
	Jan 10	100 units @ ₹ 2 per unit
Issues	Jan 22	60 units for WO 01
	Jan 27	60 units for WO 02

Solution

The valuation for receipts will be same under all methods. The value of receipts is

Jan 1	100×1	100
Jan 10	100×2	200
Total		300

The Weighted average rate will be (₹ 300/200 units), i.e., ₹ 1.50 per unit. The valuation of issues under the three methods is shown below:

Stores Ledger for the month of January (issue colum only)

Date	FIFO			LIFO			Weighted Average		
	Qty	Rate	Value	Qty	Rate	Value	Qty	Rate	Value
January									
22 – for WO 01	60	1.00	60	60	2.00	120	60	1.50	90
27 – for WO 02	40	1.00	40	40	2.00	80	60	1.50	90
	20	2.00	40	20	1.00	20			
			140			220			180
Closing Stock	80	2	160	80	1.00	80	80	1.50	120

Values allocated to the two production orders are:

	WO 01	WO 02
FIFO	60	80
LIFO	120	100
Weighted Average	90	90

Illustration 9

From the following details of stores receipts and issues of material "EXE" in manufacturing unit, prepare stores ledger using weighted average method of valuing issues.

Nov 1 Opening stock 2000 units @ ₹ 5 each	Nov 19 Returned to supplier 200 units received in lot on Nov. 4
Nov 3 Issued 1500 units	Nov 20 Received 1000 units @ ₹ 7 each
Nov 4 Received 4500 units @ ₹ 6 each	Nov 24 Issued 2100 units
Nov 8 Issued 1600 units	Nov 27 Received 1200 units @ ₹ 7.5 each
Nov 9 Returned back 100 units by production to stores from lot issued on Nov. 3	Nov 29 Issued 2800 units
Nov 16 Received 2400 units @ ₹ 6.50 each	

Solution

Stores Ledger for the month of November 2014

Date	Receipts			Issues			Balance		
	Qty	Rate	Value	Qty	Rate	Value	Qty	Rate	Value
November									
1									
2							2000	5.00	10000
3				1500	5.00	7500	500	5.00	2500
4	4500	6	27000				5000		
8				1600	5.90	9440	3400	5.90	20060
9				–100	5.00	–500	3500	5.87	20560
16	2400	6.5	15600				5900	6.13	36160
19	–200	6	–1200				5700	6.13	34960

20	1000	7	7000				6700	6.26	41960
24				2100	6.26	13146	4600	6.26	28814
27	1200	7.5	9000				5800	6.52	37814
29				2800	6.52	18256	3000	6.52	19558

NEED FOR MATERIALS CONTROL

One of the first step in the installation of **cost and management accounting system** is planning the proper control of materials and supplies from the time orders are placed with supplier until they have been consumed in the plant and office operation or have been sold as merchandise.

Materials represent an important asset and is the largest single item of cost in almost every business; accordingly the success or failure of a concern may depend largely upon efficient material purchasing, storage, accounting, utilisation and control.

Where materials are not properly controlled, excess stock of some items are likely to occur with a result unnecessary tying up of capital and loss through deterioration and obsolescence. Shortage of other materials may arise at the time when they are urgently needed and production will then be delayed.

The purchasing of materials is highly specialised function. By ordering the right quantity and quality of materials at the most favourable price, and by ensuring that it arrives at the right time, the efficient buyer is able to make a valuable contribution to the success of a business. The **efficient material control** cuts out losses and form of waste that otherwise tend to pass unnoticed. Theft, misappropriation, deterioration, breakage and additional storage costs can be reduced to a minimum by proper controls, and much avoidable idle time in the factory will be reduced if materials are available to meet the demands of the production staff. Finally and most important to the cost accountant, it is impossible to produce reliable costing information if the records of materials issued are unsatisfactory, because a cost statement cannot be more accurate than the information on which it is based.

REQUIREMENTS OF A SYSTEM OF MATERIAL CONTROL

The important requirements or essentials of adequate satisfactory system of material control are as follows:

1. Proper Coordination
2. Competent Purchasing Agent
3. Use of Standard Forms
4. Control by Budgeting Materials and Equipment
5. Storage Location
6. Operation of Perpetual Inventory
7. Standards or Levels to be Fixed
8. Storage Control and Issue

9. Internal Check
10. Development of Controlling Accounts and Subsidiary Records
11. Regular Reports

Proper Coordination: Proper coordination of all departments involved in material purchasing, receiving, testing, approving, storage, issue and accounting is essential.

Competent Purchasing Agent: Centralisation of purchasing in a purchasing department under the direct authority of a competent trained purchasing agent is also considered essential.

Use of Standard Forms: The use of standard form for orders, requisition etc., upon which written and signed instructions are given are essential for proper control of materials.

Control by Budgeting Materials and Equipment: Use of materials, supplies and equipment budgets so that the economy in purchasing and use of material can be realised, is important factor for adequate control of materials.

Storage Location: Storage of all materials and supplies should be in a designated location properly safeguarded under supervision and proper planning should be there for storing and issuing of materials.

Operation of Perpetual Inventory: Operation of proper perpetual inventory system should be used so that it is possible to determine at any time the amount and value of each kind of materials in stock. It also enables the comparison of book inventory with the result of physical counting.

Standards or Levels to be Fixed: A minimum quantity of each item of materials below which point the inventory is not allowed to drop, and a maximum quantity, above which stock is not carried should be fixed. In the same manner, ordering level and economic order quantity may be determined.

Storage Control and Issue: The proper operation of a system of stores control and issue is introduced so that there will be delivery of materials upon requisition to departments in the right amount at the time they are needed.

Internal Check: The operation of internal check should be introduced to ensure that transactions involving material and equipment are checked by reliable and independent officials.

Development of Controlling Accounts and Subsidiary Records: Controlling accounts and subsidiary records reveal summary of detailed materials costs at each stage of materials receipt and consumption from the storeroom to finished goods.

Regular Reports: Regular report and information should be provided to the management in connection with the purchase of materials, issues from stock, inventory balances, obsolete stock, goods returned to vendors and spoiled or defective units.

STOCK CONTROL

Definition and Explanation

The materials purchased by a concern may be classified as stock items which are taken into store and held until required, or as direct deliveries to the point of consumption. The control of those materials which are stock items is known as stock control.

The function of stock control is to obtain the maximum stock turnover consistent with the maintenance of sufficient stocks to meet all requirements. Stock turnover is the ratio by which the cost of the materials used per annum bears to the average stock of raw materials. Discussion with regard to the quantity of materials stocked are reached after many considerations such as:

- The availability of capital for the provisions of stocks.
- The storage space available.
- The cost of storage.
- Risk of loss due to fall in prices, deterioration, obsolescence, theft etc.
- Economic order quantities.
- Delivery delays.

For effective control of materials, it is important to decide upon different levels of materials. These levels are maximum limit or level, minimum limit or level and re-order level or ordering point or ordering level. Maximum, minimum and re-order levels are not static. They must be varied to suit the changing circumstances. Thus, alteration will take place if the usage of certain materials is increased or decreased. If the re-order period changes, or if, in the light of a review of capital available, it is decided that the overall inventory must be increased or decreased.

RE-ORDER LEVEL OR ORDERING POINT OR ORDERING LEVEL

Definition and Explanation

This is that level of materials at which a new order of supply of materials is to be placed. In other words, at this level, a purchase requisition is made out. This level is fixed somewhere between maximum and minimum levels. Order points are based on usage during time necessary to requisition an order, and receive materials, plus an allowance for protection against stock out.

The **order point** is reached when inventory on hand and quantities due in are equal to the lead time usage quantity plus the safety stock quantity.

Formula of Re-order Level or Ordering Point

The following two formulas are used for the calculation of **re-order level or point.**

Ordering point or re-order level = Maximum daily or weekly or monthly usage × Lead time

The above formula is used when usage and lead time is known with certainty. Therefore, no safety stock is provided. When safety stock is provided, then the following formula will be applicable:

Ordering point or re-order level = Maximum daily or weekly or monthly usage × Lead time + Safety stock

Illustration 11

Maximum daily requirement	800 units
Time required to receive emergency supplies	4 days
Minimum daily requirement	600 units

Time required for refresh supplies One month (30 days)

Calculate ordering point or re-order level.

Solution

Ordering point = Ordering point or re-order level

= Maximum daily or weekly or monthly × Lead time

= 800 × 30

= 24,000 units

Illustration 12

Two types of materials are used as follows:

Minimum usage	20 units per week each
Normal usage	40 units per week each
Maximum usage	60 units per week each
Re-order period or lead time	
Material A	3 to 5 weeks
Material B	2 to 4 weeks

Calculate re-order point for two types of materials.

Solution

Ordering point re-order level = Maximum daily or weekly or monthly usage × Lead time

A: 60 × 5 = 300 units

B: 60 × 4 = 240 units

Illustration 13

For Apex Company, the average daily usage of a materials is 1,00,000. Lead time for procuring materials is 20 days and the average number of units per order is 2000 units. What is the re-order level for the company?

Solution

Re-order Level = Maximum daily or weekly or monthly usage × Lead time

= 1,00,000 × 20 days

= 20,00,000 units

MINIMUM LIMIT OR MINIMUM LEVEL OF STOCK

Definition and Explanation

The minimum level or minimum stock is that level of stock below which stock should not be allowed to fall. In case of any item falling below this level, there is danger of stopping of production and, therefore, the management should give top priority to the acquisition of new supplies.

Formula

Minimum level or minimum limit can be calculated by the following formula:

Minimum limit or level = Re-order level or ordering point – Average or normal usage × Normal re-order period

Or the formula can be written as:

Minimum limit or level = Re-order level or ordering point – Average usage for normal period

Illustration 14

Normal usage	100 units per day
Maximum usage	130 units per day
Minimum usage	70 units per day
Re-order period	25 to 30 days

Calculate minimum limit or level.

Solution

To calculate minimum limit of materials, we must calculate re-order point or re-order level first.

Ordering point or re-order level

= Maximum daily or weekly or monthly usage × Maximum re-order

= 130 × 30

= 3,900 units

Minimum limit or level

= Re-order level or ordering point – Average or normal usage × Normal re-order period

= 3900 – (100 × 27.5)

= 1150 units

Normal reorder period = (25 + 30)/2 = 27.5

DANGER LEVEL OF MATERIALS OR INVENTORY STOCK

Definition and Explanation

Some enterprises also calculate **danger level**. When this level of stock is reached, then emergency steps are taken by the management to acquire material supplies.

When danger level is reached, they are made to purchase materials from the nearest possible source or place so that the workers and plant and machinery may not remain idle due to shortage of material supplies.

Formula

Danger level can be calculated by the help of the following formula:

Danger level = Average daily requirement × Time required to get emergency supply

Illustration 15

Normal usage or average requirement	700 units per day
Maximum usage	800 units per day
Minimum usage	600 units per day
Re-order period	25 to 30 days
Time required to receive emergency supplies	4 days

Calculate danger level.

Solution

Danger level = Average daily requirement × Time requirement to get emergency supply

= 700 × 4

= 2800 units

Maximum Stock Level

1. Meaning — Maximum Stock Level is that level of stock above which the stock in hand should not normally be allowed to exceed. It is the largest quantity of a particular material which may be held in the store at any time.
2. Objective — The objective of fixing the maximum stock level is to avoid the costs of overstocking such as cost of storage, cost of investment in stock, cost of insurance, risk of obsolescence etc.
3. Factors — This level is fixed after considering the following factors:
   (a) Re-order Level
   (b) Re-order Quantity
   (c) Minimum Rate of Consumption
   (d) Minimum Re-order Period
   (e) Availability of Working Capital
   (f) Availability of Storage Space
   (g) Extra Cost of Storage
   (h) Extra Cost of Insurance
   (i) Risk of Obsolescence and Deterioration
   (j) Supply of Imported Materials
   (k) Price Fluctuations
4. Formula — Maximum Stock level is computed with the help of following formula:

   Maximum Level = Re-order Level + Re-order Quantity – (Minimum Rate of Consumption × Minimum Re-order Period)

Average Stock Level

1. Meaning — Average Stock Level indicates the average stock held by the organisation.
2. Formula — This level of stock may be computed by using any one of the following formula:
   Average Inventory Level = Minimum Level + 1/2 Re-order Quantity

   OR

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

Illustration 16

Shriram Enterprises manufactures a special product 'ZED'. The following particulars were collected for the year 20X1:

(a) Monthly demand of ZED 1,000 units, (b) Cost of Placing an order ₹ 100, (c) Annual carrying cost per unit 6½%. Purchase price of input unit ₹ 200, (d) Minimum usage 25 units per week, (e) Maximum usage 75 units per week, (f) Re-order period 4 to 6 weeks. For emergency Purchase 3 weeks.

Compute from the above:

(a) Re-order quantity, (b) Re-order level, (c) Minimum level, (d) Maximum level, (e) Average stock level, (f) Danger level, (g) Total cost p.a. if order size is of: (i) EOQ, (ii) 130 units and (iii) 260 units.

Solution

(a) Re-order quantity of units used $= \sqrt{\frac{2AO}{C}}$

where, A = Annual demand of input units
O = Ordering cost per order
C = Annual carrying cost per unit

$$= \sqrt{\frac{2 \times 2{,}600 \times ₹100}{₹13}} = 200 \text{ units}$$

(b) Re-order Level (ROL) = Maximum Rate of Consumption × Maximum Re-order Period

(c) Minimum Level = 75 units × 6 weeks = 450 units

= Re-order level – (Normal Rate of Consumption × Normal Re-order Period)

= 450 units – (50 units × 5 week)

= 450 units – 250 units = 200 units

(d) Maximum Level = Re-order Level + Re-order Quantity – (Minimum Rate of Consumption × Minimum Re-order Period)

= 450 units + 200 units – (25 units × 4 weeks)

= 550 units

(e) Average Stock Level = 1/2 (Minimum) Stock Level + Maximum Stock Level)

= 1/2 (200 units + 550 units) = 375 units

Alternatively, = Minimum Level + 1/2 Re-order Quantity

= 200 units + 200 × 1/2 = 300 units

(f) Danger Level = Normal Rate of Consumption × Lead Time for Emergency Purchases

= 50 units per week × 3 = 150 units

Note: A = Annual demand of input units to produce an output of 12,000 units of 'ZED'

= 52 weeks × Normal Rate of Consumption of Input Units per week

= 52 weeks × 50 units of input per week

= 2,600 units

Statement showing Total Cost at Different Order Sizes

A. Annual usage	2,600	2,600	2,600
B. Order size	200	130	260
C. No. of orders (A/B)	13	20	10
D. Ordering cost per order	100	100	100
E. Total ordering cost (C × D)	1300	2,000	1,000
F. Average inventory (order size/2)	100	65	130
G. Carrying cost per unit (6.5% of ₹ 200)	13	13	13
H. Total Carrying Cost (F × G)	1,300	845	1690
I. Total ordering and carrying cost (E + H)	2,600	2,845	2,690
J. Purchase price (2,600 × 200)	5,20,000	5,20,000	5,20,000
K. Total cost (I + J)	5,22,600	5,22,845	5,22,690

Illustration 17

From the details given, calculate: (i) Re-order level, (ii) Maximum level, (iii) Minimum level and (iv) Danger level. Re-order 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 purchases 4 days.

Rate of Consumption: Average 15 units per day, Maximum 20 units per day.

Solution

Basic data:

O	= Ordering Cost per order	= ₹ 20
A	= Number of units to be purchased annually	= 5,000 units
PP	= Purchase price per unit inclusive of transportation cost	= ₹ 50
C	= Annual cost of storage per unit	= ₹ 5

Computations:

(i) Re-order Level = Maximum Rate of Consumption × Maximum Re-order Period
= 20 units per day × 15 days = 300 units

(ii) Maximum Level = ROL + ROQ – (Minimum Rate of Consumption × Minimum Re-order Period)
= 300 units + 200 units – (10 units per day × 6 days)
= 440 units

(iii) Minimum Level = ROL – (Average Rate of Consumption × Average Re-order Period)
= 300 units – (15 units per day × 10 days) = 150 units

(iv) Danger Level = Average Rate of Consumption × Lead time for Emergency Purchases
= 15 units per day × 4 days = 60 units

Working Notes:

(i) ROQ $= \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 5{,}000 \text{ units} \times ₹\ 20}{₹\ 5}} = 200 \text{ units}$

(ii) Average Rate of Consumption $= \frac{\text{Minimum Rate of Consumption } (x) + \text{Maximum Rate of Consumption}}{2}$

$15 \text{ units per day} = \frac{x + 20 \text{ units per day}}{2}$

or, $x = 10 \text{ units per day}$

Illustration 18

About 50 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. Compute: (i) Economic order quantity and (ii) Re-order level.

Solution

Annual consumption (A) = 50 items × 365 days = 18,250 items
Ordering cost per order (O) = ₹ 50
Carrying cost per item p.a. (C) = ₹ 0.02 × 365 days = ₹ 7.30

(i) Economic Order Quantity $= \sqrt{\frac{2AO}{C}}$

$= \sqrt{\frac{2 \times 18{,}250 \times ₹\,50}{₹\,7.30}} = 500$ items

(ii) Re-order level = Maximum Rate of Consumption × Maximum Lead Time

= 50 items per day × 32 days = 1,600 items

Calculation of Re-order Quantity

Illustration 19

If the minimum stock level and average stock level of raw material A are 4,000 and 9,000 units respectively, find out its re-order quantity.

Solution

Minimum stock level of material A = 4,000 units

Average stock level of material A = 9,000 units

Average stock level = Minimum stock level +1/2 re-order quantity

or, 1/2 Re-order quantity = 9,000 units – 4,000 units = 5,000 units

or, Re-order quantity = 10,000 units

Illustration 20

From the following information, calculate Re-order quantity:

Average usage 50 units per week. Minimum re-order period 4 weeks. Maximum usage 75 units per week. Average re-order period 5 weeks and Average stock level 375 units.

Solution

Step 1 Average usage $= \frac{\text{Minimum Rate of Consumption} + \text{Maximum Rate of Consumption}}{2}$

50 units $= \frac{\text{Minimum Rate of Consumption} + 75 \text{ units}}{2}$

Minimum Usage = (50 × 2) – 75 units = 25 units

Step 2 Average re-order period $= \frac{\text{Minimum Re-order Period} + \text{Maximum Re-order Period}}{2}$

5 weeks $= \frac{4 \text{ weeks} + \text{Maximum Re-order Period}}{2}$

10 weeks = 4 weeks + Maximum Re-order Period

Maximum Re-order Period = 10 weeks – 4 weeks = 6 weeks

Step 3 Re-order Level = Maximum Rate of Consumption × Maximum Re-order Period

= 75 units × 6 weeks = 450 units

Step 4 Minimum Level = Re-order Level – (Average Rate of Consumption × Average Re-order Period

= 450 units – (50 units × 5 weeks) = 200 units

Step 5 Average Stock level = 1/2 (Minimum Level + Maximum Level)

375 units = 1/2 (200 units + Maximum Level)

Maximum Level = 750 – 200 = 550 units

Step 6 Maximum Level = Re-order Level + Re-order Quantity – (Minimum Rate of Consumption × Minimum Re-order Period)

550 units = 450 units + Re-order Quantity – (25 units × 4 weeks)

Re-order quantity = 550 units – 450 units + 100 units = 200 units

Alternatively,

Average Stock Level = Minimum Level + 1/2 Re-order Quantity

375 units = 200 units + 1/2 Re-order Quantity

Re-order Quantity = 750 units – 400 units = 350 units

Calculation of Minimum and Maximum Level

Illustration 21

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 minimum level and maximum level of Material A.

Solution

Step 1 Average Rate of Consumption = (Minimum Rate of Consumption + Maximum Rate of Consumption)/2

= (25 units + 75 units)/2 = 50 units

Step 2 Average Re-order Period = (Minimum Re-order Period + Maximum Re-order Period)/2

= (4 weeks + 6 weeks)/2 = 5 weeks

Step 3 Re-order Level = Maximum Usage per Period × Maximum Re-order Period

= 75 units × 6 weeks = 450 units

Step 4 Minimum Level = Re-order Level – (Average Rate of Consumption × Average Re-order Period)

= 450 units – (50 units × 5 weeks) = 200 units

Step 5 Maximum Level = Re-order Level + Re-order Quantity – (Minimum Rate of Consumption × Minimum Re-order Period)

= 450 units + 300 units – (25 units × 4 weeks) = 650 units

Illustration 22

A company uses three raw materials A, B and C for a particular product for which the following data apply:

Raw Material	Usage per Unit of Product (kgs)	Re-order Quantity (kgs)	Price Per kg	Delivery period (in Weeks)			Re-order Level (kgs)	Minimum Level (kgs)
				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 C? (iv) Average stock level of A?

Solution

(i) Minimum Stock of A = Re-order level – (Average Rate of Consumption × Average Time Required to Obtain Fresh Delivery)

= 8,000 – [(10 × 200) × 2] = 4,000 kg

(ii) Maximum Stock B = Re-order Level + Re-order Quantity – (Minimum Rate of Consumption × Minimum Re-order Period)

(iii) Re-order Level of C = Maximum Rate of Consumption × Maximum Re-order Period

= (6 × 225) × 4 = 5,400 kg

Or

Re-order Level of C = Minimum Stock of C + (Average Rate of Consumption × Average Re-order Period)

= 2,000 + [(200 × 6) × 3] kg = 5,600 kg

(iv) Average Stock Level of A $= \frac{\text{Minimum Stock Level + Maximum Stock}}{2}$

$= \frac{4,000 + 16,250}{2} = 10,125$ kg

Working Note:

Calculation of Maximum Stock of A

Maximum Stock of A = ROL + ROQ – (Minimum Rate of Consumption × Minimum Re-order Period)

= 8,000 kg + 10,000 – [(175 × 10) × 1)] = 16,250 kg

Definition and Explanation

Economic order quantity (EOQ) is that size of the order which gives maximum economy in purchasing any material and ultimately contributes towards maintaining the materials at the optimum level and at the minimum cost

In order words, the **Economic order quantity (EOQ)** is the amount of inventory to be ordered at one time for purposes of minimising annual inventory cost.

The quantity to order at a given time must be determined by balancing two factors: (1) the cost of possessing or carrying materials and (2) the cost of acquiring or ordering materials. Purchasing larger quantities may decrease the unit cost of acquisition, but this saving may not be more than offset by the cost of carrying materials in stock for a longer period of time.

The carrying cost of inventory may include:

- Interest on investment of working capital
- Property tax and insurance
- Storage cost, handling cost
- Deterioration and shrinkage of stocks
- Obsolescence of stocks.

Formula of Economic Order Quantity (EOQ)

The different formulas have been developed for the calculation of economic order quantity (EOQ). The following formula is usually used for the calculation of EOQ.

$$EOQ = \sqrt{\frac{2*A*Cp}{Ch}}$$

where, A = Demand for the year

Cp = Cost to place a single order

Ch = Cost to hold one unit inventory for a year

* = ×

Example

Pam runs a mall order business for gym equipment. Annual demand for the Trico Flexers is 16,000. The annual holding cost per unit is ₹ 2.50 and the cost to place an order is ₹ 50.

Calculate economic order quantity (EOQ).

Calculation

$$\sqrt{\frac{2*16{,}000*50}{2.50}} = 800 \text{ units per order}$$

Underlying Assumption of Economic Order Quantity:

1. The ordering cost is constant.
2. The rate of demand is constant.
3. The lead time is fixed.
4. The replenishment is made instantaneously, the whole batch is delivered at once.

Illustration 23

Data relating to slotted angles in a steel furniture manufacturing unit is as follows:

(i)	Annual consumption	12 tonnes
(ii)	Unit cost	₹ 100 per kilo
(iii)	Storage/carrying cost	12%
(iv)	Procurement cost	₹ 20 per order

Calculate:

(a) EOQ per order in kilos.

(b) Annual procurement cost.

(c) Annual carrying cost.

Solution

$$EOQ = \sqrt{\frac{2 * A * O}{Ti}}$$

where, A = Annual consumption

O = Ordering cost per order

P = Unit cost

i = Carrying cost in percentage

$$EOQ = \sqrt{\frac{2 \times 12{,}000 \times 20}{100 \times \frac{12}{100}}}$$

$$= \sqrt{\frac{4{,}80{,}000}{12}}$$

$$= \sqrt{40{,}000}$$

EOQ = 200 units (kgs.) per order

Note: 1 tonne = 1,000 kgs.

Annual Requirement	Size of Order	Number of Order	Procurement Cost	Holding Cost	Combined Cost
(1)	(2)	(1) ÷ (2), (3)	(3) × ₹ 20 = (4)	(2) × $\frac{1}{2}$ × 100 × $\frac{12}{100}$ = (5)	(4) + (5) = (6)
12,000	50	240	4,800	300	5,100
12,000	100	120	2,400	600	3,000
12,000	**200**	**60**	**1,200**	**1,200**	**2,400**
12,000	400	30	600	2,400	3,000
12,000	500	24	480	3,000	3,480

Illustration 24

Data relating to slotted angles in a steel furniture manufacturing unit is as follows:

Half-yearly demand 1,000 units

Ordering cost ₹ 62.50 per order

Inventory carrying cost ₹ 2 per unit

Calculate from the above data:

(a) EOQ per order in units.

(b) Annual procurement cost.

(c) Annual carrying cost.

Solution

$$EOQ = \sqrt{\frac{2AO}{C}}$$

where,

A = Annual requirement

O = Ordering cost per unit

C = Carrying cost per unit

$$EOQ = \sqrt{\frac{2 \times 1,000 \times 2 \times 62.50}{2}}$$

$$EOQ = \sqrt{\frac{2,50,000}{2}}$$

$$= \sqrt{1,25,000}$$

EOQ = 353.55 units per order

Illustration 25

From the following information, calculate the EOQ of a particular component:

Annual Demand	1,250 units
Ordering Cost	₹ 40 per order
Inventory Carrying Cost	₹ 1 per unit

Solution

$$EOQ = \sqrt{\frac{2AO}{C}}$$

$$= \sqrt{\frac{2 \times 1,250 \times 40}{1}}$$

$$= \sqrt{1,00,000}$$

= 316.23 units per order

EOQ = 316.00 units per order

Illustration 26

From the following information, calculate the EOQ of a particular component:

Annual Demand	2,500 units
Ordering Cost	₹ 800 per order
Inventory Carrying Cost	₹ 0.50 per unit

Solution

$$EOQ = \sqrt{\frac{2AO}{C}}$$

$$= \sqrt{\frac{2 \times 2,500 \times 800}{0.50}}$$

$$= \sqrt{\frac{40,00,000}{0.50}}$$

$$= \sqrt{80,00,000}$$

= 2.828..43 units per order

Illustration 27

From the following information, calculate Economic Order Quantity (EOQ):

Annul requirements	14,400 units
Cost of placing an order	₹ 50
Carrying cost per unit p.a.	₹ 16

Solution

$$\text{Economic order quantity} = \sqrt{\frac{2AO}{C}}$$

A = Annual usage = 14,400 units

O = Ordering cost per order = ₹ 50

C = Carrying cost per unit per annum = ₹ 16

$$\text{EOQ} = \sqrt{\frac{2 \times 14{,}400 \times 50}{16}} = 300 \text{ units}$$

Illustration 28

From the following information, calculate Economic Order Quantity (EOQ):

Monthly requirements of input	1,200 units
Cost of placing an order	₹ 37.50
Purchase price per unit	₹ 100
Carrying cost per unit per month	1%

Solution

$$\text{Economic order quantity} = \sqrt{\frac{2AO}{C}}$$

A = Annual usage = 1200 × 12 =14,400 units

O = Ordering cost per order = ₹ 37.50

C = Carrying cost per unit per annum = (1% of ₹ 100) × 12 = ₹ 12

$$\text{EOQ} = \sqrt{\frac{2 \times 14{,}400 \times 37.50}{12}} = 300 \text{ units}$$

Calculation of Annual Usage

Illustration 29

From the following information, calculate Annual Usage (A):

Economic order quantity	300 units
Cost of placing an order	₹ 25
Carrying cost per unit per annum	8%
Purchase price per unit	₹ 100

Solution

A = Annual usage

O = Ordering cost per order = ₹ 25

$$C = \text{Carrying cost per unit p.a.} = 8\% \text{ of } ₹\ 100 = ₹\ 8$$

$$EOQ = 300 \text{ units}$$

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2A \times 25}{8}} = 300$$

$$\frac{2A \times 25}{8} = 300 \times 300$$

$$50A = 300 \times 300 \times 8$$

$$A = (300 \times 300 \times 8)/50 = 14{,}400$$

Illustration 30

Calculate Annual Usage (A) from the following information if the company follows the policy of economic order quantity:

Purchase price per unit of input	₹ 200
Cost of placing an order	₹ 100
Cost of carrying an unit per annum	6.5 %
Total cost of carrying inventory and ordering p.a.	₹ 2,600

Solution

Annual usage = A = ?

Ordering cost per order = ₹ 100

Carrying cost per unit per annum = 6.5% of ₹ 200 = ₹ 13

Total Cost of carrying inventory and ordering p.a. $= \sqrt{2AOC} = ₹\ 2{,}600$

$$= \sqrt{2A \times 100 \times 13} = ₹\ 2{,}600$$

$$2A \times 1{,}300 = 2{,}600 \times 2{,}600$$

$$2A = \frac{2{,}600 \times 2{,}600}{1{,}300}$$

$$A = \frac{2{,}600 \times 2{,}600}{1{,}300 \times 2} = 2{,}600$$

Calculation of Ordering Cost

Illustration 31

From the following information, calculate Ordering Cost Per Order (O):

Economic order quantity	300 units
Carrying cost per unit per month	2%
Purchase price per unit	₹ 50
Annual usage	14,400 units

Solution

A = Annual Usage = 14,400 units

O = Ordering cost per order = ?

C = Carrying cost per unit per annum = (2% of ₹ 50) × 12 = 12

EOQ = 300 units

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 14,400 \times 0}{12}} = 300$$

$$\text{or, } O = \frac{2 \times 14,400 \times 0}{12} = 300 \times 300$$

$$O = \frac{300 \times 300 \times 12}{2 \times 14,400} = ₹\ 37.50$$

Illustration 32

From the following information, calculate Ordering Cost per Order (O) if the company follows the policy of economic order quantity:

Annual usage 6,750 units

Purchase price per unit ₹ 50

Carrying cost per unit per month 2.5%

Total cost of carrying inventory and ordering p.a. ₹ 4,500

Solution

Carrying cost per unit per annum (C) = (2.5% of ₹ 50) × 12 = ₹ 15

Annual Usage (A) = 6,750 units

Ordering cost per order (O) = ?

Total Cost at EOQ size = $\sqrt{2\,AOC}$ = ₹ 4,500

$\sqrt{2 \times 6,750 \times O \times 15}$ = ₹ 4,500

2,02,500 × O = 4,500 × 4,500

O = (4,500 × 4,500)/2,02,500 = ₹ 100

Calculation of Carrying Cost

Illustration 33

From the following information calculate carrying cost per unit (C) per month (in %) if the company follows the Policy of economic order quantity:

Annual usage (A) 14,400 units

Purchase Price per unit ₹ 50

Ordering cost per order (O) ₹ 37.50

Total cost of carrying inventory and ordering p.a. ₹ 3,600

Solution

Annual usage (A) = 14,400 units

Ordering cost per order (O) = ₹ 37.50

Carrying cost per unit per (C) = ?

Total cost at EOQ size = $\sqrt{2\,AOC}$ = ₹ 3,600

$\sqrt{2 \times 14{,}400 \times 37.50 \times C}$ = 3,600

10,80,00 C = 3,600 × 3,600

C = (3,600 × 3,600)/10,80,000 = ₹ 12

Carrying cost per unit p.a. (in %) = $\frac{12}{50} \times 100 = 24\%$

Carrying cost per unit p.m. (in %) = 24%/12 = 2%

Illustration 34

From the following information, calculate monthly carrying cost per unit (C):

Economic order quantity	300 units
Annual usage	6,750 units
Purchase price per unit	₹ 50
Ordering cost per order	₹ 100

Solution

A = Annual usage = 6750 units

O = Ordering cost per order = ₹ 100

EOQ = 300 units

$$EOQ = \frac{\sqrt{2AO}}{C} = \sqrt{\frac{2 \times 6{,}750 \times 100}{C}} = 300$$

$$\text{or} \quad = \frac{2 \times 6{,}750 \times 100}{C} = 300 \times 300$$

$$C = \frac{2 \times 6{,}750 \times 100}{300 \times 300} = 15$$

Carrying cost per unit p.a. (%) = $\frac{15}{30} \times 100 = 30\%$

Carrying cost per unit p.m. = 30%/12 = 2.5%

Illustration 35

M/s Kailash Pumps uses about 75,000 valves per year and the usage is fairly equally spread throughout the year. The valve costs ₹ 1.50 per unit and inventory carrying cost is 20% p.a. The cost to place an order and process delivery is ₹ 18. It takes 45 days to receive stocks from the date of order and minimum stock of 325 valves is desired. You are required to determine:

(a) Economic order quantity and the number of orders in year

(b) The re-order level

(c) The economic order quantity if the valve price changes to ₹ 4.50 each per piece.

Solution

$$\text{EOQ} = \sqrt{\frac{2 \times 75000 \times 18}{20\% \text{ of } ₹ 1.50}} = 3000 \text{ units}$$

Number of orders = 75000/3000, i.e., 25

(a) Reorder level: It will be the minimum desired level plus normal usage quantity. Normal usage can be assumed to be (75000/12), i.e., 6250 as the consumption is evenly spread over 12 months and normal lead time is given as 45 days, i.e., 1.5 months.

= Minimum stock + (Normal usage × Normal lead time)

= 3250 + (6250 × 1.5)

= 12625 pieces

(b) EOQ: If the unit valve price is ₹ 4.50,

$$\text{EOQ} = \sqrt{\frac{2 \times 75000 \times 18}{20\% \text{ of } ₹ 4.50}} = 1732 \text{ units}$$

Illustration 35

A company needs 24000 units of raw materials which costs ₹ 20 per unit and ordering cost is ₹ 100 per order. The company maintains a safety stock of 1 month's requirements to meet an emergency. The holding cost is 10% of the average inventory. Find out:

- Economic lot size
- Ordering cost
- Holding cost
- Total Cost

If the supplier is ready to give a discount of 5% on a lot size of 4000 units, should it be accepted?

Solution

Economic lot size

$$\text{EOQ} = \sqrt{\frac{2 \times 24000 \times 100}{10\% \text{ of } ₹ 20}} = 1{,}550 \text{ units (approx.)}$$

Ordering Cost: Ordering cost is ₹ 100 per order. If EOQ is 1,550, the number of orders will be (24,000/1,550), i.e., 16 approx. So the total ordering cost will be ₹ 1,600/-.

Holding Costs: It is the given as 10% of carrying average inventory. Average inventory is not directly given. Normally, we take it as EOQ/2; but in this case as the company wants to maintain a safety stock of 1 month (i.e., 24,000/12) 2,000 units, the total carrying cost will be:

= (2,000 + 1,550/2) × 10% of ₹ 20

= ₹ 5,550

Total Cost

Ordering cost + Holding cost + Cost of material = 1,600 + 5,550 + 24,000 × 20 = ₹ 4,87,150/-

Whether discount should be availed of? Here, we need to compare the total cost under revised case – price of ₹ 19 (i.e., 5% discount on ₹ 20) and EOQ as 4,000 units.

Ordering Cost = 24,000/4,000 × 100 = ₹ 600

Holding Cost = (2,000 + (4,000/2)) × 10% of ₹ 19 = ₹ 7,600

Total cost = Ordering cost + Holding cost + Cost of material

= 600 + 7600 + 456000 = ₹ 4,64,200/-

As there will be a saving of ₹ 22,950 in the total cost, the discount offered by the supplier should be availed and the ordering quantity should be changed to 4,000 units.

QUESTIONS FOR SELF-PRACTICE

(I) Theory Questions

1. (a) What is Material Control?
   (b) State its main objectives.
   (c) Explain its important requirements.
2. Explain the concept of 'ABC Analysis' as a technique of inventory control.
3. Explain and state the factors to be considered in fixing the following:
   (a) Minimum Level
   (b) Maximum Level
   (c) Re-order Level
4. Give the meaning and specimen of each of the following in a system of Stores Accounting:
   (a) Purchase Requisition
   (b) Material Requisition
   (c) Material Transfer Note
   (d) Material Returned Note
   (e) Bill of Materials
   (f) Bin Card
   (g) Stores Ledger

5. (a) What is FIFO Method? Give illustrations.
   (b) What are its advantages?
   (c) What are its disadvantages?
   (d) What are its implications in the periods of rising and falling prices?
6. (a) What is LIFO Method? Give illustration.
   (b) What are its advantages?
   (c) What are its disadvantages?
   (d) What are its implications in the periods of falling price?
7. Compare the FIFO and LIFO methods of stock valuation with special reference to their effect on pricing of issues of goods, valuation of closing stock and profits during a period of rising prices.
8. (a) What is Weighted Average Price Method? Give illustration.
   (b) What are its advantages?
   (c) What are its disadvantages?
9. Write short notes on the following:
   (a) Base Stock Method
   (b) Replacement Price Method
   (c) Specific Price Method
   (d) Standard Cost Method
10. State how you would treat the following in cost records:
   (a) Pricing of materials returned to stores
   (b) Pricing of materials returned to suppliers
   (c) Shortage of materials during physical verification
11. Enumerate the factors which influence the selection of a particular method of pricing the issues of materials from stores.
12. How would you deal the following in Cost Accounts:
   (i) Carriage inwards on raw materials and
   (ii) Cost of handling materials?
13. What do you mean by Waste, Scrap, Spoilage and Defectives? How are these treated in Cost Accounts?
14. Distinguish between the following:
   (a) Purchase Requisition and Purchase Order
   (b) Purchase Requisition and Material Requisition
   (c) Material Requisition and Bill of Materials
   (d) Material Requisition and Material Transfer Note
   (e) Material Transfer Note and Material Returned Note

(f) Bin Card and Stores Control Card
(g) Bin Card and Stores Ledger
(h) Perpetual Inventory System and Continuous Stock Taking
(i) Material Control and Inventory Control
(j) Re-order Level and Re-order Quantity
(k) FIFO and LIFO
(l) Simple Average Method and Weighted Average Method
(m) Waste and Scrap
(n) Spoilage and Defectives

15. Write short notes on the following:
(a) ABC Analysis
(b) Economic Order Quantity
(c) Perpetual Inventory System
(d) Continuous Stock Taking
(e) Re-order Level
(f) Re-order Quantity
(g) Maximum Level
(h) Minimum Level
(i) Stores Turnover

(II) Practical Questions

Economic Order Quantity

1. Calculate the economic order quantity and the number of orders to be placed in a year in each of the following cases:

	Case (a)	Case (b)	Case (c)	Case (d)
Annual consumption	1,00,000 units	₹ 1,60,000	3600 units	5,20,000
Cost of placing an order	₹ 50	₹ 200	₹ 40	₹ 100
Annual carrying cost	8%	25%	5%	6.5%
Price per unit of material	₹ 20	₹ 40	₹ 64	₹ 200

[Ans: (a) 2500 units, 40, (b) 8000 units, 200, (c) 300 units, 12, (d) 200 units 13]

2. Calculate the economic order quantity and the numbers of orders to be placed in a year in each of the following cases:

	Case (a)	Case (b)	Case (c)	Case (d)
Quarterly consumption	₹ 5,00,000	1000 units	₹ 57,600	650 units
Ordering cost per order	₹ 50	₹ 200	₹ 40	₹ 100
Semi-annual carrying cost	4%	12.5%	2.5%	3.25%
Price per unit of material	₹ 20	₹ 40	₹ 64	₹ 200

[Ans: (a) 2500 units, 40, (b) 400 units, 10, (c) 300 units, 12, (d) 200 units, 13]

[Hint. Calculate Annual Consumption and Annual Carrying Cost]

3. Calculate Economic Order Quantity from the following information:

Annual Consumption	1,00,000 units
Carrying Cost	8 of Average Stock
Per unit Cost	₹ 20
Ordering Cost	₹ 50 per order

[Ans: 2500 units]

4. What do you understand by Economic Order Quantity? Find out the following from: Annual usage ₹ 1,60,000 @ ₹ 40 per unit. Cost of placing and receiving one order ₹ 200. Annual carrying cost: 25 of inventory value.

[Ans: 400 units]

5. A company manufactures a product having 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 the material is ₹ 20 per kg. The ordering cost is ₹ 120 per order and the holding cost is 10 per annum. Calculate:
   (i) Economic Order Quantity (EOQ), and
   (ii) Annual cost of purchasing and storage of the raw material at that quantity.

[Ans: (i) 2400 kg,. (ii) ₹ 4,800]

6. P Ltd. is engaged in the manufacture of Industrial Pumps of standard description. The company used about 75,000 valves per year 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 the carrying cost is estimated to be 20% average inventory investment on the annual basis. The cost to place an order and process the delivery ₹ 18. It takes 45 days to receive delivery from the date of an order and a safety stock of 3,200 valves desired.

   You are required to determine:
   (i) The most economical order quantity; and
   (ii) The reorder point

[Ans: EOQ – 3000 units, ROL – 9,375 unit]

7. YPS Ltd. has received an offer of quantity discounts on its order of materials as under:

Price per tonne (₹)	**Tonnes Nos.**
1,200	Less than 500
1,180	500 and less than 1,000
1,160	1,000 and less than 2,000
1,140	2,000 and less than 3,000
1,120	3,000 and above

The annual requirement for the materials is 5,000 tonnes. The ordering cost per order is ₹ 1,200 and the carrying cost is estimated at 20% per annum. You are required to compute the most Economic Order Quantity presenting the relevant information in a tabular form.

[Ans: EOQ –1000 tonnes]

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

Price per tonne (₹)	**Tonnes**
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 the most economical ordering quantity, presenting the relevant information in 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.

[Ans: 1,000 tonnes]

Stock Levels

9. The following data pertain to material X:

Supply period	4 to 8 months
Consumption rate	Maximum 600 units per month
Minimum	100 units per month
Normal	300 units per month
Yearly	3,600 units

Storage costs are 5% of stock value.

Ordering costs are B 400 per order.

Price per 3,600 units of materials ₹ 64.

Calculate:

(i) Re-order level;

(ii) Maximum stock level; and

(iii) Minimum stock level.

10. In manufacturing its product Z, a company uses two types of raw materials A and B in respect of which the following information is supplied:

    One unit of Z requires 10 kg of A and 4 kg of B materials. Price per kg of A material is ₹ 10 and that of B ₹ 20. Re-order quantities of A and B materials are 10,000 kg and 5,000 kg. Re-order quantities of A and B materials are 8,000 kg and 4,750 kg respectively. Weekly production varies from 175 units to 225 units averaging 200 units. Delivery period of A material is 1 to 3 weeks and B material 3 to 5 weeks.

    Compute: (i) Minimum Stock level of A and (ii) Maximum Stock level of B.

11. X Ltd. provides the following information in respect of material 'X':

Supply period	5 to 15 days
Rate of consumption:	
Average	15 units per day
Maximum	20 units per day
Yearly	5,000 units

    Ordering costs are ₹ 20 per order

    Purchase price per unit is ₹ 50

    Storage costs are 10 of unit value

    Compute: (i) Re-order level, (ii) Minimum level and (iii) Maximum level.

    [Ans: (i) 300 units, (ii) 150 units, (iii) 450 units]

    [Hint: Re-order Quantity – 200 units]

12. From the following information, calculate (a) Economic order quantity, (b) Total Annual Carrying and Ordering cost at that quantity, (c) Re-order level, (d) Minimum level, (e) Maximum level, (f) Average Stock and (g) Danger level.

    Rate of Usage: 5 kg per unit of finished product. Weekly production of finished product varies from 50 units to 150 units

    Purchase price of input unit ₹ 20

    Annual carrying cost 6.5

    Ordering cost per order ₹ 100

    Lead time: 3 weeks to 7 weeks. For emergency purchase 2 weeks.

    [Ans: (a) 2,000 units, (b) ₹ 2,600, (c) 5,250 units, (d) 2,750 units, (e) 6,500 units, (f) 4,625 units or 3,750 units, (g) 1,000 units]

13. **(Stock Levels)** A company manufactures 5000 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 form 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) Re-order level; (iii) Maximum level; (iv) Minimum level; and (v) Average stock level. ***(CA-PCC, Nov. 2002)***

[Ans.:

(i) Re-order Quantity (ROQ) $= \sqrt{\frac{2 \times 14{,}300 \text{ kgs} \times ₹\ 100}{₹\ 2}} = 1.196 \text{ kgs.}$

(ii) Re-order Level (ROL) = 450 kgs × 8 weeks = 3,600 kgs

(iii) Maximum Level = 3,600 kgs + 1,196 kgs – (100 kgs × 4 weeks) = 4,396 kgs

(iv) Minimum Level = 3,600 kgs – (275 kgs × 6 weeks) = 1,950 kgs

(v) Average Stock Level $= \frac{1}{2}$ ***(4,396 kgs + 1,950 kgs) = 3,173]***

14. **(Stock Levels)** Shriram Enterprises manufactures a special product "ZED'. The following particulars were collected for the year 1986.
   (a) Monthly demand of ZED-1,000 units.
   (b) Cost of placing an order Rs. 100.
   (c) Annual carrying cost per units Rs. 15.
   (d) Normal usage 50 units per week.
   (e) Minimum usage 25 units per week.
   (f) Maximum range 75 units per week.
   (g) Re-order period 4 to 6 weeks.

   Computer from the above
   (i) Re-order Quantity
   (ii) Re-order Level
   (iii) Minimum Level
   (iv) Maximum Level
   (v) Average Stock Level

   [Ans.:

   (i) Re-order Quantity of units used $= \sqrt{\frac{2 \times 2{,}600 \times ₹\ 100}{₹\ 15}} = 186 \text{ units (approximately)}$

   (ii) Re-order Level = 6 weeks × 75 units = 450 units

   (iii) Minimum Level = 450 units – 50 units × 5 weeks = 450 units – 250 units = 200 units

   (iv) Maximum Level = 450 units + 186 units – 25 units × 4 weeks = 536 units

   (v) Average Stock Level = (200 units + 536 units) = 368 units]

15. **(Re-order Level, EOQ)** About 50 items are required every day for a machine. A fixed cost of Rs. 50 per order is incurred for placing an order. The inventory carrying cost per item amounts to Rs. 0.02 per day. The lead period is 32 days compute.
    (i) Economic Order Quantity
    (ii) Re-order Level ***(CA-PCC, Nov. 1996)***

    [Ans.:

    (i) Economic Order Quantity $= \sqrt{\frac{2 \times 18{,}250 \times ₹\ 50}{₹\ 7.30}} = 500$ ***items***

    (ii) Re-order Level = 50 items per day × 32 days = 1,600 items]

16. **(EOQ, Stock Levels)** M/s Tubes Ltd. are the manufactures of picture tubes for T.V. The following are the details of their operation during 2007:

Average monthly market demand	2,000 Tubes
Ordering cost	Rs. 100 per order
Inventory carrying cost	20% per annum
Cost of tubes	Rs. 500 per tube
Normal usage	100 tubes per week
Minimum usage	50 tubes per week
Maximum usage	200 tubes per week
Lead time to supply	6-8 week

    Compute form the above:
    (i) Economic Order Quantity
    (ii) Maximum level of stock
    (iii) Minimum level of stock
    (iv) Re-order level ***(CA-PCC, May, 1998)***

    [Ans.:

    (i) Economic Order Quantity $= \sqrt{\frac{2 \times 5{,}200\ units \times ₹\ 100}{₹\ 100}} = 102$ ***tubes (approx.)***

    (ii) Minimum level of stock = 1,600 units + 102 units – 50 units × 6 weeks = 1,402 units.

    (iii) Minimum level of stock = 1,600 units – 100 units × 7 weeks = 900 units.

    (iv) Re-order level = 200 units × 8 weeks = 1,600 units]

17. (EOQ, Stock Levels) POR Tubes Ltd. are the manufacture of picture tubes for T.V. The following are the details of their operations during 1999-2000.

Ordering cost	Rs. 100 per order
Inventory carrying cost	20% p.a.

Cost of tubes	Rs. 500 per tube
Normal usage	100 tubes per week
Minimum usage	50 tubes per week
Maximum usage	200 tube per week
Lead time to supply	6-8 weeks

Required

(i) Economic order quantity

(ii) Re-order level

(iii) Maximum level of stock

(iv) Minimum level of stock ***(CA-PCC, May, 2000)***

[Ans.:

(i) EOQ $= \sqrt{\frac{2 \times (100 \text{ tubes} \times 52 \text{ weeks}) (₹ \ 100 \text{ per order})}{20\% \times ₹ \ 500}}$ ***= 102 tubes (approx.)***

(ii) Re-order level (ROL) = 200 tubes per week × 8 weeks = 1,600 tubes

(iii) Maximum level of stock = 1,600 tubes + 102 tubes – 50 tubes × 6 weeks = 1,402 tubes

(iv) Minimum level of stock = 1,600 tubes – 100 tubes × 7 weeks = 900 tubes]

18. Pumpkin Pump Co. uses about 75,000 valves per year and the usage is fairly constant at 6,250 valves per month. The valves cost Rs. 1.50 per unit when bought in quantities and the 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 Rs. 18. It takes 45 days to receive delivery from the date of an order and a safely stock of 3,200 valves is desired.

You are required to determine:

(i) the most economical order quantity

(ii) the order point. ***(C.S. Inter June 1991)***

[Ans.:

(i) EOQ $= \sqrt{\frac{2 \times 75{,}000 \times ₹ \ 18}{1.50 \times 20/100}}$ ***= 3,000 units***

(ii) (1½ × 6,250) + 3,200 = 12,575.]

19. The average annual consumption of material is 20,000 kgs. at a price of Rs. 2 per kg. The storge cost is 16% on average inventory and the cost of placing one order is Rs. 50. How much is to be purchased at a time? ***(I.C.W.A. Inter June 1994)***

[Ans.: EOQ $= \sqrt{\frac{2 \times 20{,}000 \times 50}{2 \times 0.16}}$ ***= 2,500 kgs.]***

20. The annual demans for a product is 6,400 units. The unit cost is Rs. 6 and inventory carrying cost per unit per annum is 25% of the average inventory cost.

If the cost of procurement is Rs. 75, determine:

(i) Economic order quantity (EOQ),

(ii) Number of orders per annum, and

(iii) Time between two consecutive order. ***(C.S. Inter Dec. 1998)***

[Ans.:

(i) EOQ $= \sqrt{\frac{2 \times 6{,}400 \times 75}{6 \times 25/100}}$ ***= 800 units***

(ii) 6,400 + 800 = 8 orders p.a.

(iii) 12 months + 8 orders = 15. Months]

21. Tulip Ltd. produces a product which has a monthly demand of 4,000 units. The product requires a component A which is purchased at Rs. 20. For every finished product, one unit of component A is required. The ordering cost is Rs. 120 per order and the holding cost is 10% per annum.

You are required to calculate:

(i) Economic order quantity, and

(ii) If the minimum lot size is 4,000 units, what is the extra cost Tulip Ltd. has to incur?

(C.S. Inter June 2001)

[Ans.:

(i) EOQ $= \sqrt{\frac{2 \times 48{,}000 \times 120}{2}}$ ***= 2,400 units***

(ii) Lot size 4,000 units cost: (12 × 120) + (4,000 × ½ × 20 × 10%) = 5,440

EOQ cost: (20 × 120) + (2,400 × ½ × 20 × 10%) = 4,880

Extra cost: 5,440 – 4,880 = Rs. 640]

22. A publishing house purchases 2,000 units of a particular items per year at a unit cost of Rs. 20. The ordering cost per order is Rs. 50 and the inventory carrying cost is 25%. Find the optimal order quantity and the minimum total cost including purchase cost.

If 3% discount is offered by the supplier for the purchase in lots of 1,000 or more, should the publishing house accept the offer? ***(C.S. Inter Dec. 1996)***

[Ans.:

EOQ $= \sqrt{\frac{2 \times 2{,}000 \times 50}{0.25 \times 20}}$ ***= 200 units***

Cost without Discount: (200 × 10 × 20) + 500 + (½ × 200 × 20 × 25%) = 41,000

Cost without Discount: (1,000 × 2 × 19.40) + 100 + (½ × 1,000 × 19.40 × 25%) = 41,325]

Preparation of Stores Ledger

23. From the following information, prepare Stores Ledger Account per FIFO, LIFO and Weighted Average Method.

Jan.	1	Opening Stock	200 pieces	@ ₹ 2 each
	5	Purchases	100 pieces	@ ₹ 2.20 each
	10	Purchases	150 pieces	@ ₹ 2.40 each
	20	Purchases	180 pieces	@ ₹ 2.50 each
	2	Issues	150 pieces	
	7	Issues	100 pieces	
	12	Issues	100 pieces	
	28	Issues	200 pieces	

[Ans: FIFO: Stock 80 units @ ₹ 2.50; LIFO: 50 @ ₹ 2 and 30 @ ₹ 2.40; Weighted Avg.: 80 @ 2.4428]

24. Prepare Stores Ledger as per First-In-First-Out, Last-In-First-Out and Weighted Average Method of Pricing of Issue of Materials:

			Units	**Rate**
April	1	Opening balance	1,000	₹ 5
	3	Received	5,000	₹ 6
	4	Issued	3,000	
	6	Issued	2,000	
	8	Received	3,000	₹ 5
	9	Issued	2000	

The weekly physical stock taking on April 7 showed as shortage of 100 units.

[Ans: FIFO: Stock 1,900 units @ ₹ 5 of ₹ 9,500; LIFO: 900 @ 5 and 1,000 @ 5; Weighted Avg.: 1,900 @ 5.19]

25. Prepare a Store Ledger Account on the basis of FIFO, LIFO and Weighted Average Method.

Jan	1	Opening Stock	220 units @ ₹ 9.00 each
	4	Purchased	540 units @ ₹ 9.10 each
	5	Issued	280 units
	10	Purchased	180 units @ ₹ 8.90 each
	16	Issued	160 units
	18	Purchased	340 units @ ₹ 10.20 each
	25	Issued	200 units

[Ans: FIFO: Stock 120 × 9.10 + 180 @ 8.90 + 340 × 10.20; LIFO: 220 @ 9.00, 260 @ 9.10, 200 @ 8.90, 140 @ 10.20; Weighted Avg.: 640 @ 9.49]

26. The following are the figures about the receipt and issue of materials in Z Ltd. during January. Prepare stores ledger with different methods:

Jan.	1	Received	500 units @ ₹ 2.00 each
	18	Received	350 units @ ₹ 2.10 each
	19	Issued	600 units
	24	Received	600 units @ ₹ 2.20 each
	25	Issued	450 units
	26	Received	500 units @ ₹ 2.30 each
	29	Issued	510 units

[Ans: FIFO: Stock 390 @ 2.30; LIFO: 250 @ 2 + 140 @ 2.20; Weighted Avg.: 396 @ 2.25]

27. From the following receipts and issues of material during the month of January, prepare stores ledger account according to FIFO, LIFO and Weighted Average Method.

Jan.	1	Received	250 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, stock in hand was 200 units valued @ ₹ 9 per unit.

[Ans: FIFO: 150 @ ₹ 12 & 100 @ ₹ 11, LIFO: Stock 200 units @ ₹ 9 and 50 units @ ₹ 10; Weighted Avg.: 250 @ 11.02]

28. Prepare Stores Ledger from the following using FIFO, LIFO and Weighted Average Method of Pricing (Perpetual and Periodic Method):

Feb 1. Opening Stock 200 units costing ₹ 2,000

	Receipts			**Issues**
3	300 units @ ₹ 12	Feb	2	100 units
5	100 units @ ₹ 16		4	200 units
8	200 units @ ₹ 13		7	200 units

The physical verification on 6th February, revealed a shortage of 10 units.

[Ans: FIFO: 190 @ 16 & 200 @ 13, LIFO: 90 @ 10 and 200 @ 13; Weighted Avg.: Stock 290 units @ ₹ 13]

29. The following transactions took place in respect of a material item:

Date		Receipts		Issue	
		Quantity (units)	Rate (₹)	Quantity (units)	Rate (₹)
March	2	200	2.40		
	10	300	2.60		
	15			250	2.10
	18	250	2.80		
	20			200	2.20

Prepare a priced Ledger Sheet, pricing the issues at:

(a) FIFO, LIFO

(b) Weighted average rate.

[Ans: FIFO: 50 @ 2.60 and 250 @ 2.80, LIFO: 200 @ 2.40, 50 @ 2.80 and 50 @ 2.60; Weighted Avg.: (b) 300 units of ₹ 798]

30. The Stores Ledger of a manufacturing company recorded for material R-17 for April the following information:

Date		Receipts		Issues	
		Qty. (Units)	Value (₹)	Qty. (Units)	Value (₹)
April	4	100	160		
	6	40	120		
	12			70	140
	16	50	100		
	20	40	240		
	26			90	270

(a) State the method of pricing that was employed in the Stores Ledger, and

(b) Complete the Stores Ledger as per the different method followed.

[Ans: Weighted Average Method: Stock 70 units @ ₹ 3 @ 210; FIFO: 30 @ 2 and 40 @ 6]

(III) [1] Objective Questions

A. State with reasons whether the following statements are True or False.

1. Purchase order is an order to Stores Department to issue materials.
2. EOQ is that quantity which is most economical to order.
3. EOQ is also called as re-order quantity.
4. Investment in inventory should be optimised by maintaining low stock levels.
5. Direct materials is the materials which can be directly related to the cost center.

6. The stock in hand may exceed the maximum stock level.
7. Stock levels are fixed up for inventory control.
8. In no case, material should go below minimum level.
9. The objective of scientific purchasing is to procure materials of good quality.

[Ans. True: (2, 3, 4, 5, 7, 8, 9). False: (1, 6)]

B. Match the following.

Group A	Group B
1. Scientific Purchasing	(i) A request to supply
2. Purchase Order	(ii) Purchasing materials of good quality
3. Delivery Note	(iii) Acknowledgement of goods delivery
4. Maximum Level	(iv) The level fixed beyond the stock cannot be stored
5. Minimum Level	(v) The level below which inventory is not allowed to go

[Ans: 1. (ii), 2. (i), 3. (iii), 4. (iv), 5. (v)]

C. Multiple choice questions. Select the right answer.

1. The most important element of cost is
   (i) Material
   (ii) Labour
   (iii) Overheads
2. The function of Purchase Department is
   (i) Purchase of materials
   (ii) Sale of scrap
   (iii) Production of goods
3. Purchase order is a
   (i) Request to the supplier to supply materials
   (ii) Request to the supplier to verify the stock
   (iii) Acknowledgement of goods
4. Goods received note is normally prepared in
   (i) Six copies
   (ii) Five copies
   (iii) Four copies
5. Stock levels are fixed to
   (i) Control inventory
   (ii) Purchase material
   (iii) Control cost of scrap

6. Maximum level indicates
   (i) Maximum inventory to be kept
   (ii) Minimum inventory to be kept
   (iii) Average inventory to be kept
7. EOQ is
   (i) Economic size of order
   (ii) Economic size of production
   (iii) Economic size of quantity
8. EOQ is also known as
   (i) Economic size of order
   (ii) Economic order to be placed
   (iii) Maximum level of stock to be fixed
9. Minimum inventory level is
   (i) Minimum stock to be maintained
   (ii) Maximum stock to be maintained
   (iii) Average stock to be maintained

[Ans. 1. (i), 2. (i), 3. (i), 4. (i), 5. (i), 6. (i), 7. (i), 8. (i), 9. (i)]

(III) [2] Objective Questions

A. State whether the following statements are True or False.

1. FIFO Method of pricing of materials results in higher profits.
2. Valuation of closing stock is the same under FIFO and LIFO Method.
3. Bin Card is the same as stores ledger.
4. LIFO and Market Price Method are not same.
5. If a company wants to maximise net income, it would select FIFO Method.
6. LIFO Method of pricing issues is useful during the period of inflation.
7. Weighted Average Method of pricing issues involves adding different prices and dividing by the number of such prices.
8. Under FIFO Method, materials purchased first are deemed to be issued last.
9. Under LIFO Method, materials purchased last are deemed to be issued first.

[Ans. True: (1,4, 5, 6, 9). False: (2, 3, 7, 8)]

B. Match the following.

Group A		Group B
1. FIFO	(i)	Last-In-First-Out
2. LIFO	(ii)	Average of the prices
3. Weighted Average	(iii)	Movement of materials

4. Stores Ledger — (iv) First-In-First-Out
5. FIFO — (v) Cost is understated
(vi) Shows real income in times of rising prices

[Ans. 1. (iv), 2. (i), 3. (ii), 4. (iii), 5. (vi)]

C. Multiple choice questions. Select the right answer.

1. Issue of materials during a period of time is priced at the latest purchase cost under
   (i) FIFO (ii) LIFO
   (iii) Simple Average (iv) Weighted Average
2. Stores Department maintains a record in which a separate folio is maintained for each item
   (i) Stores Ledger (ii) Bin Card
   (iii) Stock Register (iv) Bill of Materials
3. In times of rising prices, the pricing of issues will be at a more recent current market prices in
   (i) FIFO (ii) Weighted Average
   (iii) LIFO (iv) Simple Average
4. The inventory is valued at the most recent market prices and it is near to the valuation based on replacement cost in
   (i) FIFO (ii) LIFO
   (iii) Weighted Average (iv) Base Stock Method
5. According to the method of pricing, issues are close to current economic values
   (i) LIFO (ii) FIFO
   (iii) Highest-In-First-Out Price (iv) Weighted Average Price
6. In the method of pricing, cost lag behind the current economic values
   (i) LIFO (ii) FIFO
   (iii) Replacement Price (iv) Weighted Average Price
7. When price fluctuate widely, the method that will smooth out the effect fluctuations is
   (i) Simple Average (ii) Weighted Average
   (iii) FIFO (iv) LIFO
8. In the method, the charge to production is not at actual cost
   (i) Weighted Average (ii) Standard Price
   (iii) Replacement Price (iv) All of these

[Ans: 1. (ii), 2. (i), 3. (iii), 4. (i), 5. (i), 6. (ii), 7. (ii), 8. (iv)]

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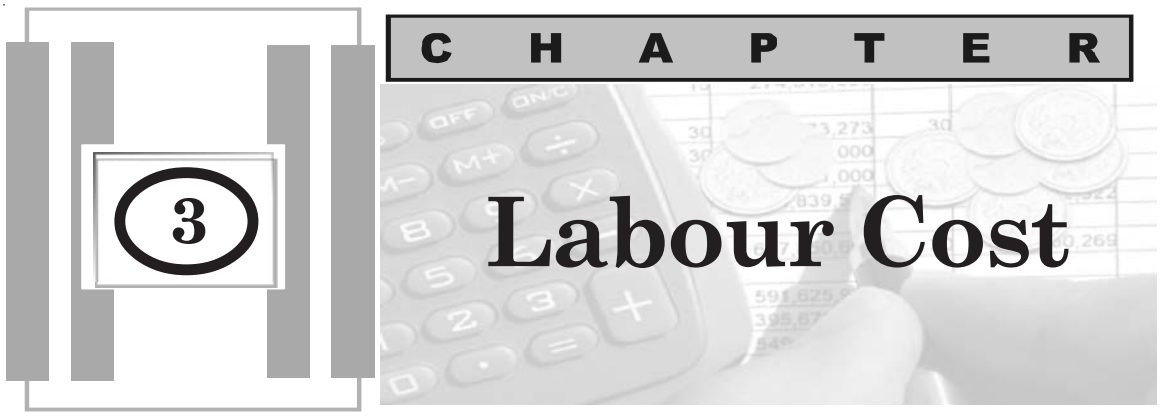


LABOUR COST: THE CONCEPT

Direct labour costs consist of gross wages paid to those who physically and directly work on the goods being produced. For example, wages paid to welder in bicycle factory who is actually fabricating the frames of bicycles would be included in direct labour. On the other hand, the wages paid to a labourer who is building an assembly line that will be used to produce a new line of bicycles is not direct labour. In general, indirect labour pertains to wages of other factory employees (e.g., maintenance personnel, supervisors, guards, etc.) who do not work directly on a product. Indirect labour is rolled into manufacturing overhead.

Flow Chart of Direct Labour Cost Analysis: The following flow chart depicts the key events completed as part of a typical direct labour cost analysis.

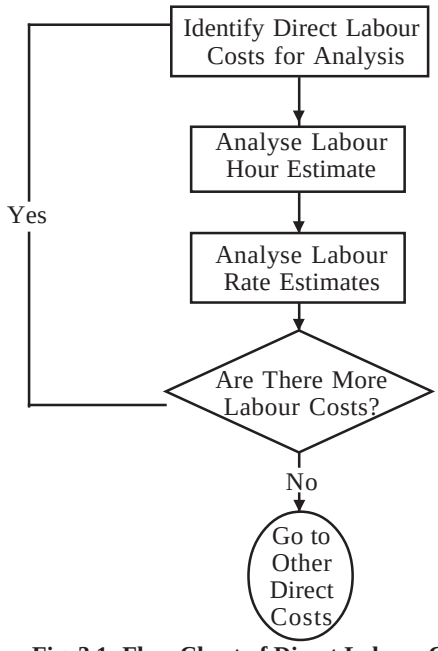


Fig. 3.1: Flow Chart of Direct Labour Cost Analysis

Identifying Direct Labour Costs for Analysis

This section presents points that you should consider as you identify direct labour costs and plan for further analysis.

- Identifying Direct Labour Classifications
- Identifying Major Types of Direct Labour
- Planning for Further Analysis

Labour represents the human contribution to production and it is the second major element of cost after material cost. The role of labour in the production process cannot be underestimated even in an organisation which uses fully automatic technology in its production process. Hence, there is a need to properly organise, account and control the labour cost.

Labour cost is divided into two types:

1. **Direct Labour Cost:** Direct labour is that labour which is directly engaged in the production work and can be conveniently identified or attributed wholly to a particular cost unit, job or process.

   Example: Wages of machine operator is a direct labour cost.

2. **Indirect Labour Cost:** Indirect labour is the wages paid to those workers who are not directly engaged in converting the raw materials into finished goods. Such costs cannot be conveniently identified with a particular job, produce or a cost unit.

   Example: Wages of supervisors, cleaners, instructors, peons, watchmen, etc. are examples of indirect labour cost.

Labour Remuneration

Remuneration is the amount of consideration paid for services rendered by an employee. The major part of remuneration is in the form of wages and salaries but it also includes perquisites and other benefits. Remuneration is a way of rewarding the people for their contribution to the organisation. Labour is one of the factors of production.

Table 3.1: Factors of Production

Factor of Production	Rewards
1. Land	Rent
2. Labour	Wages and Salaries
3. Capital	Interest
4. Entrepreneur	Profit

Each factors of production is entitled for their rewards. Similarly, labour is entitled for wages and salaries as a reward. The term remuneration covers the total monetary earnings of an employee. It includes wages and other financial incentives.

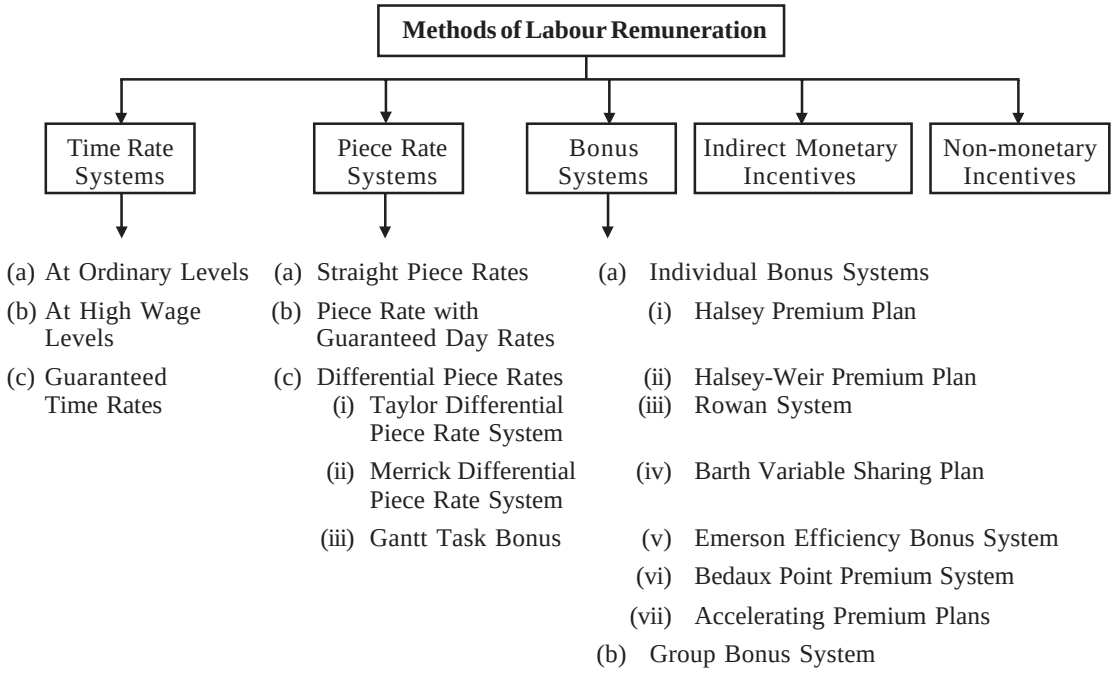


Fig. 3.2: Methods of Labour Remuneration

1. Time Rate System

(a) Time Rate System at Ordinary Levels: This is the simplest, oldest and most common method of wage payment. In this system, the payment is made to the workers based on the time for which they work. In this case, a definite amount of payment is guaranteed for a specified time and payment is made on the basis of time which may be an hour, a day, a week, a fortnight or a month. In this case, the actual output is not taken into account while making the payment. Each worker is assured of minimum wages.

Payment = Hours Worked × Rate per Hour

(b) Time Rates at High Wage Levels: This system is similar to Time Rate System at ordinary levels except that the time rate is high, than the time rate at ordinary level, in order to have a higher standards of performance. High rate is an incentive. If there is no increase in production cost, high wages increase labour cost.

(c) Guaranteed Time Rates: In this system, the payment is at the time rates but considering cost of living, merit awards for personal qualities, skill, ability, punctuality, performance, etc. This system is acceptable to the workers.

2. Piece Rate System

In the piece rate system, a rate is fixed per unit of production and wages are calculated and paid according to the quantity of work done.

Wages = Rate per unit × Number of units produced

This method does not give any consideration to the time taken by the worker in completing the work. Only the quantity of the work performed is taken into account for the payment of wages. This method provides a strong incentive for the workers to work more as the remuneration is in proportion to the worker's efforts. This method is simple and easily understood by the workers. This method decreases the supervision cost as workers themselves are interested in maximising their earnings through the maximisation of output.

(a) Straight Piece Rates: Under this system, irrespective of the time taken, the worker receives a flat rate of pay per unit of output. The earnings of the worker depends upon the number of units produced.

(i) Where rate per unit is known:

Earnings = Rate per unit × Number of units

(ii) Where standard hour rate is known:

Earnings = Standard hours of produced × Rate per standard hour

Under the standard hour method, the operator is paid at a fixed time rate for the number of standard hours of work he produces. The rate is not expressed as rate per piece instead it is expressed as rate per unit of standard time.

(b) Piece Rates with Guaranteed Day Rate: Under this system, a worker receives straight piece rate for the number of pieces he produces provided his total remuneration is greater than his earnings on a time rate basis. If the piece rate earnings fall below the time rate earnings, then the time rate earnings are paid. An alternative form of this method is a guaranteed time rate plus a piece rate payment for output above a stated minimum amount.

(c) Differential Piece Rates: Under the differential piece rate system, the rate per standard hour of production is increased as the output level increases. This scheme aims at maximum production by giving an additional incentive to increase output.

The following are the main systems that uses the principle of differential piece rate system.

(i) Taylor Differential Piece Rate System: The originator of this system is Fredrick Winslow Taylor, who is also termed as the Father of Scientific Management. In this system, it provides two piece rates, a low piece rate for output below standard and a high piece rate for output above standard. This scheme has a very strong incentive to expert workers and rewards them attractively. This scheme is suitable in mass production industries.

(ii) Merrick Differential Piece Rate System: This system is a modification of the Taylor's system and it uses three rates instead of two rates as in the Taylor's system. The rates of remuneration are:

Output Percentage	Standard Payment
1. Up to 83%	Ordinary Piece Rate
2. 83% to 100%	110% of Ordinary Piece Rate
3. Over 100%	120% of Ordinary Piece Rate

According to Merrick's system, every worker was paid solely on the basis of the output. This plan is useful for workers who are potentially high performers.

(iii) Gantt Task Bonus Plan: Gantt task bonus plan is a combined time, bonus and piece rate plan using the differential piece rate principle. Remuneration under this plan is calculated as follows:

Output	Payment
1. Output below standard	Time rate
2. Output at standard	Bonus of 20% of the time rate
3. Output above standard	High piece rate on worker's whole output

This method serves two purposes: one is to provide an incentive for efficient workers to reach a high level of output as well as to encourage and protect less skilled workers who are unable to complete work in standard time.

3. Bonus Systems

(a) Individual Bonus Systems: The individual bonus schemes under the premium bonus system includes:

(i) Halsey Premium Plan: This plan was introduced by F.A. Halsey, an American Engineer, in 1891. In this plan, a worker who takes the same time or more than allowed time receives his time rate. In case the job is completed in less than allowed time, the worker is paid a fixed percentage of the saving in time. Mostly the percentage is 50% but it varies between 30% to 70% of the time saved. The remaining represents the employer's share.

(ii) Halsey-Weir Premium System: This system was introduced by G & F Weir Limited in Glasgow in 1900. According to this system, the sharing plan is $33\frac{1}{3}\%$ to $66\frac{2}{3}\%$.

(iii) Rowan System: In 1901, David Rowan introduced the premium bonus system in Glasgow. It is similar to the Halsey Plan in respect of time saved but here a different method is used to calculate the bonus. The bonus hours are calculated as the proportion of the time taken with the time saved to the time allowed and the payment is on the basis of time work rates.

(iv) Barth Variable Sharing Plan: This premium bonus system does not guarantee a time rate. In this system, payment is proportionately less than output. This scheme is suitable for learners or beginners until they become proficient enough to go to some other scheme.

(v) Emerson Efficiency Bonus System: Emerson chose certain arbitrary points both at low task levels and high task levels. This is a premium bonus system and is similar to piecework system with guaranteed time wages.

(vi) Bedaux Point Premium System: This is a premium bonus system. Under this system, standard time is determined by work study; the time unit being the minute. Each minute of allowed time is called "B" the Bedaux Point, thus making 60 units of required work in 1 hour. The points or B's are indicated on each job ticket.

(vii) Accelerating Premium Plans: Under these plans, bonus increases at a faster rate as compared to increase in the output. This accelerating bonus provides a strong incentive to produce more and more.

(b) Group Bonus System: In many cases, output of individual workers cannot be measured conveniently but instead output of a group of workers can be conveniently measured. Under such circumstances, group payment by results is used instead of individual bonus plans.

The main group bonus scheme plans are as below:

(i) Budgeted Expense Bonus System: Under this system, bonus is based on the savings in actual total expenditure compared with the total budgeted expenditure.

(ii) Cost Efficiency: In the case standards are being set for specific elements of costs, such as material cost, labour cost, overheads and total cost in order to assess the savings in the cost. A portion of such reduction in costs is paid to employees as bonus.

(iii) Priestman System: This system is mostly used in foundries and related works. In this case, a production standard in units or points is fixed every month for the entire work. If actual production exceeds this set standard, all workers receive during the following month additional pay equal to the percentage in output over standard. If production does not exceed the standard, no bonus is paid, though time rates are guaranteed to workers.

(iv) Towne Gain Sharing Plan: In 1886, Mr. H.R. Towne introduced this group sharing system in USA. The bonus is calculated on the reduction in costs as compared with a predetermined standard. One-half of the savings is paid to individual workers pro rata with the wages earned.

(v) Waste Reduction Bonus: This bonus system is used in industries where the cost of material is high. The objective of this system is to provide incentive to workers with a view to reduce material waste to the minimum. This scheme takes the form of a percentage payment for specific reduction in waste percentage against a standard.

(vi) Rucker Plan: Under this plan, bonus is tied up with 'value added'. Value added is obtained by deducting the purchased cost of materials and services from the sales value. The standards are based on past records. The bonus is computed on a monthly basis. In actual practice, only two-thirds of the bonus earned is paid as bonus and the balance one-third is transferred to reserve fund to be used in any period in which performance is below standard.

(vii) Scanlon Plan: Scanlon plan is similar to Rucker plan but in this case the ratio of labour cost to the sales value of production is used instead of direct labour cost to added value.

(viii) Bonus System for Indirect Workers: Indirect workers provide services to the direct workers. But it is difficult to determine the output of indirect workers and hence it tends them to be excluded from the incentive schemes. This results in labour unrest as a result of paying only the time rate to indirect workers whereas giving bonus to direct workers. In order to avoid such problems, bonus is also given to foremen, supervisors, clerical staff and executives also.

— **Workers working directly with direct workers:** In case of foremen and supervisors, bonus may be based on the output of the direct workers whom they serve. Such indirect workers work directly with the direct workers and it also includes internal transport workers, checkers, inspectors, etc.

— **Workers providing general services:** In case of clerical staff and executives, bonus should be determined on a wider basis such as output of the whole factory, bonuses earned by direct producers, job evaluation, etc. Such indirect workers provide some general services and it also includes maintenance workers, canteen workers, sweepers, etc.

4. Indirect Monetary Incentives

(i) Profit Sharing Schemes: In profit sharing schemes, there is an agreement between the employer and his workers whereby the employer pays them a predetermined share of the profits of the undertaking alongwith the wages.

(ii) Co-ownership or Co-partnership: In this case, the workers get the opportunity to share in the capital of the business and to receive the part of profits that accrue to their share of ownership. In this case, employees purchase the company's shares. Due to this scheme, the employee morale is increased to a great extent which also helps to reduce the labour turnover.

5. Non-monetary Incentives

Non-monetary incentives are tied to conditions of employment rather than to the job functions. Such benefits may be provided free or may be partially contributed by the employees. The objectives of non-monetary incentives are to make the conditions of employment more and more attractive and also to promote better health amongst the employees so as to build up a happy and satisfied staff.

The various forms of non-monetary benefits are as follows:

(i) Subsidised meals.

(ii) Free canteen facilities.

(iii) Medical, health and safety services such as doctor, nursing and first aid.

(iv) General welfare which includes sports and recreation facilities, housing facilities, long service awards, etc.

(v) Housing facilities.

(vi) Educational and training — training school for employees and their children, scholarships and self-education subsidies.

(vii) Pensions, superannuation and life assurance schemes.

(viii) Subsidies to sick.

Frauds in the Payment of Wages

Frauds committed by the concerned people engaged in calculation and disbursement of wages is one of the problems associated with payment of wages. The following types of frauds are commonly observed:

1. Inclusion in the payroll of ghost or dummy workers. Dummy workers are workers who do not exist but whose names are fraudulently entered in the payroll.
2. Inclusion of wrong number of hours worked by employees in the payroll.
3. Marking an absent worker as present.

4. Ignoring to mark late arrivals or early departures.
5. Use of wrong rate of pay in the payroll.
6. Omission to record deductions, partly or entirely.
7. Other forms of manipulation in the payment of wages.

HOW TO EXERCISE CONTROL OVER LABOUR COST?

The main aim of the control over labour cost is to keep labour cost per unit of output as low as possible increasing labour productivity. For this purpose, there has to be a concerted effort by all the concerned departments involved in the control of labour cost.

Departments Involved in the Control of Labour Cost

In a large organisation, generally the following departments are involved in the control of labour cost:

Department	Function
1. Personnel Department	(a) Recruitment and selection of workers. (b) Training and development of workers. (c) Orientation and placement of workers. (d) Maintenance of personnel records.
2. Engineering and Work Study Department	(a) Preparation of plans and specifications for each job. (b) Supervision of production activities within production departments. (c) Maintaining safety and efficient working conditions. (d) Conducting time and motion studies. (e) Conducting job analysis. (f) Conducting job evaluation and merit rating. (g) Setting piece rates.
3. Timekeeping Department	(a) Recording of arrival and departure time of each worker. (b) Recording of time spent by each worker on various jobs, orders or processes.
4. Payroll Department	(a) Preparation and maintenance of payroll record for each employee and department. (b) Issue of pay-slip to each employee (c) Disbursement of salaries and wages.
5. Cost Accounting Department	(a) Classification of labour cost data. (b) Collection of labour cost data. (c) Charging of direct labour cost to the concerned department. (d) Allocation of individual indirect labour cost to the concerned. (e) Apportionment of common indirect labour cost over various departments on some equitable basis. (f) Absorption of indirect labour cost over jobs, orders or processes. (g) Analysis of Labour Cost Reports such as Idle time Report, Overtime Report, Variances from Budgeted Labour Costs.

Important Factors for the Control of Labour Cost

To exercise an effective control over the labour costs, the essential requisite is efficient utilisation; labour and allied factors. The main points which need consideration for controlling labour costs are the following:

1. Assessment of Manpower Requirement.
2. Time and Motion Study.
3. Job Evaluation and Merit Rating.
4. Labour Productivity
5. Wage Systems.
6. Incentive Systems.
7. Control over Timekeeping and Time Booking,
8. Control over Labour Turnover.
9. Control over Casual, Contract and Other Workers.

Meaning of Terms Used in Engineering and Work Study Departments

Time Study

1. Meaning	Time study is a technique which is used to measure the time that may be taken by a workman of reasonable skills and ability to perform various elements of the tasks in a job.
2. Purpose	The purpose of time study is to determine — (i) time normally required to perform a certain job, and (ii) a fair day's work for the workman.
3. Tools	Time study is conducted with the help of stopwatch.

Motion Study

1. Meaning	Motion study is a technique which involves close observation of their movements of body and limbs required to perform a job.
2. Purpose	The purpose of motion study is — (i) to eliminate waste motion, and (ii) to determine the best way of doing a job.
3. Tools	Time study is conducted with the help of a movie camera connected with micro-chronometer (i.e., a kind of clock).
4. Factors	Usually, the following factors are considered for merit rating purposes: (a) Quality of work done (b) Knowledge applied (c) Skills used (d) Sense of responsibility (e) Sense of judgement (f) Aptitude for work (g) Initiative (h) Integrity (i) Punctuality (j) Reliability (k) Discipline (l) Cooperation
5. Advantages	Advantages of merit rating are as follows: 1. Merit rating helps in determining fair wages for each worker. 2. It helps in taking decisions like who deserves promotion, who deserves increment, etc. 3. It helps in introducing a system for wage payment and incentives. 4. It reveals employee's strong and weak points. 5. It helps in ascertaining the suitability of the worker for a particular job when it is linked with job evaluation.

Distinction between Job Evaluation and Merit Rating

Job Evaluation differs from Merit Rating in the following respects:

Basis of Distinction	Job Evaluation	Merit Rating
1. Meaning	It is the assessment of relative worth of jobs in a job hierarchy.	It is the assessment of the relative worth of a job holder.
2. Job vs. Job holder	It rates the jobs.	It rates the job holders.
3. Objective	Its objective is to set up a rational wage and salary structure.	Its objective is to provide a scientific basis for determining fair wages for each worker based on his ability and performance.
4. Usefulness	It helps in establishing a simplified and rational wage and salary structure.	It helps in determining fair wages for each worker.

Timekeeping

1. Meaning Timekeeping is a system of recording the arrival and departure time of each worker.

2. Objective

(a) To provide data for the preparation of payroll.

(b) To meet statutory requirements (i.e., Attendance Record)

(c) To ascertain the overtime

(d) To ascertain the idle time

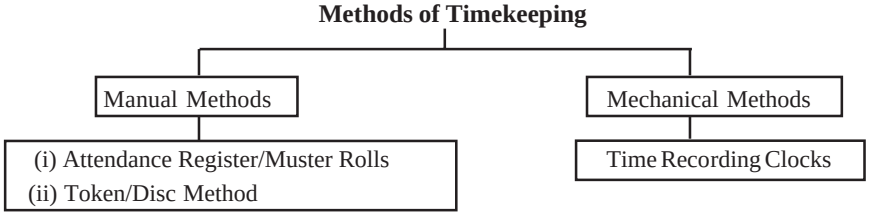
(e) To ascertain the labour cost

(f) To provide a basis for apportionment of overheads if based on labour hours

(g) To control labour cost

(h) To maintain discipline and punctuality among the workers

3. Methods The various methods of Timekeeping are as follows:



Let us discuss these methods one by one.

(a) Attendance Register/Muster Roll

(i) It is kept at the gate of the factory.

(ii) In and out time is recorded in the register either by the timekeeper or the worker.

(iii) It is signed by the worker both at the time of arrival and departure.

(iv) After the fixed reporting time, workers are marked 'late' or 'absent' as the case may be.

(v) This method is very simple.

(vi) This method is very economical.

(vii) This method is very suitable for small organisations.

(viii) Possibilities of fraudulent marking of attendance due to collusion between worker and timekeeping staff may not be ruled out.

(b) Token/Disc Method

(i) Each worker is allotted an identification number.

(ii) All tokens or discs bearing identification numbers are hung on a board at the factory gate.

(iii) When the worker arrives, he removes his disc/token from the board and puts in a box kept for the purpose at factory gate.

(iv) After the fixed reporting time, the box is removed and is replaced by another box indicating the extent of late attendance or latecomers may be required to report directly to the Timekeeping Office.

(v) On the basis of Disc/Token put in the box, attendance is recorded in the Attendance Record.

(vi) This method needs proper supervision to ensure that a worker does not put in the box more than one disc/token.

(vii) This method is suitable in small organisations only.

(c) Time Recording Clocks

(i) Each worker is given a clock card bearing an identification number.

(ii) All clock cards are placed in the rack which is kept at factory gate.

(iii) When the worker arrives, he takes his card from the 'Out' rack and punches his arrival time with the help of a machine and puts it into the 'In' rack. When he leaves the factory, this process is reversed.

(iv) Advantages of this method are:

1. It provides accurate and quick recording of attendance.
2. It helps in reducing the chances of false and fraudulent entries.

(v) Disadvantages of this method are:

1. It requires heavy capital investment.
2. It requires close supervision to ensure that a worker does not punch more than one clock card.

Time Booking

1. Meaning	Time Booking is a system of recording the time spent by each worker on various jobs, orders or processes.	
2. Objective	(a) To ascertain the labour cost of a job, order or process. (b) To check wastage of time by the worker after he enters the factory. (c) To ascertain the cost of idle time. (d) To provide a basis for apportionment of overheads where overheads are to be apportioned on the basis of time spent on various jobs, orders or processes. (e) To control labour cost by comparing actual time with the standard time allowed on various jobs. (f) To provide information for the computation of wages and bonus for the time saved under various schemes of wage payment. (g) To ensure that the time for which a worker is paid is properly utilised.	
3. Methods	(a) Daily Time Sheet	(b) Weekly Time Sheet
	(c) Job Card	(d) Combined Time and Job Card
	(e) Labour Cost Card	(f) Piece Work Card

METHODS OF TIME BOOKING

Depending upon the size of organisation, time booking may be done manually or mechanically. Large-sized organisations use time recording clocks for recording starting and closing timings of work by every worker in respect of every job. The other methods of time booking are as follows:

Daily Time Sheet

1. Meaning	It is a daily record for each worker in respect of time spent by him on each job during the day.
2. Suitability	This method is suitable where workers have to change their jobs quite frequently during a day, i.e., maintenance workers.
3. Disadvantage	This method involves a lot of clerical work.

Idle time, overtime, and fringe benefits associated with direct labour workers pose particular problems in accounting for labour costs. Are these costs a part of the costs of direct labour or are they something else?

- Idle Time
- Overtime
- Fringe Benefits

Idle Time: Machine breakdowns, materials shortages, power failure, and the like result in idle time. The labor costs incurred during idle time are ordinarily treated as manufacturing overhead cost rather than as a direct labor cost. Most managers feel that such costs should be spread over all the production of a period rather than just the jobs that happen to be in process when breakdown or other disruptions occur.

Example: To give an example for how the cost of idle time is handled, assume that a press operator earns ₹ 12 per hour. If the press operator is paid for a normal 40-hour workweek but is idle for 3 hours during a given week due to breakdowns, labour cost would be allocated as follows:

Direct labour (₹ 12 per hour × 37 hours)	₹ 444
Manufacturing overhead (idle time: ₹ 12 per hour × 3 hours)	36
Total cost for the week	₹ 480

Overtime Premium: The overtime premium paid to all factory workers (direct labour as well as indirect labour) is usually considered to be part of manufacturing overhead and is not assigned to any particular order. At first glance, this may seem strange, since overtime is always spent working on some particular order. Why not charge that order for the overtime cost? The reason is that it would be considered unfair and arbitrary to charge an overtime premium against a particular order simply because the order happened to fall on the tail end of the daily production schedule.

Example: Assume that a press operator in a plant earns ₹ 12 per hour. She is paid time and half for over time (time in excess of 40 hours a week). During a given week, she worked 45 hours and has no idle time. Her labour cost would be allocated as follows:

Direct labour (₹ 12 × 45 hours)	₹ 540
Manufacturing overhead (overtime premium: ₹ 6 per hour × 5 hours)	₹ 30
Total cost for the week	₹ 570

Observe from this computation that only the overtime premium of ₹ 6 per hour is charged to overhead account — not the entire ₹ 18 earned to each hour of overtime work (₹ 12 regular rate × 1.5 = ₹ 18)

Labour Fringe Benefits: Labour fringe benefits are made up of employment-related costs paid by the employer and include the cost of insurance programmes, retirement plans, various supplemental unemployment benefits, and hospitalisation plans. The employer also pay employer's share of social security, medicare, workers' costs often add up to as much as 30% to 40% of base pay.

Many firms treat all such costs as indirect labour by adding them in total to manufacturing overhead. Other firms treat the portion of fringe benefits that relates to indirect labour as additional direct labour cost. This approach is conceptually superior, since the fringe benefits provided to direct labour workers clearly represent an added cost of their service.

Labour Costing Formulas

Gross Pay	Hours worked × Rate per hour or number of units produced × Rate per unit
Halsey scheme	50% of time saved × Rate per hour
Halsey-Weir Scheme	1/3 of time saved × Rate per hour
Rowan Scheme	(Time taken/Time allowed × Time saved) × Rate per hour
Time Saved	Time allowed – Time taken
Labour Turnover	Average no. of employees leaving who have to be replaced A × 100 average number employed.

Mechanical Method [Time Clock Method]

(1) Procedure: Under this method the time of arrival and departure id recorded mechanically, i.e., with help of Time Clocks. Generally, each worker is given a card with an identity number. All the cards are kept on a board at the entrance tot he factory. Every time a worker arrives at or leaves the factory he takes his cards from the boards and inserts it into the Time Clock. As soon as the card is inserted into the Time Clock, the Clock mechanically prints the time on the card. Some Clocks may print late arrivals in red ink etc. The cards still hanging on the board after the scheduled time indicate absent workers.

(2) Exhibit 1: Specimen Time Clock Card

ABC Company Clock Card								
Name of Employee x x x x Week Ending x x						Card No. x x		
Day	In	Out	In	Out	In	Out	Normal	Overtime
Monday	xx	xx	xx	xx	xx	xx	xx	xx
.....	xx	xx	xx	xx	xx	xx	xx	xx
Saturday	xx	xx	xx	xx	xx	xx	xx	xx
Total Wages x x x x Total Time x x						Signature x x		

(3) Evaluation: The only disadvantage of this method is the initial heavy capital investment required for purchasing the Time Clock. However, this disadvantage is off-set by the following advantage:

(a) Accurate: Being a mechanical system, it is very accurate in recording the time of arrival, departure, overtime etc. It correctly records the late arrival, early departure etc. in respect of the employees.

(b) Economical: In the long run, this is an economical system, since it avoids recurring expenses on remuneration to assistants at the gate etc.

(c) No Misuse: The system is not open to misuse or frauds. The attendance records cannot be altered by the workers either on their own or in collusion with the assistants in labour Department.

(d) Printed Evidence: The Clock cards provide printed evidence of the record of attendance of an employee. This is useful in obtaining legal benefits like Provident Fund, Maternity Benefits, Leave Encashment etc. without any disputes.

Methods [Job Card]

Time booking is basically performed by preparing a Job Card. Job Card is a record of the work done by a worker, indicating the jobs done by him and the time spent against each job. A Job Card may be prepared either manually or mechanically. Thus Job Card is the key document in all methods of Time Booking. Let us study the procedure involved in preparation, format etc. of a Job Card in detail. A Job Cards may also be prepared either for each job or for each worker.

(A) Job Card for each Worker

(1) Meaning: When a Job Card is kept for each worker, it helps in finding out the time spent by each worker on different jobs during a day or week. In such cases, each worker is give, in addition to his Time Card, a Job Card (see Specimen below).

(2) Exhibit 2: Specimen of Job Card for each Worker

ABC Company
Job Card

Name of Employee x x x x — Token No.: x x
Department: x x — Wage Rate: x x — Week Ended: x x

	Job No.		Job No.		Job No.		Total		Cost
Day	On	Off	On	Off	On	Off	Normal	Overtime	₹
Monday	x	x	x	x	x	x	xx	xx	xx
.....	x	x	x	x	x	x	xx	xx	xx
Saturday	x	x	x	x	x	x	xx	xx	xx
Total	x	x	x	x	x	x	xx	xx	xx

Checked with Attendance Records

xx Signature (Supervisor) — xx Signature (Labour Dept.) — xx Signature (Cost Dept.)

(3) Procedure

(a) When is Jon Card Prepared: Job Card may be prepared either daily or weekly. While large organisations can prepare Daily Job Card, Week;y Job Card would be suitable for small organisations.

(b) Who Prepares Job Cards: Job Cards may be kept with the workers or with an assistant in the Labour department. When the workers are educated, the Job Card may be filled in by the workers and submitted to Labour department every day. However, if the workers are careless, the Job Cards may be torn or mutilated. Further, the details may not be recorded accurately by te workers. In such cases, it is desirable to keep the Job Cards with an assistant in the Labour department who would fill in the details at the end of every day.

(c) How is Job Card Prepared: The total time spent by a worker on each job is, firstly, entered against that Job. No. This is done by entering the time of starting the Job (On) and completing the job (off) against each job no. The time spent on each job is further classified into Normal Time and Overtime. The Costing department then computes the Labour Cost to be allocated to each job as per the formula. **Labour Cost of each Job = Time Spent × Wage Rate.** The total time spent on all job per day by a worker is also reconciled with the total period of attendance as per the attendance records.

(B) Job Card for each Job

(1) Meaning: When a Job Card is prepared for each worker, as explained above, it is not possible to directly compute the Total Labour Cost od each job. The Costing department has to prepare a Summary of the Job Cards of all workers to determine the Total Labour Cost of each job. Some organisations, therefore, prepare a Job Cards for each job. This Job Card moves with the worker from one Job to another. A Job Card for each job readily gives the total hours spent by the worker on each job and there is no need to prepare a separate summary as in the case of a Job Card for each worker. However, such Job Cards do not give details of total labour of each worker. Thus, it is not possible to reconcile such Job Cards with the respective attendance records. Such Job Cards however, are useful when there are many jobs and each job passes through several workers.

(2) Exhibit 3: Specimen of Job Card for each Job

ABC Company **Job Card**					
Description of Job x x Job Started On: x x			Jon No.: x x Job Completed On: x x		
Dept.	Workers Name/	Work Done	Time		Cost
	Token No.		On	Off	₹
xx	xxx		x		x
xx	xxx	xx	x	x	x
Total Checked xx Signature Supervisor		xx Signature Labour Dept.	xx Signature Costing Dept.		

(3) How Job Cards Help in Determination of Labour Costs: The Labour Cost os each job is determined by the Costing Department through an analysis of all Job Cards. The Total Labour Cost of a Job is = Total Labour Hours × Labour Hour Rate. The Labour Hour Rate may be so fixed that the Total Labour Cost is equal to the Gross Wages, or it may also cover all allowances, incentives etc. paid to the workers.

Payroll

Steps

The hours worked by each employee as reflected on the completed clock cards are entered by an accounting department staff on the payroll sheet or payroll summary. All employees authorized for employment by the personnel department are first listed on the payroll sheet. Hours and hourly rates are then transferred from the clock cards, and total earnings are computed. After the gross earnings (that is, the total amount earned by an employee before any deductions are taken into consideration) have been calculated for every employee, deductions are entered on the payroll sheet, and the net pay of each employee is determined. Payroll deductions are of two kinds, non-tax and tax. Non-tax deductions are made at the request of the employee or are required by union contracts. Among the more common examples are union dues, hospitalization insurance, withholding for the purchase of savings bonds, and contribution to charities. Tax deductions are made in compliance with Income Tax Act.

Paying the Wages

The Payroll sheet is the basis for the preparation of a payroll voucher by the accounting department authorizing disbursements for the net amounts payable to employees. If the number of employees is large, payments are usually made from a special payroll bank-account. In each pay period an amount to cover the net payroll is transferred from the company's general account to a special payroll bank-account. Cheque payable to the individual employees are then draw against the payroll account. Payments should be made only to the employees themselves after proper identification. As a control, payroll cheques should not be given to factory supervisors or department heads for distribution to the employees under them. Rather, an individual having no record-keeping functions associated with the payroll (such as the time-keeping function and the preparation of payroll function) should be assigned the job of distributing pay-cheques. Unclaimed pay-cheques should be investigated to determine why they have not been picked up been picked up by employees.

Overview of Statutory Requirements

According to the Factories Act, 1948, evert worker is required to work not more than 9 hours a day or 48 hours in a week. If, due to the urgency of the work, a worker is required to work for more than 9 hours a day, excess time over 48 hours i.e., overtime is to be paid to the worker at a higher rate, generally at double the normal wage rate. The excess rate over normal wage rate is called overtime premium.

Overtime

Meaning

Overtime means the work done by a worker beyond his normal working hours. Gen, the rate of Overtime work is higher than the normal rate. As per the Factories Act, Overtime rate has to be double the normal rate. Hence, **Overtime Rate = Normal Rate of Wages + Extra Rate Wages** (called Overtime Premium).

Accounting Treatment

Normal Wages are charged to the cost centre or cost unit in the usual way. The extra wages or Overtime premium is treated as explained below:

(1) Specific Job: If the Overtime was for a specific job, at the instance of the customer, it is charged to the Job. In turn, the amount of Overtime would be recovered form the customer.

(2) Normal: If the Overtime is normal or due to unavoidable cause, it is treated as a Works or Factory Overhead.

(3) Abnormal: If the Overtime is abnormal, it is treated as an exceptional item and directly debited to the Costing Profit and Loss Account.

(4) CAS 7: According to CAS 7, Overtime premium shall be assigned directly to the cost object or treated as overheads depending on the economic feasibility and the specific circumstance requiring such overtime.

Merits of Overtime

Overtime helps the management in:

(1) Increasing the production by incurring a small extra cost.

(2) Utilising the plant and machinery more effectively, thus spreading the fixed cost over a larger output. This reduces the per unit cost of production.

(3) Clearing the backlog of work.

Demerits of Overtime

However, Overtime has the following demerits:

(1) Overtime means additional cost od labour, lighting repairs for overworked machinery etc.

(2) Overtime work means fatigue for the workers leading to lower and sub-standard output.

LABOUR TURNOVER

Meaning of Labour Turnover

Labour Turnover is the rate of change in the composition of labour force of an organisation due to retirement, resignation or retrenchment etc. during a particular period. It may be defined as the number of workers left or replaced or both in relation to the average number of workers employed during the period.

Three Methods of Measurement of Labour Turnover

Methods	Formula to Measure Labour Turnover
1. Separation Rate Method	$LT = \frac{\text{No. of Separations}}{\text{Average Number of Workers in the period}} \times 100$ where, No. of Separations = No. of Workers Discharged Average No. of Workers = $\frac{\text{No. of workers at the end}}{2}$

2. Replacement Rate Method	$LT = \frac{\text{No. of Replacements}}{\text{Average Number of Workers in the period}} \times 100$ where, No. of Replacements = No. of Workers recruited in the vacancies of those leaving excluding those recruited on account of expansion scheme.
3. Flux Method	$LT = \frac{\text{No. of Separations} + \text{No. of Replacements}}{\text{Average No. of Workers in the period}} \times 100$ or, $= \frac{\text{No. of Separations} + \text{No. of Accessions}}{\text{Average No. of Workers in the period}}$ where, No. of Accessions = No. of Workers recruited in the vacancies of those leaving and those recruited on account of its expansion.

Equivalent Annual Labour Turnover Rate

In case Labour Turnover Rate is based on a period other than a year, an Equivalent Annual Labour Turnover Rate may be calculated as follows:

$$\text{Equivalent Annual Labour Turnover Rate} = \frac{\text{Turnover rate for the period}}{\text{Number of days in the period}} \times 365$$

Illustration 1

A firm's basic rate is ₹ 3 per hour and overtime rates are one-and-a-half times for evenings and double rate for weekend. Following details have been given on the three jobs:

Hours recorded	Job X	Job Y	Job Z
Normal time	480	220	150
Evening time	102	60	80
Weekend	10	30	16

Calculate labour cost chargeable to the jobs under following circumstances:

(a) Where overtime is worked occasionally to meet production requirements.

(b) Where overtime is worked at the customer's request to expedite the supply.

Solution

(a) If overtime is occasionally worked for production requirements, then the normal rates should be charged to the jobs and the premium portion should be treated as production overheads. This will be:

	Job X	Job Y	Job Z
Total hours worked	592	310	246
Charged to jobs @ ₹ per hour	₹ 1776	₹ 930	₹ 738

(b) If Overtime is Worked at the request of customers, then the entire cost of additional time worked (including the premium) must be charged to the jobs. This will be as follows:

	Job X	Job Y	Job Z
Normal time	480	220	150
Evening time	120	60	80
Weekend	10	30	16
Charged to Jobs			
Normal time @ ₹ 3 per hour	₹ 1,140	₹ 660	₹ 450
Evening time @ ₹ 4.5 per hour	₹ 459	₹ 270	₹ 360
Weekend time @ ₹ 6 per hour	₹ 60	₹ 180	₹ 96
Total	₹ 1959	₹ 1110	₹ 906

Evening time is paid @ 1.5 times of ₹ 3, i.e., at ₹ 4.50 per hour and weekend @ 2 times, i.e., at ₹ 6 per hour.

Illustration 2

A factory has a piece rate system for mass production of a TV component. The standard production fixed for a day is 40 units. The piece rate is ₹ 4. The details of remuneration payable to workers are as follows:

Efficiency	Wages	DearnessAllowance	Incentive Bonus
Up to 80%	₹ 4 per piece subject to guaranteed minimum of ₹ 100 per day	₹ 60 per day	Nil
Above 80%	Same as above	Same as above	₹ 40 for every 1% increase in efficiency above 80%

Three workers Ram, Sham and Ghanshyam gave the following performance for the month of August 2007.

Ram worked 20 days and gave output of 480 units

Sham worked 24 days and gave output of 864 units

Ghanshyam worked 25 days and gave output of 1,100 units

Calculate their total earnings.

Solution

Name	Days worked	Standard output	Actual output	Efficiency wages	Piece rate day	Minimum @ 100/	Basic Wages per day	D.A @ ₹ 60	Bonus	Total earnings
Ram	20	800	480	60%	1,920	2,000	2,000	1,200	-	3,200
Sham	24	960	864	90%	3,456	2,400	3,456	1,440	400	5,296
Ghanshyam	25	1,000	1,100	110%	4,400	2,500	4,400	1,500	1,200	7,100

Bonus for Sham is for 10% additional efficiency, i.e., 10 × 40 and

Bonus for Ghanshyam is for 30% additional efficiency, i.e., 30 × 40.

Ram will be given minimum guaranteed basic wages as his piece rate earning fall short of the minimum wages.

Illustration 3

From the following particulars, calculate the monthly wages of workers A, B and C.

(a)	Worker's monthly standard output:	1,000 units
(b)	Worker's actual output in a month:	A – 850 units, B – 720 units and C – 960 units
(c)	Rate per unit of actual output:	₹ 20 paise
(d)	Dearness allowances per month:	₹ 50 (Fixed)
(e)	House rent allowance per month:	₹ 20 (Fixed)
(f)	Travelling allowance per month:	₹ 20 (Fixed)
(g)	Additional output bonus:	Output exceeding 80% of standard, for every 1% of the actual output: ₹ 5

(MU, B.Com., Modified)

Solution

Monthly standard output = 1,000 units

A's output = 850 units

$$\% = \frac{850}{1{,}000} \times 100 = 85\%$$

B's output = 720 units

$$\% = \frac{720}{1{,}000} \times 100 = 72\%$$

C's output = 960 units

$$\% = \frac{960}{1{,}000} \times 100 = 96\%$$

Calculation of Total Monthly Wages

Particulars	A (850 units) ₹	B (720 units) ₹	C (960 units) ₹
1. Wages @ 20 per unit	170	144	192
2. Dearness Allowance (Fixed)	50	50	50
3. HRA (Fixed)	20	20	20
4. T.A. (Fixed)	20	20	20
5. Bonus:			
A (85 – 80%) × ₹ 5			
C (96 – 80% × ₹ 5	25	–	80
Total	**285**	**234**	**362**

Illustration 4

XYZ Ltd. employs its workers for a single shift of 8 hours for 25 days in a month. The company has recently fixed the standard output for a mass produced on incentive scheme to boost output.

Details of wages payable to the workers are as follows:

(i) Basic wages/piece work wages @ ₹ 2 per unit subject to a guaranteed minimum wages of ₹ 60 per day.

(ii) Dearness allowance at ₹ 40 per day.

(iii) Incentive bonus:

Standard output per day per worker:	40 units
Incentive bonus upto 80% efficiency:	NIL
Incentive bonus for efficiency above 80%:	₹ 50 for every 1% increase above 80%

The details of performance of four workers for the month of April 2012 are as follows:

Worker	No. of Days Worked	Output (Units)
A	25	820
B	18	500
C	25	910
D	24	780

Calculate the total earnings of each of the workers. ***(ICWA Modified)***

Solution

Statement of Gross Earnings

Worker (Days)	Days Worked (Units)	Output ₹	Basic Wages ₹	DA ₹	Incentive ₹	Gross Earnings
A	25	820	1,640	1,000	50 × 2 = 100	2,740
B	18	500	1,080*	720	NIL	1,800
C	25	910	1,820	1,000	50 × 11 = 550	3,370
D	24	780	1,560	960	50 × 1 = 50	2,570
*B: ₹ 60 per day × 18 days						₹ 1,080 (Higher)
₹ 2 × 500 units						₹ 1,000

Working Note: Incentive

$$A = \frac{820}{25\times40}\times100=\frac{820}{1{,}000}\times100 = 82.00\%$$

$$B = \frac{500}{18\times40}\times100=\frac{500}{720}\times100 = 69.44\%$$

$$C = \frac{910}{25\times 40}\times 100 = \frac{910}{1{,}000}\times 100 = 91.00\%$$

$$D = \frac{780}{24\times 40}\times 100 = \frac{780}{960}\times 100 = 81.25\%$$

Illustration 5

A worker produced 200 units in a week's time. The guaranteed weekly wage payment for 45 hours is ₹ 81. The expected time to produce one unit is 15 minutes which is raised further by 20% under the incentive scheme. What will be the earnings per hour of that worker under Halsey (50% sharing) and Rowan bonus schemes? ***(CA Modified)***

Solution

(i) Halsey (50% sharing) Bonus Scheme

= Time allowed for actual weekly production

= 200 Units × 18 Minutes

= 3,600 Minutes

i.e., $= \frac{3{,}600\ \text{Minutes}}{60\ \text{Minutes}} = 60\ \text{Hours.}$

Expected time to produce one unit under incentive scheme

= 15 + (15 × 20%)

= 15 + 3

= 18 Minutes

Time Saved = Time Allowed – Actual Time Taken

= 60 Hours – 45 Hours = 15 Hours

Total Earnings = (Hours Worked × Rate per hour) + $\frac{1}{2}$ × (Time Saved × Rate per hour)

= (45 hours × ₹ 1.80) + $\frac{1}{2}$ (15 hours × ₹ 1.80)

= 81 + 13.50 = ₹ 94.50

Earning per hour = $\frac{94.50}{45\ \text{Hours}}$ ₹ 2.10 per hour

Wage Rate per hour = $\frac{81}{45\ \text{Hours}}$ = ₹ 1.80

(ii) Rowan Bonus Scheme

$$= \text{Total Earnings} = \text{Hours Worked} \times \text{Rate per hour} + \left(\frac{\text{Time Saved}}{\text{Time Allowed}} \times \frac{\text{Time}}{\text{Take}} \times \frac{\text{Rate}}{\text{per hour}} \right)$$

$$= 45 \text{ hours} \times ₹ 1.80 + \left(\frac{15 \text{ Hours}}{60 \text{ Hours}} \times 45 \text{ hour} \times ₹ 1.80 \right)$$

$$= 81 + 20.25$$

$$= ₹ 101.25$$

$$\text{Earnings per hour} = \frac{101.25}{45 \text{ Hours}} = 2.25 \text{ per hour}$$

Illustration 6

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:	₹ 5.40
Standard Time per hour:	1 minute
Output per day is as follows:	
Worker A	390 units
Worker B	450 units
Worker C	600 units

Working hours per day are 8. ***(CA Modified)***

Solution

1. Normal Wage Rate per unit

Normal Rate per hour: ₹ 5.40

Standard Output per hour: 60 units

$$\text{Normal Wage rate per unit} = \frac{5.40}{60} = ₹ 0.09 \text{ per unit}$$

2. Efficiency Level

$$\text{Efficiency Level} = \frac{\text{Actual Output per day (units)}}{\text{Standard output per day (units)}} \times 100$$

A $\quad \frac{390}{480} \times 100 \quad = 81.25\%$

B $\quad \frac{450}{480} \times 100 \quad = 93.75\%$

C $\frac{600}{480} \times 100$ = 125%

Statement of Earnings of Workers (under Straight Piece Rate System)

Worker	Units	Normal Wags Rate per hour (₹)	Total (₹)
A	390	0.09	35.10
B	450	0.09	40.50
C	600	0.09	54.00

Statement of Earnings of Workers (under Merrick's Multiple Piece Rate System)

Worker Level	Efficiency ₹	Wage Rate	X	Units	=	Total Earnings ₹
A	81.25%	0.09	X	390	=	35.10
B	93.75%	0.099	X	450	=	44.55
C	125%	0.108	X	600	=	64.80

Usual Applicable Wages Rates are:

(a) Upto 83% Efficiency — Ordinary Piece Rate, i.e., ₹ 0.09

(b) 83% to 100% — 110% of Ordinary Piece Rate, i.e., ₹ 0.09 × 110% = ₹ 0.099

(c) Over 100% — 120% Ordinary Piece Rate, i.e., ₹ 0.09 × 120% = ₹ 0.108

Illustration 7

If the standard time is 10 hours, the premium 50% of time saved and the hourly wage rate is ₹ 200. Calculate the effective hourly rate earned by a worker under the Halsey system, if the time taken by the worker is 8 hours for the job.

Solution

Standard Time 10 hours

Actual Time Taken 8 hours

Time Saved 2 hours

Particulars	
(i) Wage for Time Taken (8 hours × ₹ 2000 per hour)	16,000
(ii) Bonus 50% of time saved (2 hours × $\frac{50}{100}$ × ₹ 2,000 per hour)	2,000
Total	18,000

Illustration 8

Calculate the Standard Labour hour rate for workmen of Grade III from the following data:

Basic Pay ₹ 200 per mensem

DA ₹ 150 per mensem

Fringe Benefit	₹ 100 per mensem
Number of Working days per year	300

Leave Rules

30 days PL with full pay.

20 days SL with half pay

Usually SL is fully availed of, what then would be the labour cost per hour if no SL is availed of during the year?

Solution

Particulars	Per Month (₹)	Per Year (₹)
Basic pay	200	2,400
DA	150	1,800
Fringe benefits	100	1,200
Total	450	5,400
Less: Standard Labour of 20 days $\left(\frac{450}{30} \times 20 \times \frac{1}{2}\right)$		–150
Total		**5,250**

Effective Working Days = 300 – 30 – 20 = 250

Standard Labour Rate (Assumption of 8 hours per day)

$$= \frac{5,250}{250 \times 8} = 2.625$$

If no SL is availed, the labour rate is:

$$\frac{5,400}{270 \times 8} = \frac{5,400}{2,160} = ₹\ 2.50$$

Illustration 9

A worker takes 9 hours to complete a job on daily wages and 6 hours on a scheme of payment by results. His day rate is ₹ 100 per hour, the material cost of the product is ₹ 400 and the overheads are recovered at 150% of the total direct wages.

Calculate the factory cost of the product under:

(a) The Piece Work Plan;

(b) The Rowan Plan; and

(c) The Halsey Plan.

Solution

(a) Under Piece Work Plan:

For 9 hours @ ₹ 100 = ₹ 900

(b) Under Rowan Plan:

Time Taken = 6 hours

Rate per Hour = ₹ 100

Standard Time = 9 hours

Time Saved = 9 hours – 6 hours = 3 hours

$$\text{Time Taken} \times \text{Rate per Hour} + \frac{\text{Time Taken}}{\text{Standard Time}} \times \text{Time Saved} \times \text{Rate per hour}$$

$$= 6 \times 100 + \frac{6}{9} \times 3 \times 100$$

$$= 600 + 200$$

$$= ₹\ 800$$

(c) Under Halsey Plan:

= Time taken × Rate per Hour + 50% of Time Saved × Rate per Hour

$$= 6 \times 100 + (1.5) \times 100$$

$$= 600 + 150$$

$$= ₹\ 750$$

Statement of Factory Cost

Items	Piece Rate (₹)	Rowan Plan (₹)	Halsey Plan (₹)
Materials	400.00	400.00	400.00
Direct Wages	900.00	800.00	750.00
Prime Cost	1,300.00	1,200.00	1150.00
Add: Factory Overheads (150% of Direct Wages)	1,350.00	1,200.00	1125.00
Factory Cost	2,650.00	2,400.00	2271.00

Illustration 10

You are required to ascertain the wages paid to workers X and Y under the Taylor's System.

Given:

Standard time allowed = 100 units per hour.

Normal wage rate = 10 per hour

Differential rates to be applied:

75% of piece rate when below standard and 125% of piece rate when at or above standard.

The workers have produced (in a day of 8 working hours) units as follows:

X — 300 units

Y — 450 units

Solution

Standard Production in 8 hours = 8 × 100 = 800 units

Normal Wage rate at ₹ 10 per hour

$$\text{Normal Wage rate per unit} = \frac{10}{100} \text{ ₹ } 0.10$$

Worker X: Below Standard

$$\text{Wages} = 300 \text{ units} \times 0.10 \times \frac{75}{100} = \text{₹ } 22.50$$

Worker Y: Above Standard

$$\text{Wages} = 450 \text{ units} \times 0.10 \times \frac{125}{100} = \text{₹ } 56.25$$

Illustration 11

From the given information, calculate the wages payable to a worker under the:

(a) The Gantt Task and Bonus Plan,

(b) The Halsey Premium Bonus, and

(c) The Rowan Bonus Plan.

Time allowed	6 hours
Time taken	5 hours
Rate per hour	₹ 200

Solution

(a) Gantt Task and Bonus Plan:

$$\text{Efficiency Ration} = \frac{\text{Time Allowed}}{\text{Time Taken}} \times 100$$

$$= \frac{6}{5} \times 100$$

$$= 120\%$$

Particulars	₹
1. Wages = Actual Time × Rate = 5 × 200	1000
2. *Bonus @ 20% of Actual Wages = $100 \times \frac{200}{100}$	200
Total Wages	1,200

***Note:** No Bonus is paid if efficiency is less than 100%.

(b) Halsey Premium Bonus Plan:

Hours Worked × Rate per hour + 50% of Time Saved × Hourly Rate

$$= 5 \times 200 + \left[\frac{50}{100} \times (6-5)\right] \times 200$$

= 1,000 + 100

= ₹ 1,110

(c) Rowan Bonus Plan:

$$\text{Bonus Ratio} = \frac{\text{Time Saved}}{\text{Time Allowed}}$$

$$= \frac{1}{6}$$

Time Taken × [Hourly Rate + (Hourly Rate × Bonus Ratio)]

$$= 5 \times \left[200 + \left(200 \times \frac{1}{6}\right)\right]$$

= 5 × 233.33

= ₹ 1,166.67

Illustration 12

The standard hours for a job are 100 hours. The job has been completed by Shanker in 60 hours, Ehasaan in 70 hours and Loay in 95 hours. The factory had a bonus system applicable to job based on the percentage of time saved as compared to standard hours. The rate of pay is ₹ 1 per hour. Calculate the total earnings of the three based on the following table of the incentive scheme and also the rate of earnings per hour for them.

Percentage of time saved	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

Solution

	Shanker	Ehasaan	Loay
Standard hours	100	100	100
Actual hours	60	70	95
Hours saved	40	30	5
% of time saved to standard	40%	30%	5%
Bonus percentage	20%	20%	10%

Bonus hours	8	6	0.5
Total hours for payment	68	76	95.5
Total earnings @ ₹ 1 per hour	68	76	95.5
Rate of earnings per hour	1.133	1.086	1.005

Illustration 13

(a) When will bonus paid as per Halsey Plan be equal to bonus paid as per Rowan Plan?

(b) The time allowed for a job is 8 hours and the hourly rate is ₹ 8. Calculate earnings as per Halsey and Rowan Plan and also hourly earnings under both plans.

Solution

(a) Bonus paid under Halsey plan is given by the formula

(Hours saved × Hourly rate)/2

And bonus under Rowan plan is given by the formula

(Hour saved/Standard time) × Actual hours × Hourly rate

If we want them to be equal, we must show that the formula are equal to each other, i.e.,

(Hours saved × Hourly rate)/2 = (Hours saved/Standard time) × Actual Hours × Hourly rate

Cancelling out the common variables variables, we get,

1/2 = Actual hours/Standard time

Or Actual hours =1/2 of Standard time

So, when the time saved is 50% of standard, bonus under both these methods will be same.

(b) Here, we will have to tabulate the information assuming various cases of time saved. If standard time given is 8 hours, let's assume actual time taken as 8, 7, 6... till 1 hour. Based on this, the table showing earnings under both methods is shown below:

Time allowed (a)	Time taken (b)	Time saved (c)	Bonus under		Total earnings under		Hourly earnings under	
			Halsey (d) = (c)/ 2*8	Rowan (e) = (c)/ (a)*8*(b)	Halsey (f)	Rowan (g)	Halsey (h)	Rowan (i)
8	8	0	0	0	64	64	8.00	8
8	7	1	4	7	60	63	8.57	9
8	6	2	8	12	56	60	9.33	10
8	5	3	12	15	52	55	10.40	11
8	4	4	16	16	48	48	12.00	12
8	3	5	20	15	44	39	14.67	13
8	2	6	24	12	40	28	20.00	14
8	1	7	28	7	36	15	36.00	15

Illustration 14

The following particulars apply to a factory where W, X, Y and Z work

Normal Rate per Hour	₹ 5
Standard Time per Unit	12 minutes

In a 40 hour week, the output was as follows:

W	X	Y	Z
66 units	166 units	200 units	220 units

Required: Calculate the cost per unit and earnings per worker under:

(i) Straight Time Rate System

(ii) Straight Piece Rate System

(iii) Taylor's Differential Piece Rate System

(iv) Merrick's Differential Piece Rate System

(v) Gantt's Task Bonus System

(vi) Emerson's Efficiency Bonus Plan

Solution

(i) Statement Showing Earnings per Worker and Cost per Unit (Under Straight Time Rate System)

A Worker	B Output	C Actual Time Taken	D Rate per Hour (₹)	E = C × D Earning per Worker (₹)	F = E/B Cost per Unit (₹)
W	066	40 hours	5	200	3.03
X	166	40 hours	5	200	1.20
Y	200	40 hours	5	200	1.00
Z	220	40 hours	5	200	0.91

(ii) Statement Showing Earnings per Worker and Cost per Unit (Under Straight Piece Rate System)

A Worker	B Output	C Piece Rate per Unit (₹)	D = B × C Earning per Worker (₹)	E = D/B Cost per Unit (₹)
W	66	1	66	1
X	166	1	166	1
Y	200	1	200	1
Z	220	1	220	1

Note:

A. Standard Output per Hour = 60/12 = 5 units

B. Normal Rate per Hour = ₹ 5

C. Piece Rate per Unit = $\frac{₹\ 5}{5\ \text{units}}$ = ₹ 1

(iii) Statement Showing Earning per Worker and Cost per unit (Under Taylor's Differential Piece Rate System)

A Worker	B Output	C Piece Rate per Applicable (₹)	D = B × C Earning per Worker (₹)	E = D/B Cost per Unit (₹)
W	066	0.80	52.80	0.80
X	166	0.80	132.80	0.80
Y	200	1.20	240.00	1.20
Z	220	1.20	264.00	1.20

Note: Standard output in 40 hours week = (40 × 60/12) = 200 units

(iv) Statement Showing Earnings per Worker and Cost per Unit (Under Merrick's Differential Piece Rate System)

A Worker	B Efficiency (₹)	C Output Worker (₹)	D Piece Rate Applicable (₹)	E = C × D Earning per Worker (₹)	F = E/C Cost per Unit (₹)
W	33%	66	1.00	66	1.00
X	83%	166	1.00	166	1.00
Y	100 %	200	1.10	220	1.10
Z	110 %	220	1.20	264	1.20

(iv) Statement Showing Earnings per Worker and Cost per Unit (Under Merrick's Task Bonus System)

A Worker and Output	B SH for AO	C Time Rate/ Hour	D Std. Wages	E Bonus	F Guaranteed Time Wages	G Actual (D + E) or F w.e.h. (₹)	H = G/A Cost Per Unit (₹)
W 066	13.2	5.00	66	Nil	200	200	3.03
X 166	33.2	5.00	166	Nil	200	200	1.20
Y 200	40.0	5.00	200	40	200	240	1.20
Z 220	44.0	5.00	220	44	200	264	1.20

(vi) Statement Showing Earnings per Worker and Cost per Unit
(Under Emerson's Efficiency Bonus Plan)

A Worker	B Output	C Hours Taken	D Time Rate per Hour (₹)	E Guaranteed Wages (₹)	F Bonus (₹)	G = E + F Earning per Worker (₹)	H = G/B Cost per Unit (₹)
W	066	40	5	200	Nil	200	3.03
X	166	40	5	200	20	220	1.33
Y	200	40	5	200	40	240	1.20
Z	220	40	5	200	60	260	1.18

Illustration 15

A company had 500 workers on its roll on 1st April, 2007 and 600 on 30th June, 2007. During the quarter, 5 workers left, 20 were discharged and 75 workers were recruited. Of these, 10 workers were recruited as replacements for people leaving, while the rest were for expansion. Calculate the labour turnover rate under (a) Flux Method, (b) Replacement method and (c) Separation method.

Solution

The average number of people working = (500 + 600)/2 = 550

Labour turnover rate under Flux method

$$\text{LT Rate} = \frac{\frac{1}{2} \times (\text{No. of separations} + \text{No. of accessions})}{\text{Average manpower in the period}} \times 100$$

LT Rate = (1/2 (5 + 20 +10))/500*100

LT Rate = 3.18%

Labour turnover rate under Replacement method

$$\text{LT Rate} = \frac{\text{No. of replacements during a period}}{\text{Average manpower in the period}} \times 100$$

LT Rate = (10/550) × 100

LT Rate = 1.82%

Labour turnover rate under Separation method

$$\text{LT Rate} = \frac{\text{No. of avoidable separations during a period}}{\text{Average manpower in the period}} \times 100$$

LT rate = 25/500 × 100 = 4.54%

Illustration 16

The extracts from the payroll of a factory is a follows:

Number of employees at the beginning of April 20×5	150
Number of employees at the end of April 20×5	250

Number of employees resigned during April 20×5	25
Number of employees discharged during April 20×5	5
Number of employees replaced due to resignations and discharges during April 20×5	20

Required: Calculate the labour turnover rate and equivalent annual rate for the factory by different methods.

Solution

1. Separation Rate Method = $\frac{\text{Number of Separation}}{\text{Average No. of Workers}} \times 100$

$$= \frac{25 + 5}{(150 + 250)/2} \times 100 = 15\%$$

Equivalent Annual Labour Turnover Rate = $\frac{\text{Turnover rate for the period}}{\text{Number of days in the period}} \times 365$

Equivalent Annual Labour Turnover Rate = $\frac{15}{30} \times 365 = 182.5\%$

2. Replacement Method = $\frac{\text{No. of Replacement}}{\text{Average No. of Workers}} \times 100 = \frac{20}{200} \times 100 = 10\%$

Equivalent Annual Labour Turnover Rate = $\frac{10}{30} \times 365 = 121.67\%$

3. Flux Rate (i) = $\frac{\text{No. of Separations + No. of Replacements}}{\text{Average No. of Workers}} \times 100$

$$= \frac{30 + 20}{200} \times 100 = 25\%$$

Flux Rate (ii) = $\frac{(\text{No. of Separations + No. of Replacements})/2}{\text{Average No. of Workers}} \times 100$

$$= \frac{(30 + 20)/2}{200} \times 100 = 12.5\%$$

Equivalent Annual Labour Turnover Rate = $\frac{25}{30} \times 365 = 304.17\%$

Illustration 17

Calculate the number of employees in the beginning and at the end of the year from the following information:

Labour Turnover Rate	3%
No. of Separations during the year	12

No. of Employees at the end were 100 in excess of number of employees in the beginning.

Solution

$$\text{Labour Turnover Rate} = \frac{\text{No. of Separations}}{\text{Average No. of Employess}} \times 100$$

$$3 = \frac{12}{\text{Average No. of Employess}} \times 100$$

$$\text{Average No. of Employees} = \frac{12}{.03} = 400$$

$$\frac{OE + CE}{2} = 400$$

$$OE + CE = 800 \quad \text{....(I)}$$

$$CE - OE = 100 \quad \text{....(II)}$$

Adding both the equations:

$2CE = 900$

$CE = 900/2 = 450$

$OE = 450 - 100 = 350$

Thus, the number of employees in the beginning are 350.

Illustration 18

Calculate the number of separations during the year from the following information:

Labour Turnover Rate (based on Separation)	10%
Labour Turnover Rate (based on Replacement)	8%
No. of Replacements during the year	16

Solution

Step 1 → Calculation of Average No. of Employees

$$\text{Labour Turnover Rate (based on Replacement)} = \frac{\text{No. of Replacements}}{\text{Average No. of Employees}} \times 100$$

$$8 = \frac{16}{\text{Average No. of Employees}} \times 100$$

$$\text{Average No. of Employees} = \frac{16}{08} = 200$$

Step 2 → Calculation of No. of Separations

$$\text{Labour Turnover Rate (based on Replacement)} = \frac{\text{No. of Replacements}}{\text{Average No. of Employees}} \times 100$$

$$10 = \frac{\text{No. of Separations}}{200} \times 100$$

No. of Separations during the year = 10% of 200 = 20

QUESTIONS FOR SELF-PRACTICE

(I) Theory Questions

1. How is labour turnover measured?
2. Explain the various methods of labour remuneration.
3. What are the merits and demerits of Time Rate System and Piece Rate System of labour remuneration?
4. Write short notes on:
   (a) Direct and Indirect Labour Cost
   (b) Labour Turnover
   (c) Overtime vs. ldle Time

(II) Practical Questions

1. Calculate monthly remuneration of X, Y and Z.

   Standard production per worker per month 1000 units.

   Actual production X – 800 units, Y – 700 units, Z – 900 units during the month.

Piece work rate p.u. of actual production	15 paise
Dearness allowance	₹ 40 p.m. (fixed)
House rent allowance	₹ 20 p.m.

   Actual production bonus @ ₹ 5 for each % of actual production exceeding 75 actual production over standard production.

2. From the following, find out the labour hour rate:
   (a) Number of hours work per day 8.
   (b) Total number of workers in the department 500.
   (c) Out of 300 working days, 2.5% is treated to be idle time.
   (d) Total works overheads for the department 25 lakhs.
   (e) Sunday holiday and during the year the company declared 8 holidays.
3. The following details are given to you regarding a particular job.

Monthly Working Hours	192 hours
Hourly Wage Rate	₹ 30
Piece Rate per unit	₹ 12
Normal time taken per unit	96 minutes

Normal output per month	480 units
Actual output per month	600 units

You are required to calculate for the month:

(a) Normal Piece Rate Method.

(b) Merrick's Differential Piece Rate Method.

(c) Halsey Premium Plan.

(d) Halsey-Weir Premium Plan.

Further, which of these methods are beneficial for the worker and for the management?

4. What will be the earnings of a worker at ₹ 8 per hour when he takes 140 hours to do a volume of work for which the standard time is 200 hours? The plan of payment of hours is on a sliding scale as given under:

   (a) within the first 10% saving in standard time, bonus is 40% of time saved;

   (b) within the second 10% saving in standard time, bonus is 50% of time saved;

   (c) within the third 10% saving in standard time, bonus is 60% of time saved;

   (d) within the fourth 10% saving in standard time, bonus is 70% of time saved; and

   (e) for the rest, bonus is 75% of time saved.

5. From the following data, prepare a statement showing the cost per day of 8 hours of engaging a particular type of labour:

(a) monthly salary (basic + DA)	₹ 5,000
(b) leave salary payable to the workers	5% of the basic
(c) employer's contribution to PF	10% of basic
(d) employer's contribution to State insurance	2% of total salary
(e) number of working hours in a month	200

6. In a company, a daily wage rate guaranteed to a worker is ₹ 50 and the standard output fixed for the month is 500 articles representing 100% efficiency. The daily wage rate is paid to those workers who show up to $66\frac{2}{3}$ % of the efficiency standard.

   Beyond this, there is a bonus payable on a graded scale.

Up to 90% efficiency	10% bonus payable
Up to 100% efficiency	20% bonus payable.

Further increase of 1 for every 1 further rise in efficiency.

Find out the total earnings of X, Y and Z (workers) who have worked for 26 days in a month. Their output for the month is as follows:

X 400 articles;

Y 500 articles; and

Z 200 articles.

7. In a factory where the Rowan Plan is introduced, workers X and Y can earn ₹ 320 and ₹ 337.50 respectively on a job for which the standard time fixed is 12 hours.

   The rate is ₹ 30 per hour. Calculate what would be their earnings, if the Halsey Plan on a 5 : 5 basis had been allowed.

8. From the particulars given below, prepare the labour cost per man day of 8 hours;
   (a) Basic salary – ₹ 40 per day
   (b) Dearness allowance ₹ 5 per every point over 100 cost of living index = 700 points
   (c) Leave salary = 100% of (a) and (b)
   (d) Employer's contribution to PF = 10% of (a), (b), (c)
   (e) Employer's contribution to State Insurance = 2.5% of (a), (b), (c);
   (f) Expenditure on amenities to labour = ₹ 200 per head per month; and
   (g) Number of working days in a month of 25 days of 8 hours each.

9. The following information was collected from the books of Simren Ltd. for the year ending 31 December, 2008.

Particulars	₹	₹
Sales		28,00,000
Less: Variable costs		
Materials	6,01,000	
Direct labour	5,19,000	
Factory overheads	3,20,000	
Sales overheads	1,90,000	16,30,000
		11,70,000
Less: Fixed overheads		5,30,000
Profit		6,40,000

   Actual number of hours of direct labour = 2,06,000 (which include 4,000 hours of training, half of which is unproductive). Due to delay in filling vacancies, 6,000 potential direct hours were lost.

   Cost of re-employment – separation cost ₹ 25,630; selection cost ₹ 32,080; recruitment cost ₹ 23,140; and training cost ₹ 31,160. Calculate profit lost due to labour turnover.

10. In an engineering factory, the standard time for a job is 16 hours and the basic wage is ₹ 25 per hour. A bonus scheme is instituted so that the worker is to receive his normal rate for the hours actually worked and 50 for the hours saved. Materials for the job cost ₹ 500 and overheads are charged on a basis of ₹ 50 per labour hour. Calculate the wages and effective rate of earning per hour if the job is completed (i) in 12 hours and (ii) in 14 hours. Also ascertain factory cost of the job on the same basis.

11. A factory department has 180 workers who are paid at an average of ₹ 17.50 per week (48 hours), dearness allowance per month (208 hours of ₹ 130), provident fund deduction is at 8 on gross, of which 1 is for the family pension fund of half the number of workers, and Employees' State Insurance 6is at ₹ 1.25 for each. The company gives only a minimum bonus of $8\frac{1}{3}$ and allows statutory leave of two weeks per year with pay. Show the weekly wage summary for the financial books and the departmental labour hour cost for job costing. ***(ICWA)***

12. Calculate the earnings of workers X and Y under the Straight Piece Rate System and the Taylor's Differential Piece Rate System from the following particulars:

    Normal rate per hour ₹ 18.00

    Standard time per unit 20 seconds

    Differential Rates to be applied:

    80% of piece rate below standard

    120% of piece rate at or above standard.

    Worker X produced 1,300 units per day (of 8 hours) and worker Y produces 1,500 units per day (of 8 hours).

13. Rolland Ltd., operates in one of its departments, a group incentive scheme. A minimum hourly rate is guaranteed to each of the six employees in the group if actual output for the week is less than the standard output. If actual output is greater than the standard output, the hourly rate of each employee is increased by 4% for each additional 600 units of output produced. The standard output for the group is 12,000 units for a 40 hour week.

    During the week ending 31st December 2007, each employee in the group worked 40 hours and the actual output and minimum hourly rates were as follows:

Employees	Actual Output (in units)	Minimum Hourly Rate (₹)
Lal	2,500	0.60
Hari	2,700	1.00
Mohan	2,400	0.60
Shyam	2,500	0.80
Hanuman	2,460	0.60
Krishna	2,440	0.40

    You are required to:

    (a) Calculate the earnings of each employee; and

    (b) Appraise the effectiveness of the company of this group incentive scheme.

    (CA, Adapted)

14. The standard hours of Job "A" is 100 hours. The job can be completed by A in 60 hours, B in 70 hours and C in 95 hours.

    The bonus system applicable to the job is as follows:

Percentage of time saved to time allowed	**Bonus%**
Savings up to 10	10 of time saved
11 to 20	15 of time saved
21 to 40	20 of time saved
41 to 100	25 of time saved

    Rate of pay is ₹ 15 per hour. Calculate the total earnings of each worker and also the rate of earnings per hour.

15. Two workers 'A' and 'B' produce the same product using the same material. Their normal wage rate is also the same. 'A' is paid bonus according to Rowan scheme while 'B' is paid bonus according to Halsey scheme. The time allowed to make the product is 50 hours. 'A' takes 30 hours while 'B' takes 40 hours to complete the product. The factory overhead rate is ₹ 5 per person-hour actually worked. The factory cost of product manufactured by 'A' is ₹ 3,490 and cost of product manufactured by 'B' is ₹ 3,600.

    Required:

    (i) Compute the normal rate of wages.

    (ii) Compute the material cost.

    (iii) Prepare a statement comparing the factory cost of the product as made by two workers.

(CA, Adapted)

(III) Objective Questions

(A) State whether the following statements are True or False.

1. Wage plan promotes industrial peace.
2. Cost of living is increasing due to inflation.
3. Dearness allowance is linked with cost of living index.
4. Medical facilities are monetary benefits.
5. Time rate method remunerates the workers on the basis of time taken on the job.
6. Piece rate method brings down productivity.
7. Piece rate method pays the workers by results.
8. Labour is most important factor of production.
9. Taylor's differential piece rate system does not differentiate the workers.

[Ans: True: (1, 2, 3, 5, 7, 8). False: (4, 6, 9)]

(B) Match the following.

Group A	Group B
1. Labour Unions	(i) Monetary benefits
2. Basic Wages	(ii) Non-monetary benefits
3. Subsidised Transition	(iii) Greater bargaining power
4. Dearness Allowance	(iv) Element of labour cost
5. Time Rate	(v) Wages based on time taken
	(vi) Wages based on output

[Ans. 1. (iii), 2. (i), 3. (ii), 4. (iv), 5. (v)]

(C) Multiple choice questions. Select the right answer.

1. The method of remuneration to give stability of labour cost of the employers is
   (i) straight piece work
   (ii) premium bonus
   (iii) measured day work
2. The following is the most relevant use of the clock card.
   (i) to measure employee efficiency
   (ii) to facilitate payment for the time spent on the work premises
   (iii) to calculate bonus payment
3. Under Halsey Premium Plan, _____% of time saved shared by employer.
   (i) 110
   (ii) 115
   (iii) 50
4. A worker has a time rate of ₹ 15 per hour. He makes 720 units of a component (standard time 5 minutes per unit) in a week of 48 hours. His total wages including Rowan Bonus for the week is:
   (i) ₹ 792 (ii) ₹ 820
   (iii) ₹ 840 (iv) ₹ 864
5. The standard time required per unit of a product is 20 minutes. In a day of 8 working hours, a worker gives an output of 30 units. If he gets a time rate of ₹ 20 per hour, his total earnings under Halsey Plan was
   (i) ₹ 200 (ii) ₹ 192
   (iii) ₹ 180 (iv) ₹ 160

[Ans. 1. (iii), 2. (ii), 3. (iii), 4. (iv), 5. (iii)]

❄ ❄ ❄

CHAPTER 4

Overhead Cost

OVERHEAD: THE CONCEPT

Cost is defined as the amount of expenditure, actual or notional, incurred on or attributable to given item. Cost represents the resources that have been or must be sacrificed to attain a particular objective.

Direct costs are those costs that can be specifically and exclusively identified with a particular cost object. Indirect costs cannot be identified specifically and exclusively with a given cost object. Direct costs can be accurately traced because they can be physically identified with a particular object whereas indirect costs cannot.

Prime cost refers to the direct cost of the product and consists of direct labour cost plus direct materials and direct expenses.

Overheads are the indirect costs that cannot be allocated to any specific job or process as they are not capable of being identified with any specific job or process. It includes cost of indirect materials, indirect labour and indirect expenses that cannot be conveniently charged to any job or process. The CIMA defines overhead cost as "the total cost of indirect materials, labour and indirect expenses." In short, it is the cost of materials, labour and expenses that cannot be economically identified with specific saleable cost unit.

The cost attributable to a cost center or cost unit can be classified into two categories — direct and indirect. The cost which can be directly identified with a cost unit or cost center is called as Direct/ Prime Cost. The aggregate of indirect cost such as material cost, indirect wages and indirect expenses is called overhead. In other words, any expenditure over and above prime cost is known as overhead.

CLASSIFICATION OF OVERHEAD COSTS

The basic principles to be considered while treating an item as overhead (OH) are as follows:

- The aggregate of indirect material costs, indirect wages and indirect expenses is OH. Thus, it comprises of all indirect costs. Therefore, the relationship of the items of cost to products, jobs, etc. must be traced.

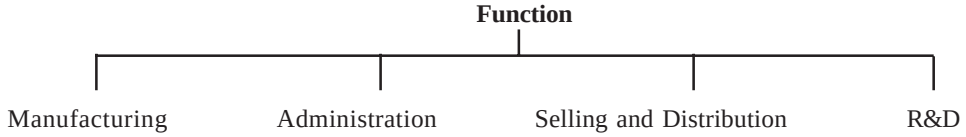
- Direct costs are also treated as OH in cases where efforts involved in identifying and accounting are disproportionately large. Costs incurred for item like nuts, bolts, etc., if very small, can be apportioned as OH over the jobs or products.
- The OH can be apportioned to a cost center in accordance with the principles of benefit and/or responsibilities. The benefit principle implies that if cost center occupies a certain proportion of a large unit of space for which standing charges are accurately ascertained, it should be charged with a corresponding proportion of such costs. The responsibility principle implies that as the departmental head has no control over the amount of rent and rates paid, his department should not bear any brunt of allocation of such costs.
- Capital expenditure should be excluded from costs and should not be treated as OH.
- Expenditure that does not relate to costs should not be treated as OH. Payment like donations, subscriptions, etc. cannot be treated as OH.

The process of grouping costs according to their common characteristics is called cost classification. It involves two steps: (i) the determination of the class or groups into which the overhead costs are subdivided, and (ii) the actual process of classification of the various expenses. The classification of overhead costs depends on the type and size of business, nature of product or services rendered and the management policy. The various types of classifications are:

1. Functional classification,
2. Classification with regards to behaviour of the expenditure,
3. Element-wise classification,
4. Classification according to the nature of expenditure.

Functional Classification of Overheads

Classification of overhead expenses with reference to major activity centers of a concern is called functional classification. As per this classification, the overhead expenses can be classified as follows:



Manufacturing or Production or Works Overhead: All the indirect expenses incurred by the operations of the manufacturing divisions of a concern are classified as manufacturing overhead. Examples of such expenses are depreciation, insurance charges on fixed assets like plant and machinery, stores, repairs and maintenance of fixed assets, electricity charges, fuel charges, factory rent, etc.

Administration Overhead: All the expenses incurred towards the control and administration of an undertaking are called administration overhead. Examples are, office rent, salaries and wages of clerks, secretaries and accountants, postage, telephone, general administration expenses, depreciation and repairs of office building, etc.

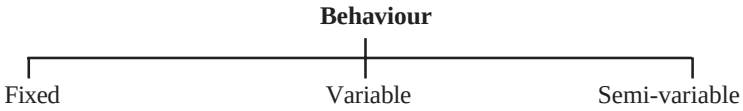
Selling and Distribution Overhead: The cost incurred towards marketing, distribution and sales is called selling and distribution overhead. It includes sales, office expenses, salesmen's salaries and

commission, showroom expenses, advertisement charges, samples and free gifts, warehouse rent, packaging expenses, transportation cost, etc.

Research and Development Expenses: The costs incurred for researching on new and improved products, new application of materials or improved methods is called research costs. Development costs are incurred towards commercial application of the discoveries made.

Classification with Regard to Behaviour of Expenditure

Based on the behaviour, the overheads can be classified into (a) Fixed overhead, (b) Variable overhead and (c) Semi-variable overhead.



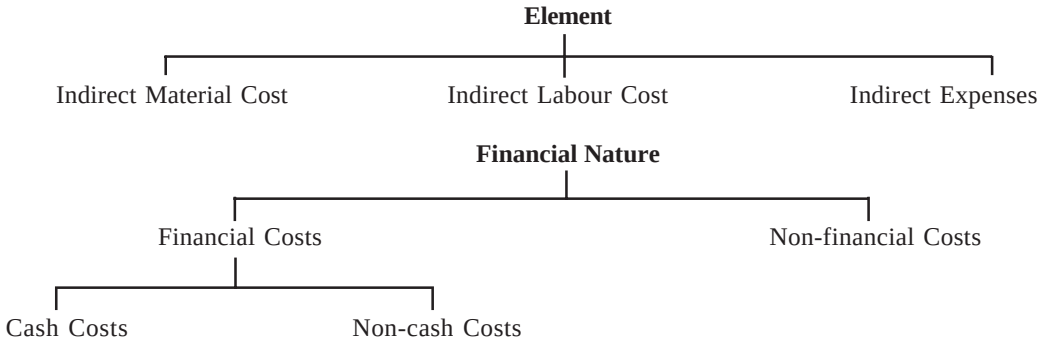
Fixed Overhead: Those costs remain constant regardless of the changes in the volume of activity. Examples are rent, depreciation, etc.

Variable Overhead: Variable overhead cost varies with changes in volume of activity. Examples are material cost, labour cost, etc.

Semi-variable Overhead: Semi-variable overhead remains fixed upto a certain activity level, but once that level is exceeded, they vary with the volume. Examples are salary of an employee (fixed amount plus overtime depending on the overtime hours), telephone charges, etc.

ELEMENT-WISE CLASSIFICATION

Based on the elements, overheads can be classified as indirect material cost, indirect labour cost and indirect expenses.



The costs incurred in materials used to further the manufacturing process, that is necessarily built into the product are called indirect materials. For example, cutting oil used in cutting surface, threads and buttons used in stitching clothes, etc. are considered as indirect materials.

Indirect labour consists of all salaries and wages paid to the staff for the purpose of carrying tasks incidental to goods or services, which will not form part of salaries and wages paid while working directly upon the product.

Indirect expenses are those that are incurred by the organisation while carrying out their total business activities and cannot be conveniently allocated to job, process cost unit or cost center.

Steps in Overhead Accounting

The total cost is ascertained by adding the overhead to the prime cost. The apportionment of overheads that cannot be specifically related to cost units or cost centers is done by the following procedure.

Step 1. First, the overhead is collected from different source documents, for different items of overhead expenses, the documents which are used for the collection, allocation and apportionment of overheads are standing order numbers, departmental distribution summary, journal, invoice and payroll.

A factory is administratively divided into various subdivisions known as departments such as repairs department, power department, stores department, etc. The following factors must be considered while organising a concern into a number of departments.

(i) Every manufacturing process is to be divided into its natural divisions in order to maintain natural flow of raw materials from time of its purchase till its conversion into finished goods and sales.

(ii) For ensuring smooth flow of production, the sequence of operations is taken into consideration, while determining the location of various departments and layout of production facilities.

(iii) For physical control on production and maintaining efficiency of the concern, division of labour, authority and responsibility must be taken into consideration with organisation departments.

Types of Department

The main departments of manufacturing concern are:

(a) Production Departments: The process of manufacturing is carried on in these departments.

(b) Service Departments: Service departments render a particular type of service to the other departments. For example, repairs and maintenance electricity, etc.

(c) Partly Producing Departments: A department may normally be service department, but some times does some productive work, so it becomes partly producing department. For example, a carpentry shop which is mainly responsible for the repairs.

Step 2. The next step is primary distribution of overheads. This is the allocation and apportionment of expenses to cost centers.

Tracing and assigning accumulated cost to one or more cost centers or cost units is called *cost allocation*. For example, the cost of repairs and maintenance of a particular machine is charged to that particular department wherein such machine is located.

Certain costs cannot be traced to a particular cost unit or cost center. The proportionate allotment of costs (which cannot be identified wholly with a particular department) over two or more cost centers or units is called *cost apportionment*.

The main difference between cost allocation and cost apportionment is that while the allocation involves tracing of the whole of a cost to a cost over the cost units or cost centers on some suitable basis.

Allocating costs to different projects or services is necessary for the allocating ascertainment of the actual cost involved in each project or service. The costs that are assigned to cost objects can be divided into direct costs and indirect costs. Direct costs can be accurately traced to cost objects because they can be specifically and exclusively traced to a particular cost object whereas indirect costs cannot be traced directly to a cost object because they are usually common to several cost objects. Hence, the concept of cost allocation comes into picture.

Cost allocation is the process of assigning costs in a situation wherein a direct measure does not exist for the quantity of resources consumed by a particular cost object. Cost allocations involve the use of surrogate rather than direct measures. The basis that is used to allocate cost to cost object is called an allocation base or cost driver.

Cost allocation is direct, but cost apportionment needs a suitable basis.

Bases of Apportionment

Apportionment of overhead costs to production and service departments and then reapportionment of service department costs to other service and production departments should be done on some suitable equitable basis. There should be proper correlation between the expenses and the basis of cost apportionment. The process of apportionment of overhead is known as Primary Distribution.

The following are the main bases of overhead apportionment used in manufacturing concerns.

(i) Direct Allocation: Overheads are directly allocated to various departments on the basis of expenses incurred for each department respectively. Examples are overtime premium of workers engaged in a particular department, power when separate meters are available, jobbing, repairs, etc.

(ii) Direct Labour Hours: Under this basis, the overhead expenses are distributed to various departments in the ratio of total number of labour hours worked in each department. For example, administrative salaries and particularly salaries of supervisors are apportioned on the basis of labour hours worked. This is so because time is an element of cost in these cases.

(iii) Direct Wages: According to this basis, expenses are distributed amongst the departments in the ratio of direct wage bills of various departments.

(iv) Number of Workers: The total number of workers working in each departments form the basis for the apportioning overhead expenses among departments.

(v) Relative Areas of Departments: The area occupied by different departments form the basis for the apportionment of certain expenses like lighting and heating, rent, rates, taxes on building, air-conditioning, etc.

(vi) Capital Values: In this method, the capital values of certain assets like machinery and building are used as basis for the apportionment of certain expenses. Examples are rates, taxes, depreciation, insurance charges of the building, etc.

(vii) Light Points: This is used for apportionment of lighting expenses.

(viii) Kilowatt Hours: This basis is used for the apportionment of power expenses.

(ix) Technical Estimates: This basis of apportionment is used for the apportionment of those expenses for which it is difficult to find out any other basis of apportionment. An assessment of

the equitable proportion is carried out by technical experts. This is used for distributing works manager's salary, internal transport, steam, water, etc., when these are used for processes.

Principles of Apportionment of Overhead Cost

The following are the principles for the determination of a suitable basis for cost apportionment:

(i) Service or Use or Benefit Derived: If the service rendered by a particular item of expense to different departments can be measured, overheads can be apportioned on that basis. For example, rent charges can be distributed according to the floor space occupied by each department.

(ii) Ability to pay Method: Under this method, overhead is distributed in proportion to the sales, income or profitability of the departments, territories or products, etc.

(iii) Efficiency Methods: Under this method, the apportionment of expenses is made on the basis of production targets.

(iv) Survey Methods: Under this method, a survey is made of the various factors involved and the share of overhead costs to be borne by each cost center is determined.

Step 3. Reapportionment of Service Department Costs to Production Departments. The reapportionment of service department costs to the production departments or the cost centers is known as Secondary Distribution.

Service Department Cost	Basis of Apportionment
(i) Maintenance department	Hours worked for each department
(ii) Payroll or time keeping	Total labour or machine hours or number of employees in each department
(iii) Employment or personnel department	Rate of labour turnover or number of employees in each department
(iv) Store keeping department	No. of requisitions or value of materials of each department
(v) Purchase department	No. of purchase orders or value of materials for each department
(vi) Welfare, ambulance, canteen service, recreation room expenses	No. of employees in each department
(vii) Building service department	Relative area in each department
(viii) Internal transport service or overhead crane service	Weight, value-graded product handled, weight and distance travelled
(ix) Transport department	Crane hours, truck hours, truck mileage, truck tonnage, truck tonne-hours, tonnage handled, number of packages
(x) Powerhouse (Electric power cost)	Wattage, horsepower, horsepower machine hours, number of electric points, etc.

Methods of Reapportionment or Redistribution

The following are the methods of redistribution of service department costs to production departments:

(i) Direct Redistribution

(ii) Step Method

(iii) Reciprocal Service Method.

Direct Redistribution

Under this method, the costs of service departments are directly apportioned to production departments without taking into account any service rendered by one service department to another service department. Thus, proper apportionment cannot be made and the production department may either be overcharged or undercharged. As budgeted overhead for each department cannot be prepared thoroughly, the department overhead rates cannot be ascertained correctly.

Illustration 1

The particulars of cost incurred in the production departments and service departments of cost of a manufacturing concern are as follows. Cost of service department D is to be apportioned in the ratio of 5 : 4 : 4 and E in the ratio of 4 : 3 : 2.

Figures in ₹

Production Departments			Service Departments	
A	**B**	**C**	**D**	**E**
1,00,000	1,50,000	1,25,000	75,000	60,000

Calculate the costs allocated to each production department.

Solution

Statement of Reapportionment of Service Department Costs

Particulars	Production Departments			Service Departments	
	A	**B**	**C**	**D**	**E**
Total Expenses	1,00,000	1,50,000	1,25,000	75,000	60,000
Department D (5 : 4 : 4)	28,846	23,077	23,077	**(75,000)**	—
Department E (4 : 3 : 2)	26,667	20,000	13,333	—	**(60,000)**
Total	1,55,513	1,93,077	1,61,410	—	

Working Notes:

1. Apportionment of Services — Dept. D Expenses:

   Total Expenses = ₹ 75,000

   Ratio of Apportionment = 5 : 4 : 4 (as given)

   Apportionment of Dept. A = 75,000 × 5/13 = 28,846

   Dept. B = 75,000 × 4/13 = 23,077

   Dept. C = 75,000 × 4/13 = 23,077

2. Apportionment of Service — Dept. E Expenses:

Total Expenses = 60,000

Ratio of Apportionment = 4 : 3 : 2 (as given)

Apportionment to Dept. A = 60,000 × 4/9 = 26,667

B = 60,000 × 3/9 = 20,000

C = 60,000 × 2/9 = 13,333

Illustration 2

In a light engineering factory, the following particulars have been collected for the quarter ended 31st December, 2014. The department summary showed the following expenses:

Production Departments			Service Departments	
P_1 (₹)	P_2 (₹)	P_3 (₹)	S_1 (₹)	S_2 (₹)
8000	7000	6000	4000	6000

From the given data, you are required to reapportion the service departments costs to production departments using direct redistribution method. Apportion the expenses of service department S_2 in the ratio of 4 : 4 : 2 and those of service department S_1 in the ratio of 3 : 3 : 4 to the production departments P_1, P_2 and P_3 respectively.

Solution

Production Overheads Distribution Summary for the Quarter Ending 31st December, 2014

Particulars	Production Departments			Service Departments	
	P_1 (₹)	P_2 (₹)	P_3 (₹)	S_1 (₹)	S_2 (₹)
Total expenses as per summary	8,000	7,000	6,000	4,000	6,000
Dept. S_2 (4 : 4 : 2)	2,400	2,400	1,200	—	(6,000)
Dept. S_1 (3 : 3 : 4)	1,200	1,200	1,600	(4,000)	—
Total	11,600	10,600	8,800	—	—

Step Method

Under this method, the sequence of distribution starts first with the service department that provides greatest services, as measured by costs, to the greatest number of other service departments and the last service department that distributes its cost will be the one that provides least amount of services to the least number of other service departments. Just like the direct method, under this method also, if a service department costs are distributed to other service departments, other service departments do not allocate their costs back to it. Thus, the cost of last service department is apportioned only to the production departments.

Illustration 3

A manufacturing company has two Production Departments P and Q and three Service Departments – Timekeeping, Stores and Maintenance. The Departmental summary showed the following expenses for July, 2014.

Production Departments		Service Departments (in order of their importance)		
P	Q	X (Timekeeping)	Y (Stores)	Z (Maintenance)
15,000	10,000	5,000	6,000	4,000

The other information relating to the above departments is as follows

Particulars	Service Departments			Production Departments	
	X (Timekeeping)	Y (Stores)	Z (Maintenance)	P	Q
No. of Employees	–	10	5	20	15
No. of Stores Requisitions	–	–	6	24	20
Machine Hours	–	–	–	1200	800

Apportion the expenses of service departments.

Solution

Department	As per Primary Distribution Summary	Secondary Distribution			
		From X to Y, Z, P & Q (₹)	From Y to Z, P & Q (₹)	From Z to P & Q (₹)	Total
X (Timekeeping)	5,000	(–) 5,000	—	—	—
Y (Stores)	6,000	1,000	(–) 7,000	—	—
Z (Maintenance)	4,000	500	840	(–) 5,340	—
P	15,000	2,000	3,360	3,204	23,564
Q	10,000	1,500	2,800	2,136	16,436
Total	40,000				40,000

Note: Basis of apportionment

(a) Timekeeping: Number of employees (i.e., 2 : 1 : 4 : 3)
(b) Store: Number of store requisition (i.e., 3 : 12 : 10)
(c) Maintenance: Machine Hours (i.e., 3 : 2)

Reciprocal Service Method

This method recognises the fact that every department should be charged for the services rendered to it. If two service departments provide service to each other, each department should be charged for the cost of services rendered by the other. Simultaneous Equation Method, Repeated Distribution Methods, Trial and Error Method are used to deal with inter-service department transfers.

Advantages of Departmentalisation of Overhead

1. It facilitates control of overhead expenses by means of predetermined budgets.
2. It helps in controlling the uses made of the services rendered to the respective departments.
3. "Correct" cost can be determined as the actual overhead costs of the respective departments are taken into consideration in determining the overhead rates.

4. The reasons for variance can be known by the analysis of underabsorption or overabsorption of overhead. It helps in taking remedial measures.
5. It helps in arriving at the cost of work-in-progress correctly.

Statement Showing the Apportionment of Overheads

Items of Overheads Apportioned	Basis of Apportionment	Production Department		Service Department	
		P_1 ₹	P_2 ₹	S_1 ₹	S_2 ₹
Fixed Power Generation Cost	Normal Capacity	.....	.....	.....	.....
Variable Power Generation Cost	Actual Power Consumption (kwh)	.....	.....	.....	.....
Lighting	No. of Light Points	.....	.....	.....	.....
Depreciation	Asset Value	....	.....	.....	.....
Insurance	Asset Value	.....	.....	.....	.....
Rent, Rates & Taxes	Floor Area	.....	.....	.....	.....
Repairs	Floor Area	.....	.....	.....	.....
Stores Overheads	Direct Material	.....	.....	.....	.....
Employee's Insurance Charges	Direct Wages	.....	.....	.....	.....
Staff Welfare Expenses	No. of Workers	.....	.....	.....	.....
Supervision Expenses	No. of Workers	.....	.....	.....	.....
Total Overheads Apportioned		.....	.....	.....	.....

Illustration 4

T Ltd. has two production departments and two service departments and provides you the following data:

	Production Departments		Service Departments	
	P_1	P_2	S_1	S_2
Direct materials	40,000	30,000	20,000	10,000
Direct wages	15,000	20.000	5,000	10,000
Floor area (sq. ft.)	5,000	4,000	3,000	2,000
Value of plant & machinery	50,000	60,000	20,000	10,000
Value of stock	35,000	25,000	5,000	5,000
No. of workers	100	50	25	25
No of light points	200	50	25	25
Horsepower of machines	50	25	15	10

The indirect expenses for the period were:

Factory Rent, Rates, Taxes and Repairs	₹ 14,000
Depreciation, Insurances and Repairs of Machinery	₹ 28,000

Insurance of Stock	₹ 700
Supervision and Staff Welfare Expenses	₹ 2,000
Stores Overheads	₹ 1,000
Lighting and Heating	₹ 3,000
Power	₹ 1,000

Required: Prepare the Statement showing the apportionment of overheads.

Solution

Items of Overheads	Basis of Apportionment	Total ₹	Production Department		Service Department	
			P_1 ₹	P_2 ₹	S_1 ₹	S_2 ₹
1. Factory Rent, Rates, Taxes and Repairs	Floor Area (5 : 4 : 3 : 2)	14,000	5,000	4,000	3,000	2,000
2. Depreciation, Insurance and Repair of Machinery	Value of Plant and Machinery (5 : 6 : 2 : 1)	28,000	10,000	12,000	4,000	2,000
3. Insurance of Stock	Value of Stock (7 : 5 : 1 : 1)	700	350	250	50	50
4. Supervision and Staff Welfare Expenses	No. of Workers (4 : 2 : 1 : 1)	2,000	1,000	500	250	250
5. Stores Overheads	Value of Materials (4 : 3 : 2 : 1)	1,000	400	300	200	100
6. Lighting and Heating	No. of Light Points (8 : 2 : 1 : 1)	3,000	2,000	500	250	250
7. Power	HP of Machinery (10 : 5 : 3 : 2)	1,000	500	250	150	100
		49,700	19,250	17,800	7,900	4,750

Basis of Apportionment of Overheads of Service Departments

The following table suggests the basis of apportionment of some common items of overheads of service departments:

Service Department	Basis
1. Purchase Department	Number of Purchase Orders or Number of Purchase Requisitions or Value of Materials Purchased.
2. Stores Department	Number of Material Requisitions or Value of Materials Issued.
3. Timekeeping Department Payroll Department	Number of Employees or Total Labour Hours or Machine Hours.
4. Personnel Department Canteen, Welfare, Medical, Recreation Department	Number of Employees or Total Wages.

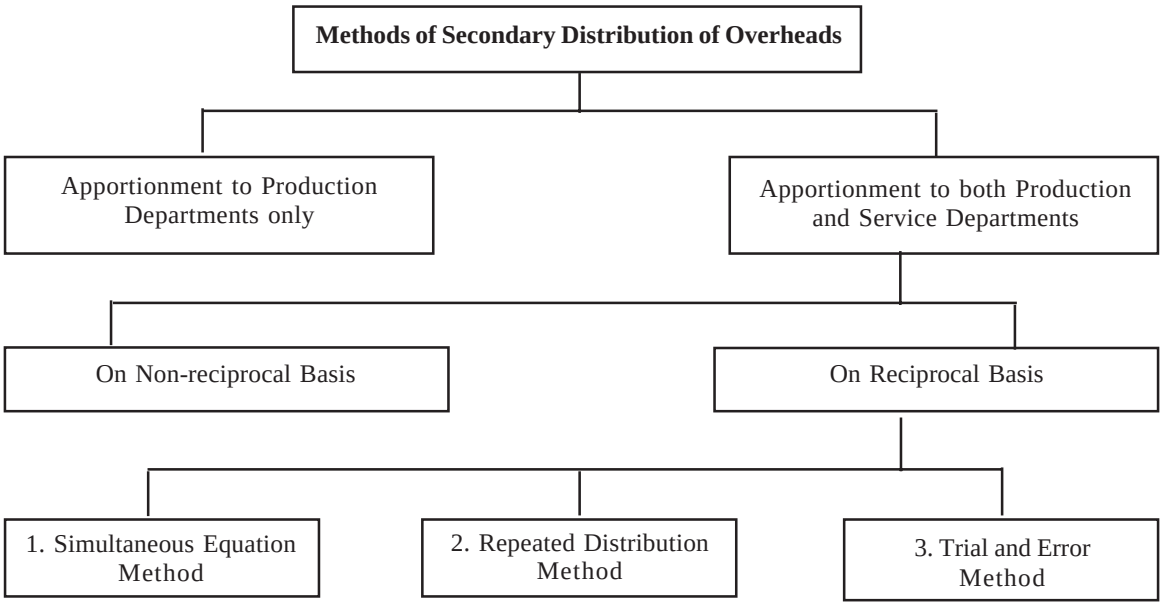
5. Repairs and Maintenance	Number of Hours Worked in Each Department.
6. Horsepower	Meter Reading or H.P. Hour for Powers. Meter Reading or Floor Space for Lighting, Heat Consumed.
7. Inspection	Inspection Hours or Value of Items Inspected.
8. Drawing Office	Number of Drawings Made or Man-hours Worked.
9. Accounts Department	Number of Workers in Each Department or Time Devoted
10. Tool Room	Direct Labour Hours or Machine Hours or Wages

SECONDARY DISTRIBUTION OF OVERHEADS

Meaning of Secondary Distribution of Overheads

Secondary distribution of overheads means the apportionment of overheads of service departments among the production departments on some suitable basis.

Methods of Secondary Distribution of Overheads



Apportionment to Production Departments Only

Under this method, the costs of service departments are directly apportioned to production department only, ignoring the service rendered by one service department to another service department.

Illustration 5

CAS Ltd. has three production departments and four service departments. The expenses for departments as per Primary Distribution Summary are as follows:

Production Departments:	₹	₹
A	60,000	
B	52,000	
C	48.000	1,60,000
Service Departments:	**₹**	**₹**
Stores	8,000	
Timekeeping and Accounts	6,000	
Power	3,200	
Canteen	2.000	19,200

The following information is also available in respect of the production departments:

	Dept. A	Dept. B	Dept. C
Horsepower of machines	300	300	200
Number of workers	20	15	15
Value of stores requisition in (₹)	2,500	1,500	1,000

Required:

Apportion the costs of service departments over the production departments.

Solution

Statement Showing the Secondary Distribution of Overheads

Item of Cost	Basis of Apportionment	Total	Production Departments		
		₹	A ₹	B ₹	C ₹
Cost as per Primary Distribution Summary		1,60,000	60,000	52,000	48,000
Stores	Value of Stores Requisition (5 : 3 : 2)	8,000	4,000	2,400	1,600
Timekeeping and Accounts	No. of Workers (4 : 3 : 3)	6,000	2,400	1,800	1,800
Power	HP of Machine (3 : 3 : 2)	3,200	1,200	1,200	800
Canteen	No. of Workers (4 : 3 : 3)	2,000	800	600	600
Total		1,79,200	68,400	58,000	52,800

Apportionment to Both Production and Service Departments

Under this method, the costs of a service department are apportioned to both production departments and other service departments on some equitable basis. This may be done on reciprocal basis or non-reciprocal basis.

Apportionment on Non-reciprocal Basis/Step Ladder Method

This method involves the following three steps:

Practical Steps Involved in the Step Ladder Method	
Step 1:	Apportion the cost of first service department which serves the largest number of departments to production departments and other service departments.
Step 2:	Apportion the cost of second service department which serves the next largest number of departments.
Step 3:	Continue this process till the cost of last service department is apportioned. Thus, the cost of last service department is apportioned only to the production departments.

Tutorial Note: Some authors are of the view that the cost of service department with largest amount of cost should be distributed first.

Illustration 6

BT Ltd. has two production departments P_1 and P_2 and three service departments S_1, S_2 and S_3. The overheads of various departments for a period are given below:

P_1 – ₹ 53,000, P_2 – ₹ 7,000, S_1 – ₹ 17,000, S_2 – ₹ 30,000, S_3 – ₹ 13,000

The costs of service departments are to be apportioned as follows:

P_1	P_2	S_1	S_2	S_3	
S_1	50%	30%	–	–	20%
S_2	30%	50%	10%	–	10%
S_3	40%	60%	–	–	–

Required: Prepare Overhead Distribution Statement according to Step Ladder Method.

Solution

Overheads Distribution Statement

Particulars	P_1 (₹)	P_2 (₹)	S_1 (₹)	S_2 (₹)	S_3 (₹)
Overheads as given	53,000	7,000	17,000	30,000	13,000
Apportionment of S_2's costs to P_1, P_2, S_1 and S_3 in the ratio of 3 : 5 : 1 : 1	9,000	15,000	3,000	(30,000)	3,000
Apportionment of S_1's cost to P_1, P_2 and S_3 in ratio of 5 : 3 : 2	10,000	6,000	(20,000)	–	4,000
Apportionment of S_3's costs to P_1, and P_2 in the ratio of 2 : 3	8,000	12,000	–	–	(20,000)
	80,000	40,000	–	–	–

Apportionment on Reciprocal Basis

This method recognises the fact that where two or more service departments render services to each other. Each department receiving such services should be charged for the cost of services rendered by the other. The reciprocal service methods are conceptually preferable. Any one of following three methods may be followed for inter-service distribution:

(i) Simultaneous Equation Method

(ii) Repeated Distribution Method

(iii) Trial and Error Method

Let us discuss these methods one by one.

(i) Simultaneous Equation Method

This method involves the following steps:

Practical Steps Involved in the Simultaneous Equation Method	
Step 1:	Calculate the total costs of each service department by forming and solving simultaneous equations.
Step 2:	Reapportion the total costs of each service department only to Production Department on the basis of given percentages.

Illustration 7

TT Ltd. has two production departments P_1 and P_2 and two service departments S_1 and S_2. Expenses of these departments are as follows:

P_1 – ₹ 51,837, P_2 – ₹ 12,163, S_1 – ₹ 40,000, S_2 – ₹ 16,000

The expenses of service departments are to be apportioned are as follows:

	P_1	P_2	S_1	S_2
S_1	50%	40%	—	10%
S_2	30%	50%	20%	—

Required: Apportion the cost of service departments by using Simultaneous Equation Method.

Solution

Step 1: Formation of simultaneous equations

Let X = Total expenses of S_1, and Y = Total expenses of S_2

X = 40,000 + 20% of Y

Y = 16,000 + 10% of X

Step 2: Solving simultaneous equations

X = 40,000 + .20Y ..... (I)

Y = 16,000 + .10X ..... (II)

Putting the value of X in equation II

Y = 16000 + .10 (40,000 + .20Y)

= 16000 + 4000 + .02Y

Y – .01Y = 20,000

Y = 20,000/.98 = ₹ 20,408

Putting value of Y in equation I

X = 40,000 + .20 × 20,408

X = 44,082

Step 3: Overheads Distribution Summary

Item	Production Departments	
	P_1 (₹)	P_2 (₹)
As per primary distribution summary	51,837	12,163
90% of costs of S_1 apportioned to P_1 and P_2 in the ratio of 5 : 4	22,041	17,633
80% of costs of S_2 apportioned to P_1 and P_2 in the ratio of 3 : 5	6,122	10,204
Total overheads of Production Department	80,000	40,000

(ii) Repeated Distribution Method

This method involves the following steps:

Practical Steps involved in the Repeated Distribution Method	
Step 1:	Apportion the costs of first service department (say S_1) over other service departments and production departments on agreed percentages.
Step 2:	Apportion the costs of second service department (say S_2) plus the share received from S_1 over other departments on agreed percentages.
Step 3:	Apportion the costs of third service department (say S_3) plus the share received from S_1 and S_2 over other departments on agreed percentages.
Step 4:	Repeat this process of distribution again beginning with S_1 until the total costs of the service departments are exhausted or reduced to too small figure. The small figure should be apportioned over production departments and not over other service departments.

Illustration 8

Taking the same figure of Illustration 7, apportion the expenses of service departments using Repeated Distribution Method.

Solution

Overheads Distribution Statement

Items	Production Departments		Service Departments	
	P_1 (₹)	P_2 (₹)	S_1 (₹)	S_2 (₹)
Overheads as per Primary Distribution	51,837	12,163	40,000	16,000
Cycle I:				
Cost of S_1 apportioned in the ratio (5 : 4 : 1)	20,000	16,000	(40,000)	4,000
Cost of S_2 apportioned in the ratio (3 : 5 : 2)	6,000	10,000	4,000	(20,000)
Cycle II				
Cost of S_1 apportioned in the ratio (5 : 4 : 1)	2,000	1,600	(4,000)	400
Cost of S_2 apportioned in the ratio (3 : 5 : 2)	120	200	80	(400)
Cycle III				
Cost of S_1 apportioned in the ratio (5 : 4 : 1)	40	32	(80)	8
Cost of S_2 apportioned in the ratio (3 : 5)	3	5	–	(8)
Total Overheads	80,000	40,000	–	–

Illustration 9

A company has three production departments A, B and C and two service departments — the boiler house and the pump room. The boiler house has to depend upon the pump room for its supply of water and the pump room, in its turn, is dependent on the boiler house for its supply of steam power for driving the pump. The expenses incurred by the production department are:

A ₹ 4,00,000
B ₹ 3,50,000
C ₹ 2,50,000

The expenses for the boiler house are ₹ 1,17,000 and for the pump room ₹ 1,50000.

The expenses of the boiler house and the pump room are apportioned to the production departments on the following basis:

Particulars	A (%)	B (%)	C (%)	Boiler House (%)	Pump Room (%)
Expenses of the Boiler House	20	40	30	–	10
Expenses of the Pump Room	40	20	20	20	–

Show clearly as to how the expenses of the boiler house and the pump room would be apportioned to A, B and C departments? ***(CS Modified)***

Solution

Note: Alternatively, this sum can also be solved using the Repeated Distribution Method.

Simultaneous Equation Method

Let X be the total overheads of the Boiler House.

Let Y be the total overheads of the Pump Room.

Then; X = ₹ 1,17,000 + 20% of Y

Y = ₹ 1.50,000 + 10% of X

X = 1,17,000 + 0.2Y

Y = 1,50.000 + 0.1X

Multiplying by 10, we get,

$10X = 11,70,000 + 2Y$

$10Y = 15,00,000 + 1X$

$10X - 2Y = 11,70,000$ (Equation 1)

$-1X + 10Y = 15,00,000$ (Equation 2)

By multiplying Equation (1) by –1 and Equation (2) by 10, we get,

$-10X + 2Y = -11,70,000$

$-10X + 100Y = 1,50,00,000$

\+ – –

$-98Y = -1,61,70,000$

$$98\,Y = 1,61,70,000$$

$$Y = \frac{1,61,70,000}{98}$$

Pump Room Y = ₹ 1,65,000

Substituting Y = 1,65,000 in Equation (1), we get,

$$10X - 2Y = 11,70,000$$

$$10X - (2 \times 1,65,000) = 11,70,000$$

$$10X - 3,30,000 = 11,70,000$$

$$10X = 11,70,000 + 3,30,000$$

$$10X = 15,00,000$$

$$X = \frac{15,00,000}{10}$$

Boiler house X = ₹ 1,50,000

Apportionment of Overheads

Items	Total (₹)	Production Departments		
		A (₹)	B (₹)	C (₹)
Opening Expenses	10,00,000	4,00,000	3,50,000	2,50,000
Boiler House (1,50,000 – 10% for pump room) (Working Note 1) (2 : 4 : 3)	1,35,000	30,000	60,000	45,000
Pump Room (1,65,000 – 20% for Boiler house) (Working Note 2) (2 : 1 : 1)	1,32,000	66,000	33,000	33,000
Total	12,67,000	4,96,000	4,43,000	3,28,000

Working Notes:

1. Boiler house expenses

$$A = 1,35,000 \times \frac{20}{90} = 30,000$$

$$B = 1,35,000 \times \frac{40}{90} = 60,000$$

$$C = 1,35,000 \times \frac{30}{90} = 45,000$$

2. Pump room expenses

$$A = 1{,}32{,}000 \times \frac{40}{80} = 66{,}000$$

$$B = 1{,}32{,}000 \times \frac{20}{80} = 33{,}000$$

$$C = 1{,}32{,}000 \times \frac{20}{80} = 33{,}000$$

Allocation, Apportionment and Reappointment of Overheads

Illustration 10

In a factory of Risith Ltd., the following particulars have been extracted for the period ended 31.3.2014.

Particulars	Production Dept.		Service Dept.	
	A ₹	B ₹	X ₹	Y ₹
Direct Material	3,700	7,400	200	700
Direct Wages	1,850	3,700	100	350
Direct Expenses	11,250	22,500	50	175
Indirect Material	6,160	12,320	100	350
Indirect Wages	3,090	6,180	50	175
Assets Value	37,000	74,000	2,000	7,000
No. of Workers	37	74	2	7
HP Hours	74	148	4	14
Light Points	37	74	2	7
Floor Area (sq. ft.)	185	370	10	35
No. of Working Hours	4,000	8,000	—	—

The detail of indirect expenses for the period is as under:

	₹
Staff Welfare Expenses	3,600
Supervision Expenses	3,600
Power	7,200
Lighting	3,600
Depreciation	7,200
Insurance (Assets)	600
Rent and Rates	600
Repairs (Building)	2,400

Employee's Insurance	600
General Overheads	480
Stores Overheads	120

Note: General overheads to be apportioned on the basis of direct wages.

The expenses of service departments X and Y are apportioned as under:

	A	B	X	Y
X	25%	50%	—	25%
Y	25%	50%	25%	—

You are required to prepare the statements showing:

(i) The allocation of overheads;

(ii) The apportionment of overheads;

(iii) The distribution of service departments overheads by method of (a) Continued Distribution and (b) Algebraic Equations;

(iv) Overhead distribution summary and rates of overhead absorption.

Solution

(i) Statement Showing the Allocation of Overheads

Item of Overheads Allocated	Production Dept.		Service Dept.	
	A ₹	B ₹	X ₹	Y ₹
Direct Material	—	—	200	700
Direct Wages	—	—	100	350
Direct Expenses	—	—	50	175
Indirect Material	6,160	12,320	100	350
Indirect Wages	3,090	6,180	50	175
Total Overheads Allocated	9,250	18,500	500	1,750

(ii) Statement Showing the Apportionment of Overheads

Item of Overheads Apportioned	Basis of Apportionment	Production Dept.		Service Dept.	
		A ₹	B ₹	X ₹	Y ₹
1. Staff Welfare Expenses	No. Workers	1,110	2,220	60	210
2. Supervision Expenses	No. of Workers	1,110	2,220	60	210
3. Power	HP Hours	2,220	4,440	120	420
4. Lighting	Light Points	1,110	2,220	60	210

5. Depreciation	Asset Value	2,220	4,440	120	420
6. Insurance	Asset Value	185	370	10	35
7. Rent & Rates	Floor Area	185	370	10	35
8. Repairs	Floor Area	740	1,480	40	140
9. Employee's Insurance Charges	Direct Wages	185	370	10	35
10. General Overheads	Direct Wages	148	296	8	28
11. Stores Overheads	Direct Material	37	74	2	7
Total Overheads Apportioned		9,250	18,500	500	1,750

(iii) Statement Showing the Distribution of Overheads of Service Deptt. (According to Repeated Distribution Method)

Particulars	Production Dept.		Service Dept.	
	A ₹	B ₹	X ₹	Y ₹
A. Total Allocated Overheads	9,250	18,500	500	1,750
B. Total Apportioned Overheads	9,250	18,500	500	1,750
C. Total Overhead (A + B)	18,500	37,000	1,000	3,500
Cycle I				
Reapportionment of X's Overhead 1 : 2 : 1	250.00	500.00	–1,000	250
Reapportionment of Y's Overhead 1 : 2 : 1	937.50	1,875.00	937.50	–3,750
Cycle II				
Reapportionment of X's Overhead 1 : 2 : 1	234.37	468.75	–937.50	237.38
Reapportionment of Y's Overhead 1 : 2 : 1	58.59	117.19	58.60	–234.38
Cycle III				
Reapportionment of X's Overhead 1 : 2 : 1	14.65	29.30	–58.60	14.65
Reapportionment of Y's Overhead 1 : 2	4.89	9.76	—	–14.65
Total Overheads of Prod. Deptt.	20,000.00	40,000.00	—	—

Distribution of Service Department's Overhead through Algebraic Equations

Let x be the total overheads of Dept. x

Let y be the total overheads of Dept. y

Thus, $x = 1{,}000 + \frac{1}{4}y$ .... (I)

$y = 3{,}500 + \frac{1}{4}x$ .... (II)

$= 3{,}500 + \frac{1}{4}(1{,}000 + \frac{1}{4}y)$ (Putting the value of x in equation II)

$= 3{,}500 + 250 + 1/16\,y$

$16y = 60{,}000 + y$

$15y$ = ₹ 60,000

y = ₹ 4,000

x = 1,000 + ¼ × 4,000 (Putting the value of y in equation I)

= ₹ 2,000

(iv) Statement Showing Overheads Distribution Summary and Rates of Overhead Absorption

Particulars	Production Dept.		Service Dept.	
	A ₹	B ₹	X ₹	Y ₹
A. Total Allocation Overhead	9,250	18,500	500	1,750
B. Total Apportioned Overhead	9,250	18,500	500	1,750
C. Reapportioned Overhead of X	500	1,000	–2,000	500
D. Reapportioned Overhead of Y	1,000	2,000	1,000	–4,000
E. Total Overheads	20,000	40,000	—	—
F. No. of Hours	4,000	8,000		
G. Rate per Hour (E/F)	5	5		

Illustration 11

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 20X1.

	Total ₹	A ₹	B ₹	C ₹	X ₹	Y ₹
Direct Material		1,000	2,000	4,000	2,000	1,000
Direct Wages		5,00	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 of Assets (₹ lakhs)		20	40	20	10	10
Machine Hours		1,000	2,000	4,000	1,000	1,000
Horsepower of Machines		50	40	20	15	25

A technical assessment of 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:

(i) A statement showing distribution of overheads to various departments.

(ii) A statement showing redistribution of service departments expense's to production departments.

(iii) Machine hour rates of the production departments A, B and C.

Solution

(i) Statement Showing Distribution of Overheads to Various Departments

Item	Basis	Total (₹)	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Direct Materials	Actual	3,000	—	—	—	2,000	1,000
Direct Wages	Actual	3,000	—	—	—	1,000	2,000
Factory Rent	Area	4,000	1,000	500	1,000	500	1,000
Power	HP × M. Hrs.	2,500	500	800	800	150	250
Depreciation	Cap. Value	1,000	200	400	200	100	100
Other Overheads	Machine Hrs.	9,000	1,000	2,000	4,000	1,000	1,000
Total Overheads Apportioned		22,500	2,700	3,700	6,000	4,750	5,350

(ii) Redistribution of Service Department's Expenses

Particulars	Ratio	A (₹)	B (₹)	C (₹)	X (₹)	Y (₹)
Total Overheads		2,700	3,700	6,000	4,750	5,350
Dept. X overhead apportioned	(45 : 15 : 30 : 10)	2,138	712	1,425	–4750	475
Dept. Y overhead apportioned	(60 : 35 : — : 5)	3,495	2,039	—	291	–5,825
Dept. X overhead apportioned	(45 : 15 : 30 : 10)	131	44	87	–291	29
Dept. Y overhead apportioned	(60 : 35 : — : 5)	17	10	—	2	–29
Dept. X overhead apportioned		1	—	1	–2	—
Total Overheads of Production Departments		8,482	6,505	7,513		

(iii) Machine Hour Rate

Machine Hours	1,000	2,000	4,000
Machine Hour Rate (₹)	8.48	3.25	1.88

Illustration 12

Modern Manufactures Ltd. have three production departments P_1, P_2 and P_3 and two service departments S_1 and S_2, the details pertaining to which are as under:

	P_1	P_2	P_3	S_1	S_2
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 Machines	10,000
Sundries	9,695

The expenses of the service departments are allocated as under:

	P_1	P_2	P_3	S_1	S_2
S_1	20%	30%	40%	—	10%
S_2	40%	20%	30%	10%	—

Required:

Find out the total cost of product X which is processed for manufacture in Departments P_1, P_2 and P_3 for 4, 5 and 3 hours respectively, given that its Direct Material Cost is ₹ 50 and Direct Labour Cost ₹ 30.

Solution

Statement Showing Distribution of Overheads of Modern Manufacturers Ltd.

Particulars	Basis	Total	Production Dept.			Service Dept.	
		₹	P_1 ₹	P_2 ₹	P_3 ₹	S_1 ₹	S_2 ₹
Direct Wages	Actual	1,695	—	—	—	1,500	195
Rent & Rates	Area	5,000	1,000	1,250	1,500	1,000	250
General Lighting	Light Points	600	100	150	200	100	50
Indirect Wages	Direct Wages	1,939	600	400	600	300	39

Power	HP	1,500	600	300	500	100	—
Depreciation of Machines	Value of Machines	10,000	2,400	3,200	4,000	200	200
Sundries	Direct Wages	9,695	3,000	2,000	3,000	1,500	195
Total Overheads Apportioned		30,429	7,700	7,300	9,800	4,700	929

Redistribution of Service Departments' Expenses over Production Departments

Particulars	**Total** ₹	**P_1** ₹	**P_2** ₹	**P_3** ₹	**S_1** ₹	**S_2** ₹
Total Overheads	30,429	7,700	7,300	9,800	4,700	929
Dept. S_1 Overhead apportioned in the ratio (20 : 30 : 40 : — : 10)		940	1,410	1,880	–4,700	470
Dept. S_2 Overhead apportioned in the ratio (40 : 20 : 30 : 10 : —)		559.6	279.8	419.7	139.9	1,399
Dept. S_1 Overhead apportioned in the ratio (20 : 30 : 40 : — : 10)		27.8	41.97	55.96	–139.9	13.99
Dept. S_2 Overhead apportioned in the ratio (40 : 20 : 30 : 10 : —)		5.59	2.80	4.20	1.40	–13.99
Dept. S_1 Overhead apportioned in the ratio (20 : 30 : 40 : — : 10)		0.28	0.42	0.56	–1.40	0.14
Dept. S_2 Overhead apportioned in the ratio (40 : 20 : 30 : 10 : —)		0.06	0.03	0.05	—	-0.14
Total Overheads	30,429	9,233.51	9,035.02	12,160.47		
Working hours		3,070	4,475	2,419		
Working Rate per Hour		3.00	2.02	5.03		

Cost of the Product X	₹
Direct Material Cost	50.00
Direct Labour Cost	30.00
Overhead Cost (*Refer to Working Note*)	37.19
Total Cost	117.19

Working Note:

Calculation of Overhead Cost

= ₹ 3 × 4 + ₹ 2.02 × 5 + ₹ 5.03 × 3

= ₹ 12 + ₹ 10.10 + ₹ 15.09 = ₹ 37.19

Illustration 13

X Ltd. has three departments which are regarded as production departments. Service departments costs are distributed to these production departments using the Step ladder 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:

Departments	Factory Overhead ₹	Direct Labour Hours	No. of Employees	Area in sq. m.
Production:				
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
Service:				
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		Basis
P	—	Number of Employees
Q	—	Direct Labour Hours
R	—	Area in Square Metres
S	—	Direct Labour Hours

You are required to:

(a) Prepare a schedule showing the distribution of overhead costs of the four service departments to the three production departments; and

(b) Calculate the overhead recovery rate per direct labour hour for each of the three production departments.

Solution

Schedule Showing the Distribution of Overhead Costs and Overhead Recovery Rate

Particulars	Service Departments				Production Departments		
	P ₹	Q ₹	R ₹	S ₹	X ₹	Y ₹	Z ₹
Overhead Costs	45,000	75,000	1,05,000	30,000	1,93,000	64,000	83,000
Distribution of Overheads of Dept. P	(45,000)	5,000	4,000	5,000	10,000	12,500	8,500
Distribution of Overheads of Dept. Q	—	(80,000)	24,000	12,000	16,000	12,000	16,000
Distribution of Overheads of Dept. R	—	—	(1,33,000)	19,000	57,000	28,500	28,500

Distribution of Overheads of Dept. S	—	—	—	(66,000)	24,000	18,000	24,000
A. Total Overheads					3,00,000	1,35,000	1,60,000
B. Direct Labour Hours					4,000	3,000	4,000
C. Overheads Recovery Rate Per Hour (A/B)					₹ 75	₹ 45	₹ 40

Illustration 14

A company has two production departments and two service departments. The data relating to a period are as under:

Particulars		Production Departments		Service Departments	
		PD_1	PD_2	SD_1	SD_2
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
Actual 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:

	PD_1	PD_2	SD_1	SD_2
SD_1	50%	40%	—	10%
SD_2	60%	20%	20%	—

You are required to:

(i) Apportion the power generation plant costs to the four departments.

(ii) Reapportion service department cost to production departments.

(iii) Calculate the overhead rates per direct labour hour of production departments, given that the direct wages rate of PD_1 are PD_2 and ₹ 5 and ₹ 4 per hour respectively.

Solution

(i) Statement of Apportionment of Power Generation Plant Costs to the Four Departments

Particulars	Total Costs (₹)	Basis of Apportionment of Power Generation Cost	Production Departments		Service Departments	
			PD_1 (₹)	PD_2 (₹)	SD_1 (₹)	SD_2 (₹)
Fixed expenditure	37,500	Normal capacity (kwh) (4 : 7 : 2.5 : 3.5)	8,824	15,441	5,515	7,720
Variable expenditure	84,375	Actual Power Consumption (kwh) (13 ; 23 ; 10.25 : 10)	19,500	34,500	15,375	15,000
Total	1,21,875		28,324	49,941	20,890	22,720
Overheads Summary						
Direct Materials	30,000		—	—	10,000	20,000
Direct Wages	30,000		—	—	20,000	10,000
Overheads	1,80,000		80,000	50,000	30,000	20,000
Total	3,61,875		1,08,324	99,941	80,890	72,720

(ii) Statement showing Reapportionment of Overheads of Service Department According to Repeated Distribution Method

Particulars	Total (₹)	Production Departments		Service Departments	
		PD_1 (₹)	PD_2 (₹)	SD_1 (₹)	SD_2 (₹)
Total Overheads	3,61,875	1,08,324	99,941	80,890	72,720
Dept. SD_1 overheads apportioned in the ratio: (50 : 40 : — : 10)		40,445	32,356	–80,890	8,089
Dept. SD_2 overheads apportioned in the ratio: (60 : 20 : 20 : —)		48,485	16,162	16,162	–80,809
Dept. SD_1 overheads apportioned in the ratio: (50 : 40 : — : 10)		8,081	6,465	–16,162	1,616
Dept. SD_2 overheads apportioned in the ratio: (60 : 20 : 20 : —)		970	323	323	–1,616
Dept. SD_1 overheads apportioned in the ratio: (50 : 40 : — : 10)		162	129	–323	32
Dept. SD_2 overheads apportioned in the ratio: (60 : 20 : 20 : —)		19.20	6.40	6.40	-32
Dept. SD_1 overheads apportioned in the ratio: (50 : 40 : — : 10)		3.20	2.56	–6.40	0.64
Dept. SD_2 overheads apportioned in the ratio: (60 : 20 : 20 : —)		0.48	0.16	—	–0.64
Total Overheads of Prod. Dept.	3,61,875	2,06,489.88	1,55,385.12	—	—

(iii) Computation of Overhead Rates per Direct Labour Hour of Production Departments

Particulars	Production Departments	
	PD_1	PD_2
A. Total Direct Wages (₹)	95,000	50,000
B. Direct Wages Rate per Hour (₹)	5	4
C. Direct Labour Hours (₹)	19,000	12,500
D. Overheads (₹)	2,06,489.88	1,55,385.12
E. Overhead Rate per Direct Labour Hour (₹) (D/C)	10.87	12.43

Illustration 15

A company has three production departments and two services 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 Department by using the Repeated Distribution Method.

Solution

Statement Showing the Reapportionment of the Cost Service Departments (According to Repeated Distribution Method)

Particulars	Production Department			Service Department	
	A (₹)	B (₹)	C (₹)	SD_1 (₹)	SD_2 (₹)
Overheads	13,600	14,700	12,800	9,000	3,000
Cycle I					
Reapportionment of overheads of Dept. X in the ratio of 4 : 3 : 2 : 1	3,600	2,700	1,800	–9,000	900

Reapportionment of overheads of Dept. Y in the ratio of 3 : 3 : 2 : 2	1,170	1,170	780	780	–3,900
Cycle II					
Reapportionment of overheads of Dept. X in the ratio of 4 : 3 : 2 : 1	312	234	156	–780	78
Reapportionment of overheads of Dept. Y in the ratio of 3 : 3 : 2 : 2	23.40	23.40	15.60	15.60	–78
Cycle III					
Reapportionment of overheads of Dept. X in the ratio of 4 : 3 : 2 : 1	6.24	4.68	3.12	–15.60	1.56
Reapportionment of overheads of Dept. Y in the ratio of 3 : 3 : 2 : 2	.59	.58	.39		–1.56
Total Overheads of Prod. Deptt.	18,712.23	18,832.66	15,555.11		

Illustration 16 (Computation of Selling Overheads Recovery Rate)

XYZ Ltd., a manufacturing company, having an extensive marketing network throughout the country, sells its products throughout four zonal sales offices, viz., A, B, C and D. The budgeted expenditure for the year are given below:

		₹	₹
Sales Manager's salary			1,20,00
Expenses relating to Sales Manager's Office			80,000
Travelling Salesmen's salaries			3,20,000
Travelling Expenses			36,000
Advertisements			30,000
Godown Rent:	Zone 'A'	15,000	
	'B'	25,200	
	'C'	9,800	
	'D'	18,000	68,000
Insurance on inventories			20,000
Commission on sales			6,00,000

The following further particulars are also available:

Zone	Sales in (₹ Lakhs)	No. of Salesmen	Total Mileage Covered	Allocation of Advertisement	Average Stock (₹ Lakhs)
A	36	5	6,000	30%	6
B	48	6	14,000	30%	8
C	16	2	4,500	20%	4
D	20	3	5,500	20%	2

Based on the above details, compute Zonewise Selling overheads, as percentage to sales.

Solution

Statement Showing the Computation of Zonewise Selling Overheads Recovery Rates

Item of Overhead	Basis of Apportionment	Total (₹)	Zones			
			A (₹)	B (₹)	C (₹)	D (₹)
Sales Manager's Salary	Sales	1,20,000	36,000	48,000	16,000	20,000
Sales Manager's Office Expense	Sales	80,000	24,000	32,000	10,667	13,333
Salesmen's Salaries	No. of Salesmen	3,20,000	1,00,000	1,20,000	40,000	60,000
Travelling Expenses	Mileage covered	36,000	7,200	16,800	5,400	6,600
Advertisement	Budgeted ratio	30,000	9,000	9,000	6,000	6,000
Godown Rent	Actual	68,000	15,000	25,200	9,800	18,000
Insurance	Average inventory	20,000	6,000	8,000	4,000	2,000
Commission on Sales	Sales	6,00,000	1,80,000	2,40,000	80,000	1,00,000
Total Overheads		12,74,000	3,77,200	4,99,000	1,71,867	2,25,933
Amount of Selling		1,20,00,000	36,00,000	48,00,000	16,00,000	20,00,000
Overhead as percentage of Sales $= \frac{\text{Overheads}}{\text{Sales}} \times 100$		10.62%	10.48%	10.40%	10.74%	11.30%

Illustration 16

In a factory, there are three production departments and two service departments. In December, 2012, the departmental expenses were:

Production Departments (₹)		Service Departments (₹)	
P_1	1,30,000	S_1	24,000
P_2	1,20,000	S_2	20,000
P_3	1,00,000	–	–

The service department expenses are allocated on a percentage basis as follows:

Particulars	P_1	P_2	P_3	S_1	S_2
S_1	30	40	15	–	15
S_2	40	30	25	5	–

Prepare a statement showing the distribution of service department expenses to the production department by using the repeated distribution method. ***(CA Modified)***

Solution:

Repeated Distribution Method

Distribution of the Service Department Expenses (using Repeated Distribution Method)

Items	Production Department			Service Department	
	P_1 (₹)	P_2 (₹)	P_3 (₹)	S_1 (₹)	S_2 (₹)
Opening Expenses	1,30,000	1,20,000	1,00,000	24,000	20,000
S_1 (W.N.2)	7,200	9,600	3,600	(24,000)	3,600
				Nil	23,600
S_2 (W.N.3)	9,440	7,080	5,900	1,180	(23,600)
				1,180	Nil
S_3 (W.N.4)	354	472	177	(1,180)	177
				Nil	177
S_4 (W.N.5)	70.80	53.10	44.25	8.85	(177)
				8.85	Nil
S_5 (W.N.6)	2.655	3.54	1.3275	(8.85)	1.3275
				Nil	1.3275
S_6 (W.N.7)	0.56	0.42	0.35	Nil	(1.3275)
Total	1,47,066.05	1,37,209.06	1,09,722.75	Nil	Nil

Working Notes:

1.

Particulars	P_1	P_2	P_3	S_1	S_2	Total
S_1	30	40	15	–	15	100
S_2	40	30	25	5	–	100

2.

P_1	$24,000 \times \frac{30}{100}$	= 7,200
P_2	$24,000 \times \frac{40}{100}$	= 9,600
P_3 and S_2	$24,000 \times \frac{15}{100}$	= 3,600

3.

P_1	$23,600 \times \frac{40}{100}$	= 9,440
P_2	$23,600 \times \frac{30}{100}$	= 7,080
P_3	$23,600 \times \frac{25}{100}$	= 5,900
S_1	$23,600 \times \frac{5}{100}$	= 1,180

4.

P_1	$1{,}180 \times \frac{30}{100}$	= 354
P_2	$1{,}180 \times \frac{40}{100}$	= 472
P_3 and S_2	$1{,}180 \times \frac{15}{100}$	= 177

5.

P_1	$177 \times \frac{40}{100}$	= 70.80
P_2	$177 \times \frac{30}{100}$	= 53.10
P_3	$177 \times \frac{25}{100}$	= 44.25
S_1	$177 \times \frac{5}{100}$	= 8.85

6.

P_1	$8.85 \times \frac{30}{100}$	= 2.655
P_2	$8.85 \times \frac{40}{100}$	= 3.54
P_3 and S_2	$8.85 \times \frac{15}{100}$	= 1.3275

7.

P_1	$1.3275 \times \frac{40}{100}$	= 0.531
P_2	$1.3275 \times \frac{30}{100}$	= 0.39825
P_3	$1.3275 \times \frac{25}{100}$	= 0.331875
S_1	$1.3275 \times \frac{5}{100}$	= 0.066375

Note: Alternatively, this sum can also be solved by the Simultaneous Equation Method.

Illustration 17

Calculate the overheads that can be allocated to the production departments A and B. There are also two service departments X and Y. X renders service worth ₹ 12,000 to Y and the balance to A and B at 3 : 2. Y renders service to A and B in the ratio 9 : 1.

Particulars	A	B	X	Y
Floor area (sq. ft.)	5,000	4,000	1,000	2,000
Assets (₹ lakhs)	10	5	3	1
Horsepower of machines	1,000	500	400	100
Number of the workers	100	50	50	25
Light points	50	30	20	20

The expenses includes:

Particulars	₹
Depreciation	1,90,000
Rent, rates, etc.	36,000
Insurance	15,200
Power	20,000
Canteen expenses	10,800
Electricity	4,800

(CA Modified)

Solution

Overhead Distribution Summary

Items	Basis (₹)	Total	Production Department		Service Department	
			A (₹)	B (₹)	X (₹)	Y (₹)
Electricity (W.N.2)	Light Points	4,800	2,000	1,200	800	800
Depreciation (W.N.3)	Asset Value	1,90,000	1,00,000	50,000	30,000	10,000
Canteen Expenses (W.N.4)	No. of Workers	10,800	4,800	2,400	2,400	1,200
Rent, Rates, etc. (W.N.5)	Floor Area	36,000	15,000	12,000	3,000	6,000
Power (W.N.6)	Horsepower of Machines	20,000	10,000	5,000	4,000	1,000
Insurance (W.N.7)	Asset Value	15,200	8,000	4,000	2,400	800
Total –		2,76,800	1,39,800	74,600	42,600	19,800
Department X	(W.N.8)	–	18,360	12,240	(42,600)	12,000
					Nil	31,800
Department Y	(W.N. 9)	–	28,620	3,180	–	(31,800)
Total	–	2,76,800	1,86,780	90,020	Nil	Nil

Workings:

1.

Items	A	B	X	Y	Total
Floor Area	5,000	4,000	1,000	2,000	12,000
Assets	10	5	3	1	19
Horsepower of Machines	1,000	500	400	100	2,000
Number of the Workers	100	50	50	25	225
Light Points	50	30	20	20	120

2. Electricity (Light Points)

A	$4,800 \times \frac{50}{120}$	= 2,000
B	$4,800 \times \frac{30}{120}$	= 1,200
X	$4,800 \times \frac{20}{120}$	= 800
Y	$4,800 \times \frac{20}{120}$	= 800

3. Depreciation (Asset Value)

A	$1,90,000 \times \frac{10}{19}$	= 1,00,000
B	$1,90,000 \times \frac{5}{19}$	= 50,000
X	$1,90,000 \times \frac{3}{19}$	= 30,000
Y	$1,90,000 \times \frac{1}{19}$	= 10,000

4. Canteen Expenses (No. of Workers)

A	$10,800 \times \frac{100}{225}$	= 4,800
B	$10,800 \times \frac{50}{225}$	= 2,400
X	$10,800 \times \frac{50}{225}$	= 2,400
Y	$10,800 \times \frac{25}{225}$	= 1,200

5. Rent, Rates, etc. (Floor Area)

A	$36,000 \times \frac{5,000}{12,000}$	= 15,000
B	$36,000 \times \frac{4,000}{12,000}$	= 12,000

X	$36,000 \times \frac{1,000}{12,000}$	= 3,000
Y	$36,000 \times \frac{2,000}{12,000}$	= 6,000

6. Power (Horsepower of Machines)

A	$20,000 \times \frac{1,000}{2,000}$	= 10,000
B	$20,000 \times \frac{500}{2,000}$	= 5,000
X	$20,000 \times \frac{400}{2,000}$	= 4,000
Y	$20,000 \times \frac{100}{2,000}$	= 1,000

7. Insurance (Asset Value)

A	$15,200 \times \frac{10}{19}$	= 8,000
B	$15,200 \times \frac{5}{19}$	= 4,000
X	$15,200 \times \frac{3}{19}$	= 2,400
Y	$15,200 \times \frac{1}{19}$	= 800

8. Department X Expenses:

A	$30,600 \times \frac{3}{5}$	= 18,360
B	$30,600 \times \frac{2}{5}$	= 12,240
Y	Given	= 12,000
		= 42,600

9. Department Y Expenses:

A	$31,800 \times \frac{9}{10}$	= 28,620
B	$31,800 \times \frac{1}{10}$	= 3,180

Illustration 18

ZED Ltd., a manufacturing unit, has three production departments A, B and C and two service departments X and Y. The following estimates of expenses are available for a period:

Particulars	₹
Rent and Rates	3,20,000
Power	4,40,000
Staff Welfare Expenses	3,00,000
Insurance on Building	1,60,000
Insurance on Machinery	6,00,000
Staff Canteen Expenses	1,00,000

The other technical details about the departments are as under:

Particulars	Total	A	B	C	X	Y
Floor area ('000 sq. ft.)	80	10	20	30	10	10
Number of Workers	50	10	15	15	5	5
Horsepower of Machines	100	30	20	25	15	10
Cost of Machines (₹ lakhs)	10	6	2	1	1	0

The costs of service departments are distributed as under:

Particulars	A	B	C	X	Y
Department X	40%	30%	20%	–	10%
Department Y	20%	40%	20%	20%	–

Required: Show the Primary and Secondary Distribution of overhead expenses and the resulting total costs of the production departments. ***(CS Modified)***

Solution

Item	Base	Total	Production Departments			Service Departments	
			A	B	C	X	Y
Rent and Rates	Floor Area	3,20,000	40,000	80,000	1,20,000	40,000	40,000
Power	HP M/c	4,40,000	1,32,000	88,000	1,10,000	66,000	44,000
SWE	No. of Workers	3,00,000	60,000	90,000	90,000	30,000	30,000
Ins. Bldg.	Floor area	1,60,000	20,000	40,000	60,000	20,000	20,000
Ins. M/c	Cost M/c	6,00,000	3,60,000	1,20,000	60,000	60,000	–
Staff Canteen Expenses	No. of workers	1,00,000	20,000	30,000	30,000	10,000	10,000
Primary Distribution		19,20,000	6,32,000	4,48,000	4,70,000	2,26,000	1,44,000
X:	2,60,000		1,04,000	78,000	52,000	(2,60,000)	26,000
Y:	1,70,000		34,000,	68,000	34,000	34,000	(1,70,000)
Secondary Distribution		19,20,000	7,70,000	5,94,000	5,56,000	Nil	Nil

1. Rent and Rates

A	10	40,000
B	20	80,000
C	30	1,20,000
X	10	40,000
Y	10	40,000
	80	3,20,000

2. Power

A	30	1,32,000
B	20	88,000
C	25	1,10,000
X	15	66,000
Y	10	44,000
	100	4,40,000

3. SWE

A	10	60,000
B	15	90,000
C	15	90,000
X	5	30,000
Y	5	30,000
	50	3,00,000

4. Insurance Building

A	10	20,000
B	20	40,000
C	30	60,000
X	10	20,000
Y	10	20,000
	80	1,60,000

5. Insurance Machinery

A	6	3,60,000
B	2	1,20,000
C	1	60,000
X	1	60,000
Y	–	–
	10	6,00,000

6. Canteen

A	10	20,000
B	15	30,000
C	15	30,000
X	5	10,000
Y	5	10,000
	50	1,00,000

$$X = 2,26,000 + 0.20Y$$
$$Y = 1,44,000 + 0.10X$$
$$X - 0.20Y = 2,26,000$$
$$-X + 10Y = 14,40,000 \text{ (multiply by 10)}$$
$$X - 0.20Y = 2,26,000$$
$$-X + 10Y = 14,40,000$$
$$9.8Y = 16,66,000$$
$$Y = 1,70,000$$
$$X = 2,60,000$$

The following factors should be taken into consideration for determining the basis for applying overheads to products:

1. **Adequacy:** The overhead rate should be such that equitable apportionment can be made to the cost centers or cost units. The amount of overhead recovered should be equivalent to the amount of overheads incurred.
2. **Convenience:** The overhead rate should be simple, easy to understand and convenient in application.
3. **Time Factor:** Overhead rate should have some relation to the time taken by various jobs for completion.
4. **Manual or Machine Work:** Different overhead rates should be applied for manual and machine work.
5. **Different Overhead Rates:** When the nature of work done by various departments is not the same, different overhead rates should be ascertained.
6. **Information:** The availability affects the selection of the overhead rates. For example, labour hour rate can be applied where labour time cards are maintained.

UNDERABSORPTION AND OVERABSORPTION OF OVERHEADS

Overhead costs are fully recovered from production, if actual rate method of absorption is adopted. But if a predetermined rate is used, the actual expense may be different from the charged or budgeted overhead expenses. If the overheads absorbed are less than the overheads incurred, it is underabsorption of overheads. On the other hand, if the amount of overhead absorbed is more than the actual overheads incurred, it is overabsorption of overheads.

Causes of Underabsorption or Overabsorption of Overheads

The following are the causes of underabsorption or overabsorption of overheads:

1. Error in estimating the overheads may lead to overabsorption or underabsorption of overheads.
2. The anticipated output may be different from the actual output.
3. The hours anticipated may be more or less than the actual hours worked.
4. Due to fluctuations in the prices of material or wage rates, the basis upon which the factory overhead is recovered from production may not be correct.

5. If overheads are not charged to work-in-progress proportionately.
6. Non-recurring expenditure incurred due to unexpected changes in the methods of production.
7. Seasonal fluctuations in the overhead expenses.

Accounting for Underabsorption and Overabsorption of Overheads

The disposal of underabsorbed/overabsorbed depends on the extent of such underabsorption/ overabsorption and the circumstances index which it arise. The main methods of disposal of underabsorption/overabsorption of overheads are as follows:

Use of Supplementary Rates

Supplementary rates are used to carry out adjustment for the difference between overhead absorbed and overhead incurred. This rate can be calculated by dividing underabsorbed/overabsorbed overheads by the actual base.

Advantages

It facilitates the absorption of actual overhead incurred for production. Correction of costs through supplementary rates is necessary for maintain data for comparison.

Disadvantages

These rates can be determined only after the end of the accounting period. It requires a lot of clerical work.

WRITING OFF TO COSTING PROFIT AND LOSS ACCOUNT

Insignificant amount of overabsorption and underabsorption may be written off to costing profit and loss account. Underabsorption due to idle facilities should be written off to costing profit and loss account. Underabsorption or overabsorption which arises due to abnormal cause such as strikes, lockouts, breakdowns, etc., should be carried over to next year and is considered while fixing the rate for that period.

The value of stock is distorted under this method as the overabsorption or underabsorption of overheads is not allocated to the stock of work-in-progress and finished goods.

ABSORPTION IN THE ACCOUNTS OF SUBSEQUENT YEARS

The overabsorption or underabsorption of overheads can be carried over as deferred charge to the next accounting period by transferring it to a suspense or overhead reserve account. This method is suitable in case of new projects and when the normal business period is more than one year. Criticism levied against this method is that it distorts the cost for the purpose of comparison, as the overabsorbed or underabsorbed costs are carried forward.

ACCOUNTING AND CONTROL OF MANUFACTURING EXPENSES

Manufacturing overhead control account opened in the cost ledger is debited by indirect material, indirect labour and indirect expense incurred by passing the following journal entry:

Manufacturing Overhead Control A/c Dr.
To Stores Ledger Control A/c
To Wage Control A/c
To General Ledger Adjustment A/c

The debit side of this account represents the total manufacturing expenses incurred. The recovery of such expenses is made by passing the following entry.

Work-in-progress A/c Dr.
To Manufacturing Overhead Control A/c

The balance in the manufacturing overhead control account represents the amount of underabsorption or overabsorption of overheads.

Control of Manufacturing Overheads

- Nature of overheads
- Budgeting of overheads
- Comparison of actual and budgeted overheads
- Actual amount per functional unit
- Standard costing

For better control of the manufacturing overheads, the manufacturing expenses can be classified into fixed, variable and semi-variable expenses. The management of the organisation should concentrate on the controllable costs that will be incurred. One way of reducing the overhead cost is through increasing the production level, i.e., by following the concept of economies of scale.

The service requirement of each department can be estimated by referring the budgeted output of each production department. There should be adequate care to identify the variability of each item while determining the budgeted amount.

The control of manufacturing overheads can also be done by comparing the actual and budgeted overheads.

Also, the actual amount per functional unit can be compared with the appropriate budgeted amount.

Finally, control can also be done by use of standard costing method. Here, the actual overheads should be compared with the standard overheads, and the variations, if any, should be analysed and reported to the management for taking appropriate actions.

QUESTIONS FOR SELF-PRACTICE

(I) Theory Questions

1. Explain the basis of apportionment of overheads.
2. Explain primary distribution of overheads.
3. What do you mean by secondary distribution of overheads? Explain the various methods of secondary distribution of overheads.

4. Write short notes on:
   (a) Overheads
   (b) Overheads vs. Costs

(II) Practical Questions

1. Break up the cost into Fixed Cost and Variable Cost using the method of Least Squares:

Units	Repairs and Maintenance Cost (₹)
200	5,600
220	5,900
260	6,500
280	6,900

(Ans.: Y = 16X + 2.385)

2. Break up the cost into fixed cost using the technique of Least Square Method.

Units	Factory overheads (₹)
18	416
16	378
17	386
19	424
15	335

(Ans.: Y = 2.16X + 351.08)

3. A Ltd. has three manufacturing departments — A, B, C and a department — S. The following figures are available for one month of 25 days 8 hours. each day. All the departments work for all the working days and with full attendance.

Expenditure	Total	Departments			
		S	A	B	C
Power and lighting	1100	240	200	300	360
Supervisor's Salary	2000	–	–	–	–
Rent	500				
Welfare	600				
Others	1200	200	200	400	400
Total	5400				
Supervisor's Salary		20%	30%	30%	20%
No. of Workers		10	30	40	20
Floor Areas (sq.ft.)		500	600	800	600
Service rendered by service department			50%	30%	20%

(Ans.: A = 1,800, B = 2,000, C = 1,600)

4. From the following particulars, you are required to calculate the departmental overhead rates for each of the production departments and service departments on appropriate basis.

Particulars	Production Departments			Service Departments	
	A	B	C	D	E
Direct wages (₹)	8000	12,000	16,000	4,000	8,000
Direct material	4,000	8,000	8,000	6,000	6,000
No. of workers	100	150	150	50	50
Electricity (units)	4,000	3,000	2,000	1,000	1,000
No. of light points	10	16	4	6	4
Value of assets (₹)	1,00,000	70,000	50,000	20,000	1,00,000
Area (sq. ft.)	150	250	50	50	50

The expenses incurred are as under:

Power ₹ 2,200, Lighting ₹ 400, Stores overheads ₹ 1,920, Incentives to workers ₹ 6,000, Depreciation ₹ 15,000, Repairs and maintenance work of machine ₹ 10,000, General overheads ₹ 24,000, Rent and Rates ₹ 1,100.

You are required to show a statement of distribution of overheads assuming that the stores and general overheads are distributed in proportion of direct wages.

(Ans.: A = 14,073, B = 14,687, C = 14,657, D = 3,990, E = 12,613)

5. A company has three production departments and two service departments. For the period ending 31 December, 2007, the departmental distrubution summary has the following totals:

Production Departments	(₹)
P_1	1,600
P_2	1,400
P_3	1,000
Service Departments	**(₹)**
S_1	4,400
S_2	600
Total	5,000

The service department costs are proposed to be charged on a percentage basis as given below:

Particulars	P_1	P_2	P_3	S_1	S_2
S_1	20%	40%	30%	—	10%
S_2	40%	20%	20%	20%	—

You are required to show the apportionment of service departments's overheads by the following methods: (i) simultaneous equation and (ii) repeated distribution.

(Ans.: P_1 = 1,347, P_2 = 2,056, P_3 = 1,595)

6. Nerul Ltd. has production departments A, B and C and two service departments S_1 and S_2. Monthly expenses (₹) include; rent (5,000); indirect wages (1,500); depreciation (10,000); lighting (600); power 1,500; and sundries 10,000.

Additional Information:

Particulars	Total	Production Dept.			Service Dept.	
		A	B	C	S_1	S_2
Floor space (sq. ft.)	10,000	2,000	2,500	3,000	2,000	500
Light points	90	15	10	35	15	15
Wages (₹)	10,000	3,000	2,000	3,000	1,500	500
Horsepower of the machines	150	60	30	50	10	–
Value of machines	2,50,000	60,000	80,000	1,00,000	5,000	5,000
Working hours	–	6,226	4,028	4,066	–	–

The expenses of S_1 and S_2 are allocated as follows (in percentage):

Particulars	A	B	C	S_1	S_2
S_1	20	30	40	—	10
S_2	40	20	30	10	—

Calculate the overhead charges recovery per hour.

(Ans.: A = 8,900, B = 8,420, C = 11,278)

7. A factory has two production departments A and B and two service departments C and D. Following figures have been extracted from the books of the respective departments.

Particulars	Production Departments		Service Departments	
	A	B	C	D
Wages (₹)	8,000	6,000	3,000	3,500
Area (m^2)	1,500	1,100	900	500
No. of employees	40	30	20	10
Value of plant and machinery (₹)	16,000	12,000	8,000	4,000
Value of stock (₹)	25,000	15,000	—	—
Lighting units	5,000	3,000	1,500	500

The followings figures of actual costs were taken from the financial books.

Particulars	₹
Supervision	3,000
Repairs to plant and machinery	1,200
Light	1,000
Employer's contribution to Employees State Insurance	200
Rent	800
Depreciation of plant and machinery	2,000
Insurance (Stock)	1,200
Power	4,000
Canteen expences	1,200

Apportion the above costs to the various departments on most equitable bases and draw an overhead analysis sheet.

(Ans.: A = 4,788, B = 3,369, C = 1,899, D = 944)

8. A company is divided into four departments. A, B and C are production departments and D is service department. The actual costs for a period are as follows:

Particulars	₹
Rent	10,000
Repairs to plant	6,000
Depreciation of plant	4,500
Supervision	15,000
Power	9,000
Light	1,000
Employer's liability insurance	2,000

The following details are available in respect of the four departments:

Particulars	A	B	C	D
Area (sq. ft.)	1,500	1,100	900	500
No. of employees	40	30	20	30
Horsepower of machines	800	500	200	–
Total wages (₹)	60,000	40,000	30,000	20,000
Value of plant (₹)	2,40,000	1,80,000	1,20,000	60,000
Value of stock (₹)	1,50,000	90,000	60,000	–
Light points (₹)	40	30	20	10

Appropriate the costs of the various departments.

(Ans.: A = 18,950, B = 13,483, C = 8,650, D = 6,417)

9. Calculate the overheads allocable to production departments A and B. There are also two services X and Y.

X renders services worth (₹) 12,000 to Y and the balance to A and B at 3 : 2; Y renders services to A and B at 9 : 1.

Particulars	A	B	X	Y
Floor space (sq.ft.)	5,000	4,000	1,000	2,000
Assets (₹ lakhs)	10	5	3	1
Horsepower of machines	1,000	500	400	100
No. of workers	100	50	50	25
Light and fan points	50	30	20	20

Expenses and charges are:

Particulars	(₹)
Depreciation	2,10,000
Rent, rates and taxes	36,000
Insurance	15,200
Power	20,000
Canteen expenses	24,000
Electricity	5,000

(Ans.: A = 2,09,229, B = 1,00,971)

10. In Real Chemicals Ltd., there are two service departments, P and Q and three production departments A, B and C. In May 2008, the departmental expenses were:

Particulars	(₹)
A	1,30,000
B	1,20,000
C	1,00,000
P	24,000
Q	20,000

Service department expenses are allocated on the following (in percentage):

Particulars	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's expenses to production departments under the simultaneous equation method.

(Ans.: A = 16,705, B = 17,289, C = 9,421)

11. In a light engineering factory, the following particulars have been collected for the three month period ending on 31 December. Compute the departmental overhead rates for each of the production departments assuming the overheads are recovered as percentage of direct wages.

Particulars	Production Departments			Service Departments	
	A (₹)	B (₹)	C (₹)	D (₹)	E (₹)
Direct wages (₹)	2,000	3,000	1,000	1,500	1,500
Direct materials (₹)	1,000	2,000	2,000	1,500	1,500
Staff (Nos.)	100	150	150	50	50
Electricity (kWh)	4,000	3,000	2,000	1,000	1,000
Light points (Nos.)	10	16	4	6	4
Asset value (₹)	60,000	40,000	30,000	1,00,000	10,000
Area occupied (sq. yards)	150	250	50	50	50

The expenses for the period were:

Particulars	₹
Motive power	550
Lighting power	100
Stores overhead	400
Amenities to staff	1,500
Depreciation	5,000
Repairs and maintenance	3,000
General overhead	6,000
Rent and taxes	275

Apportion the expenses of the service department's expenses in proportion to direct wages and that of the service department D in the ratio of 5 : 3 : 2 to department A, B, and C respectively.

(ICWA)

12. ABC Ltd. has three production departments P_1, P_2 and P_3 and two service department's S_1 and S_2. The following data are extracted from the records of the company for the month of October 2007.

Particulars	(₹)
Rent and rates	62,500
General lighting	7,500
Indirect wages	18,750
Power	25,000
Depreciation on machinery	50,000
Insurance of machinery	20,000

Other Information:

Particulars	P_1	P_2	P3	S_1	S_2
Direct wages (₹)	37,500	25,000	37,500	18,750	6,250
Horsepower of machines used	60	30	50	10	—
Cost of machinery (₹)	3,00,000	4,00,000	5,00,000	25,000	25,000
Floor space (sq. ft.)	2,000	2,500	3,000	2,000	500
Number of light points	10	15	20	10	5
Production hours worked	6,225	4,050	4,100	—	—

Expenses of the departments S_1 and S_2 are reapportioned as below:

Particulars	P_2	P_2	P_3	S_1	S_2
S_1	20%	30%	40%	—	10%
S_2	40%	20%	30%	10%	—

Required:

(i) Compute overhead absorption rate per production hour of each production department.

(ii) Determine the total cost of product X which is processed for manufacture in department P_1, P_2 and P_3 for 5 hours, 3 hours and 4 hours respectively, given that its direct material cost is ₹ 625 and direct labour cost is ₹ 375. ***(CA, December 2007)***

[Ans.: (i) A = 54,930, B = 56,815, C = 72,004, (ii) A = 55,236, B = 57,053, C = 72,320]

13. You are given the following data about at a factory and costs of production over the past 5 months.

Particulars	Output (Units)	Semi-variable Overhead (₹)
June	4,200	17,600
July	4,000	17,000
August	4,300	17,900
September	3,800	16,400
October	2,700	13,100

There is a high degree of correlation between output and costs and so it is decided to calculate fixed costs and the variable cost per unit of output using the least squares method.

Required:

(a) Calculate a formula to determine the expected level of costs, for any given volume of output.

(b) Determine the total costs if output is 4,500 units.

14. ZED Ltd., a manufacturing unit, has three production departments A, B, and C and two service departments X and Y. The following estimates of expenses are available for a period.

Particulars	(₹)
Rent and Rates	3,20,000
Power	4,40,000
Staff Welfare Expenses	3,00,000
Insurance on Building	1,60,000
Insurance on Machinery	6,00,000
Staff Canteen Expenses	1,00,000

The other technical details about the departments are as under:

Particulars	Total	A	B	C	X	Y
Floor Area ('000 sq. ft.)	80	10	20	30	10	10
Number of Workers	50	10	15	15	5	5
Horsepower of Machines	100	30	20	25	15	10
Cost of Machines (₹ lakhs)	10	6	2	1	1	0

The cost of service departments are distributed as under:

Particulars	A	B	C	X	Y
Department X	40%	30%	20%	—	10%
Department Y	20%	40%	20%	20%	—

Required:

Show the Primary and Secondary Distribution of overhead expenses and the resulting total costs of the production departments.

(Ans.: A = 7,70,000, B = 5,94,000, C = 5,56,000)

[III] Objective Questions

(A) State whether the following statements are True or False.

1. Overhead absorption is the allotment of overheads to cost units.
2. Overhead absorption rates for fixed overheads are based on normal plant capacity.
3. Underabsorption of overheads means that actual overheads are more than absorbed overheads.
4. Underabsorption of overheads decreases profit in costing books.
5. When actual overheads are more than absorbed overheads, it is known as overabsorption.

6. Administrative overheads are usually absorbed as a percentage of prime cost.
7. Departmentalisation of overheads facilitates control objective accounting.
8. Linking overheads to cost unit is known as overhead absorption.
9. Variable overhead cost is a period cost.

[Ans. True: (1, 2, 3, 7, 8). False: (4, 5,6, 9)]

(B) Match the following.

Group A	Group B
1. Rent	(i) No. of light points
2. Lighting and Heating	(ii) Time spent on machine
3. Supervision	(iii) Cost of each machine
4. Insurance	(iv) Actual depreciation
5. Depreciation	(v) Requisition slip
	(vi) Floor area occupied by each machine

[Ans. 1. (vi), 2. (i), 3. (ii), 4. (iii), 5. (iv)]

(C) Multiple choice questions. Select the right answer.

1 The process by which cost items are charged direct to a cost unit is called

(i) Absorption (ii) Apportionment
(iii) Allocation (iv) Allotment

2. A common absorption rate used throughout the following for all jobs and units of output irrespective of the department in which they were produced is called

(i) Machine hour rate (ii) Department absorption rate
(iii) Overall absorption rate (iv) Blanket absorption rate

3. When allocating service department costs to production departments, the method that does not consider different cost behaviour pattern is the

(i) Step method (ii) Reciprocal method
(iii) Simple rate method (iv) Dual rate method

4. Machine hour rate is followed when

(i) Most of the work is done by machine (ii) Most of the work is done by labour
(iii) One operator uses several machines

5. Labour hour rate is followed when most of the work is done by

(i) Labour (ii) Machines
(iii) Different groups of machines

[Ans. 1. (iii), 2. (iii), 3. (iii), 4. (iii), 5 (i)]

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