

COST ACCOUNTING

SYLLABUS

COST ACCOUNTING

UNIT-I Accounting information and managerial Decision-making, Financial Accounting vs. Cost and Management Accounting, Role of Management Accountant, Basic Cost terms and Concepts, Relevant Cost, Statement of Cost.

UNIT -2 Absorption Costing and Marginal Costing, Break Even Analysis, Cost-Volume-Profit analysis, Managerial Application of CVP Analysis.

UNIT-3 Job order Cost Systems, Cost Allocation and Activity Based costing, Process Cost System, Normal Loss and Abnormal Loss, Joint Product and By Products, Equivalent Production.

UNIT – 4 Segment performance Analysis, Responsibility Accounting System, Variance Analysis, Evaluation of Cost and Sales Variances.

UNIT-5 Budgetary Control System, Operating and Functional Budgets, Financial Budgets, Master Budgets, Zero-Base Budgeting, Strategy and Balanced Score Card

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INTRODUCTION

In today's world of ours every activity is with some motive i.e. propose. In most of these cases the purpose is to earn profit while in other cases the purpose may be social welfare, providing education, health care etc., whatever may be the purpose the activity is likely to be an organised affair.

Every organisation has to use resources-Material, labour, services, Capital and to work effectively the people in the organisation require information.

The use of Cost Accounting System was first traced in France during seventeenth Century. In eighteenth century, come iron masters and potters in England too had begun to produce Cost Accounting information. Cost Accounting provides cost information for taking effective and efficient decisions. In the present era of Cut-throat competition the need for Cost Accounting in any business organisation has increased manifold with the increase in size and complexity of business, the organizations need to work more hard to survive. But the business decisions have to be taken with the help of accounting information. On the basis of the information provided by Financial accounting alone, business decisions cannot be taken. Similarly, information provided by cost accounting is not enough for decision making, management Accounting overcomes the limitations of financial and cost accounting and is useful in taking important business decisions.

Cost and management Accounting is an attempt to providing the students with a thorough grounding of relevant concepts. This book is divided into five units which deals accounting information, its relationship with managerial decision-making, the role of the management accountant, absorption Costing and marginal Costing, cost volume profit analysis, managerial application of CVP analysis and job order cost system. Cost allocation and activity-based costing, responsibility accounting system, variance analysis, budgetary control system along with zero-base budgeting have also been introduced in a Easy and Simple manner. A number of problems have been provided for practice. A list of key Terms and a summary are also provided at the end of each chapter.

Attempts have been made to produce a quality text to fit students and others needs. However there is always scope for improvement. We welcome comments and suggestions to improve the text with a view to make it more useful and better for the students

UNIT -1 ACCOUNTING

Chapter Outlines

- 1.0 Learning Objectives
- 1.1 Introduction

- 1.2 Accounting Information and Managerial Decision-making
 - 1.2.1 Concept of Decision-making
 - 1.2.2 Concept of Differential Costs
 - 1.2.3 Steps in Decision-making
 - 1.2.4 Make or Buy Decision
 - 1.2.5 Operate or Shutdown
 - 1.2.6 Expand or Reduce Capacity Decisions
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1.0 LEARNING OBJECTIVES

After studying this chapter, you should be able to understand:

- The concept of decision making.
- Explain the concept of relevant cost.
- Steps to be taken for decision making.
- Distinction between Book keeping and Accounting.
- Explain the importance and types of Cost Sheet.
- Distinguish between Cost Centre and Cost Unit, Cost estimation and Cost ascertainment.
- Role of a management Accountant.
- Distinguish between Financial Accounting and cost Accounting.
- Describe the various types of material losses.
- Explain the Accounting treatment of different losses.

1.1 INTRODUCTION

In the beginning the main objective of accounting was to ascertain the result of the business activities during a year and to show the financial position of the business as on a particular date. But with the lapse of time more and more is being expected from accounting. At present accounting has to meet the requirements of taxation authorities, investors, government regulations, management and owners. Accounting is a discipline which records, classifies, Summarises and interprets financial information about the activities of a concern so that intelligent decisions can be made about the concern. cost Accounting has developed due to the complexities so modern commerce and growth of factory system. This chapter attempts to shows the basic concepts of cost accounting including the elements of cost, the role of a management Accountant and Cost Sheet.

1.2 ACCOUNTING INFORMATION AND MANAGERIAL DECISION-MAKING

12.1 Concept of Decision-Making

Decision making is associated with planning and is directed towards achieving a desired goal. It is the process of evaluating two or more alternatives leading to final selection. It is however be noted that even the best decision does not guarantee the success decision making which is the essence of management, is a reflection of responsibility in the case of an enterprise and constitutes the hall-mark distinguishing the work of the higher echelons of management from the unglamorous, though vital, ploodings of the rank and file of the undertaking. In this connection Sir Geoffery Heyworth once remarked, "In the unilever's world empire, there are some two hundred people who take on themselves the decisions which make or mar the success of business as a whole".

1.2.2 Concept of Differential Cost

Differential cost is the change in cost which may result from adopting an alternative course of action in the level of activity which may be due to change in fixed cost or variable cost. In other words, it is the aggregate of changes in fixed cost and variable cost which take place due to adopting of an alternative course of action in the level of output.

Differential costs are affected by the decisions.

They may be regarded as the difference in the total cost resulting from a change.

In other words it is the increase or decrease in the total cost that result from the alternative course of action.

The A. A. A. Committee defines it as "the increase or decrease in total cost or the change in specific elements of cost that result from any variation in operation".

According to the institute of cost and management Accountant, London, differential cost may be defined as "the increase or decrease in total cost or the change in specific elements of cost that result from any variation in operations".

1.2.3 Steps in Decision-making

(a) *Identifying the problem:*

The decision making process starts with the identification of problem. The manager must take utmost care and be able to define the problem clearly because all subsequent actions depend on this if the problem at hand is not clearly defined, managers may spend considerable time and efforts in gathering information which is not relevant to the real problem.

(b) *Identifying the Alternative Courses of Action:*

Once the problem is identified all possible and feasible solutions should be identified. It is the idea phase of decision process and the experience of the concerned manager is of utmost importance. The manager must be objective in identifying different alternative courses of action and need not let his bias to enter into the decision process.

(c) *Accumulation of Relevant Information:*

Manager require a lot of information before making decisions. Depending upon whether the decision situation has long run implications or short-run implications, relevant data and information about different courses of action should be gathered. Information may be available internally or may have be collected from external sources. It is the relevance of information and the sources of information which is important.

(d) *Making a Decision:*

The information collected in respect of each of the alternative course of action should be analysed carefully to see the effect if each course of action on the objective of the firm. An economic cost benefit analysis should be made for each of the alternative course of action. Out of these different alternative the best one should be selected. The following are the rules applied in making decisions related to each of the following matters

1.2.4 Make or Buy decision

The make or buy decision is made to determine the alternative which is most desirable. In case of industries, a number of spare parts, components are used in the final assembly to make final product. These accessories can be either manufactured written and organisation or can be procured from outside sources. Therefore it is necessary to decide whether all the parts are to be manufactured within or to be purchased from outside sources. The decisions taken will have the effects on production capacities, working capital, competitive position and funds.

Illustration 1.1

An automobile manufacturing company finds that while the cost of making is its own workshop part no. 0028 is ` 6.00 each, the same is available in the market at ` 5.60 with no assurance of continuous supply. The cost data is as follows:

Direct Materials	2.50
Direct wages	2.00
Other variable costs	0.50
Depreciation and other fixed costs	1.00
Total	6.00

You are required (a) To suggest to the managing director, giving your view to make or buy the part (b) To give your view in case the suppliers reduce the price from ` 5.60 to ` 4.60.

Solution: In order to decide whether to make or buy the part no 0028, fixed expenses should be excluded from the cost as they will be incurred irrespective of the part not being produced.

Thus, the additional cost of the part will be as follows:

Direct Materials	2.00
Direct wages	2.50
Other variable costs	0.50
Total	5.00

- (a) The Company should make the part is available in the market at Rs. 5.60 because the production of every part will give a contribution of 60 paise i.e. (5.60 – 5.00) to the Company.
- (b) On the other hand if the part is available in the market at ` 4.60, the Company should not manufacture the part, because, the additional cost of producing the part is 40 paise (i.e., ` 5.00 – ` 4.60) more than the price at which it is available in the market.

In certain cases, inspite of lower variable cost, there may be increase in fixed cost. Therefore it is necessary to find out the minimum quantity required in order to justify the making of product instead of buying. This can be calculated by the following formula:

$$\text{Increase in} = \frac{\text{fixed cost}}{\text{Contribution per unit}}$$

1.2.5 Operate or Shutdown

Differential cost analysis is also used when a business is confronted with the possibility of a temporary shutdown. This type of analysis has to determine whether in the short-run a firm is better of operating then not operating. As long as the products sold recovery their variable costs and make a contribution towards the recovery of fixed costs, it may be preferable to operate and not to shutdown. Also management should consider the investment in the training of its employees which would be lost in the event of temporary shutdown.

Illustration 1.2

A manufacturing company has three product lines A, B, and C the company's management requested an income statement by product lines and received the following:

	Product A	Product B	Product C	Product D
Sales	4,00,000	1,00,000	3,00,000	8,00,000
Cost of goods sold	2,50,000	60,000	2,00,000	5,10,000
Gross profit	1,50,000	40,000	1,00,000	2,90,000
Operating expenses	1,30,000	70,000	80,000	2,80,000
Net Profit	20,000	30,000	20,000	10,000

The Company's owner argued that such an analysis is misleading and he requested further information about the Company's operating expenses. He was given the following:

	Product A	Product B	Product C	Product D
Variable operating expenses	1,10,000	30,000	50,000	1,90,000

Total Fixed Operating expenses	-	-	-	90,000
				2,80,000

You are required to prepare income statement showing the contribution by products covering the company's fixed costs. Would you recommend discontinuance of product B?

Solution:

	Product A	Product B	Product C	Product D
Sales	4,00,000	1,00,000	3,00,000	8,00,000
Less: Marginal Cost and Cost of goods sold	3,60,000	90,000	2,50,000	7,00,000
Contribution	40,000	10,000	50,000	1,00,000
Less: Fixed operating expenses				90,000
				10,000

Note: Cost of goods sold is a variable expenses comment on the Discontinuance of product B, if product B is a discontinued, the total contribution will be (`1,00,000 - 10,000) = `90,000. But the total fixed expenses remain the same i.e. `90,000. That means there will be no profit in such a case on the other hand, if product B is not continued, the total contribution will ` 1,00,000 and the fixed expenses will be `90,000 and there will be a net profit of `10,000 so it is not advisable to discontinue product B.

1.2.6 Expand or Reduce capacity Decisions

The resources that are scarce are taken into account in order to expand or reduce that production activities. The scarce resources include raw material, labour, labour hours, space, capital, machine hours etc. These scarce resources help in decision making of alternative choices. Here, differential and profit and contribution per unit of scarce resource.

Illustration 1.3

A Company engaged in plantation activities has 200 hectares of virgin land, which can be used in growing jointly or individually tea, coffee and cardamom. The yield per unit hectre of different Crops and their selling price per K.g. are as under:

Particulars	Yield Kgs	Selling price (`)
Tea	2000	20
Coffee	500	40
Cardamom	100	250

The relevant cost data are give n below:

Variable cost per kg	Tea	Coffee	Cardamom
Labour Charges	8	10	120
Packing Materials	2	2	10
Other costs	4	1	20
Total	14	13	150
Fixed Cost per annum			
Cultivation and growing cost		10,00,000	
Administrative Cost		2,00,000	
Land revenue		50,000	
Repairs and maintenance		2,50,000	
Other costs		3,00,000	

The policy of the Company is to produce and sell all three kinds of commodities and the maximum and minimum area to be cultivated per commodity is as follows:

Commodity	Maximum	Minimum
Tea	160	120
Coffee	50	30
Cardamom	30	10

Calculate the most profitable product mix and maximum profit which can be achieved.

Solution:

	Tea	Coffee	Cardamom
Selling price	20	40	250
Less: variable cost	10	13	150
Contribution	6	27	100
Contribution per yield hectre	2,000	500	100
Total contribution	12,000	13500	10000
Key Factor	2	1	3
Hectrs Allotted	140	50	10
Total yield	16,80,000	675000	100000

Total Contribution	2455000
Less: Fixed Cost	<u>1800000</u>
Profit	655000

1.2.7 Key Factor

Generally the product will be selected on the basis of the $\frac{P}{V}$ ratio which is highest, when there is no limiting or key factor. But when the resources are scarce the choice of the product is made on the basis of the contributions per unit of production.

A key factor is one which generally limits the profit, output or sales many a times a business may not be in a position sell the output it produces. But in some cases, it cannot meet the market demand due to scarcity of resources like materials, labour, plant capacity etc. though it can sell all it produces. Under such circumstances, it has to take a decision regarding the choice of the product whose production is to be stopped, reduced or increased. Therefore, these scarce resources should be utilized in those directions where the contribution per unit is maximum.

Illustration 1.4

Birla Equipment ltd. Manufactures four Components the cost particulars of which are given below:

Element of Cost	Components			
	A	B	C	D
Material	80	120	90	100
Labour	20	30	20	25
Variable overheads	10	10	15	12
Fixed overheads	15	20	20	23
Output per machine hour (units)	4	3	3	2
	125	180	145	160

The key factor is shortage of machine Capacity.

You are required to advise management as to whether they should continue to produce all or some of these components (which are used in its main product) or they should buy them from a supplier who has quoted the following prices:

A = ` 115, B = ` 185, C = ` 135, D = ` 175

Solution: Profitability Statement

	Components			
	A	B	C	D
Direct Material	80	120	90	100
Direct Labour	20	30	20	25
Variable Cost	10	10	15	15
Marginal Cost per unit(a)	110	160	125	137
Purchase price per unit (b)	115	185	135	175
Excess per unit (b) over (a)	5	25	10	38
Output per machine hour (units)	4	3	3	2

Contribution per unit	20	75	30	76
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Thus even if there is no key factor, it may not be possible to produce all the components required and that some of them must be purchased from outside. If this is so that component which result in the least loss to the company must be purchased from outside. The following statement will reveal the loss to the Company through purchases of components from outside:

A	20
B	30
C	75
D	76

Thus it is clear from the above Statement that component A may be purchased from outside if needed, and if still the own production could not be effected C should be purchased.

The profitability statement clearly shows that from the point of view of loss per machine hour if the components are purchased from outside, the ranking of four components would be A, C, B, D.

1.2.8 Special Orders

All business decisions should not be evaluated in the same way. Sometimes special orders or one time orders have different characteristics from recurring orders. Therefore, each order should be evaluated based on costs relevant to the situation and the goals of the business firm. The question of special orders arises when a company has excess or idle production capacity and management considers the possibility of selling additional products at less than normal selling prices, provided that such a special order will not affect the regular sales of the same product.

Illustration 1.5

Tata Company Ltd. Produce business calculators and the selling price was fixed at `400. The following are the cost particulars:

Direct material cost	140
Direct labour Cost	40
Variable Factory overhead	20
Other variable cost	20
Fixed overhead	5,00,000 p.a.
Commission	30% on selling price.

The Company was producing only 10,000 units. Since the demand was only 10,000 units. However the Company has the capacity to produce another 1,000 units without any additional fixed overheads one of the distributors offered that he will take 1,000 units in addition to his normal quota, but at a selling price of `320 per unit. He was also prepared to accept only half of his regular Commission for this transaction0

The managing Director wants you as the cost and management Accountant to prepare a statement to the Board of Directors with your specific recommendations, based on the calculations in the statement.

Solution:

Statement of Profitability

Particulars	Present production	Additional production	Total
Production & Sales	10,000	1,000	11,000
Sales	40,00,000	3,20,000	43,20,000
Direct material at `140	14,00,000	1,40,000	15,40,000
Direct labour at `40	4,00,000	40,000	4,40,000
Variable factory overhead at ` 20	2,00,000	20,000	2,20,000
Other variable cost at `20	2,00,000	20,000	2,20,000
Commission at 30% on sales value	12,00,000	-	12,00,000
At 15% on sales value	-	48,000	48,000
Total variable cost	34,00,000	2,68,000	36,68,000
Contribution	6,00,000	52,000	6,52,000
Less: Fixed overhead	5,00,000	-	5,00,000

Profit	1,00,000	52,000	1,52,000
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Recommendation

The proposal gives a contribution of ` 52 per unit ($52,000/1,000$). Additional profit will be ` 52,000. Here the proposal should be accepted.

1.2.9 Sell or process further

The decision whether a product should be sold at the split off point or processed further is faced by many manufacturers. The choice between selling a product at split-off or processing it further is short-run operating decision. Additional processing adds values to a product and increases its selling price above the amount for which it could be sold at split-off. The decision to process further depends upon whether the increase in total revenues exceeds the additional costs incurred for processing beyond split-off.

Illustration 1.6

A production Company is evaluating two possible processes for the manufacture of a component. The following data is made available.

	Process A ` Per unit	Process B ` Per unit
Selling price	30	20
Variable cost	12	14
Total fixed cost	30,00,000	21,00,000
Output capacity in units	4,30,000	5,00,000
Expected sales in units in next 2 years	4,00,000	4,00,000

You are required to suggest

- Which process should be chosen?
- Would you change your answer as given above if you are informed that the capacities of the two process as follows: A = 6,00,000 units and B = 5,00,000 units why?

Solution:

Comparative Profitability Statement

Particulars	Process A (`)	Process B(`)
Selling price per unit	30	20
Variable cost per unit	12	14
Contribution per unit	8	6
Total contribution	32,00,000	24,00,000
Less: Total fixed cost	30,00,000	21,00,000
Profit	2,00,000	3,00,000
Process B can be selected as it gives higher profit	34,40,000	30,00,000
Total contribution if present capacity is utilized and sold		
Total Profit	4,40,000	9,00,000
Process B may be chosen		
Total contribution	48,00,000	30,00,000
(if capacity of A of 6,00,000 units and of B 5,00,000 units)		
Total profit	18,00,000	9,00,000
Process A may be chosen		

1.2.10 Accept or Reject Decisions

Sometimes, a firm which is selling its product in the market may get orders from some certain customers to sell the product at a slightly lesser price. This may take place in case of special orders, foreign customers, one time quantity sales etc. A decision to accept or reject has to be taken based on differential cost and the contribution if the contribution is more than the differential cost, the order can be accepted. This is because the fixed cost is already recovered in the normal production and the contribution in excess of marginal or differential cost leads to profit. But the price should not be less than marginal cost. The question of accept or reject the special orders arises in case

when the manufacturer has idle production capacity makes him to think about the possibility if selling the additional products at lesser prices.

Illustration 1.7

A producer is operating at 50% of its capacity due to competition. The following are the details:

	Per Unit (`)
Raw materials	6.00
Direct wages	4.00
Variable overhead	2.00
Fixed overhead	3.00
	15.00
Output	15000 units
Total cost	`225000
Sales value	`210000
Loss	`15000

A foreign customer wants to buy 6000 units of `13.50 per unit and the Company does not know whether to accept or not as it is suffering losses at the current level.

Solution:

Particulars	Existing level (15000 units) (`)	New order (6000 units) (`)	Total (16000 units) (`)
Sales	2,10,000	81,000	2,91,000
Variable Cost:			
Raw materials	90,000	36,000	1,26,000
Labour	60,000	24,000	84,000
Variable overhead	45,000	18,000	63,000
Total Variable cost	1,95,000	78,000	2,73,000
Contribution	15,000	3,000	18,000
Less: Fixed cost	30,000	-	30,000
Profit/Loss	-15,000	3,000	-12,000

The manufacturer must accept the order as his losses will come down from `15,000 to `12,000.

1.3 DIFFERENCE BETWEEN COST ACCOUNTING AND MANAGEMENT ACCOUNTING

The important differences between Cost Accounting and Management Accounting are as follows:

- Purpose:** The purpose of cost Accounting is the ascertainment of cost at each stage of production. The purpose of management Accounting is to provide information to the management for decision making.
- Basis:** Cost Accounting is prepared mainly on the basis of past and less emphasis is given for the future. Whereas management accounting purely aims at the future based on the past information.
- Preparation:** Cost Accounting is prepared on the basis of some rules and regulations prescribed by the ICWAI. Whereas management Accounting is prepared without adopting any specific and rigid rules. It may be prepared according to the will of the managerial personals.
- Reports:** The Reports of the Cost accounting are subject to statutory audit on the other hand, The reports of the management Accounting are not subject to statutory audit.
- Useful:** The reports of the cost Accounting are useful both to the internal and external parties. On the other hand the reports of the management Accounting are useful only for the internal parties.
- Scope:** Cost Accounting does not include tax planning and tax accounting whereas management Accounting includes tax planning and tax accounting.
- Evaluation:** Cost Accounting evolves due to the limitation of financial accounting, on the other hand management accounting evolves due to the limitations of cost accounting. It is the managerial aspects of financial accounting and cost Accounting.
- Maintenance of Records:** The maintenance of records is compulsory for complying the statutory requirements in selected industries as notified by Govt. from time to time. On the other hand the maintenance of records is purely voluntary and for internal use of management of the Company.

9. **Planning Aspect:** Cost Accounting is mainly concerned with short-term planning, on the other side management Accounting is concerned with short term as well as long term planning of the organization.
10. **Installation of system:** Cost Accounting can be installed without the help of the management accounting in the organization on the other hand management accounting system cannot be properly installed without a proper cost accounting system.
11. **Derivation of Data:** Cost Accounting data are derived basically from financial accounts, on the other hand management Accounting data are derived from both Cost Accounts as well as from financial accounts.
12. **Status:** The status of the cost accountant in the organization comes after the management accountant. On the other hand the status of the management accountant is higher than cost accountant in the organization due to direct participation in decision making process.

1.4 DIFFERENCE BETWEEN FINANCIAL ACCOUNTING AND COST ACCOUNTING

1. **Purpose:** The main purpose of Cost Accounting is to analyse, ascertain and control costs on the other hand the purpose of financial Accounting is to record financial transactions and prepare financial statements.
2. **Decision making:** The Cost Accounts are basically designed to facilitate decision making in the areas of production, purchase, sales etc. but on the other hand financial accounts are of limited use in decision making.
3. **Analysis of Cost and Profit:** The Cost Accounting shows the detailed cost and profits for each product, process, job, contract, etc. on the other way the financial Accounting shows the overall profit/Loss of the entire organization.
4. **Transactions Recorded:** In Cost Accounting keep records both external and Internal transactions. On the other hand in Financial Accounts keep records external transactions with outsiders.
5. **Access:** In Financial Accounting anybody can have access to Financial Statements of Companies. On the other hand in cost accounting the outsiders generally have no access to cost records.
6. **Control:** Cost Accounting Control all elements of Costs, but on the other hand financial Accounting does not exercise adequate control over material, labour and overhead costs.
7. **Profit or Loss:** Cost Accounting determines the profit loss or each product, process, job and department whereas Financial Accounting determines the profit or loss of the entire business.
8. **Units:** Cost Accounting records both monetary and physical units such as labour hour, machine hour etc. whereas Financial Accounting records only monetary units in the books of accounts.
9. **Valuation of Closing Stock:** Closing Stock is valued at cost price only in Cost Accounting on the other hand. In Financial Account Closing Stock is valued at cost or market price whichever is less.
10. **Audit:** Cost Accounting need not be followed by a system of external audit, whereas financial Accounting needs a system of independent audit of the financial records by an external auditor.
11. **Tax Assessment:** Cost Accounting does not form a basis for tax assessment whereas financial Accounting forms a basis for determination tax liability of the business.
12. **Parties:** Cost Accounting serves the information needs of the management whereas Financial Accounting serves the information needs of owners, creditors, employees and the society as large.
13. **Lack of uniformity:** Installing a costing system is purely optional. A concern is free to empty any method it likes. There are no fixed rules and regulations. Therefore different cost accounting system may be followed by different firms in the same industry which makes comparison difficult.

1.5 DIFFERENCE BETWEEN FINANCIAL ACCOUNTING AND MANAGEMENT ACCOUNTING

1. **Objective:** Financial Accounting aims at recording business transaction systematically to ascertain profit or loss and financial position at the end of the financial year.
The aims of management Accounting at preparing various statements for material planning, control and decision making.
2. **Time period:** In Financial Accounting the accounts are prepared for a particular period. Whereas in management accounting the reports are prepared from time to time to update with the changing business environment.
3. **Audit:** In Financial Accounting under Company law Financial accounts are subject to compulsory Audit. Whereas in management Accounting audit is optional. However, management is there is to ensure efficiency and productivity of the employees and system.

4. **Principles:** Financial Accounting is prepared as per Generally Accepted Accounting principles (GAP). In Management Accounting No set of standing principle are followed. However, accounting standards are followed to take managerial decisions more effective.
5. **Nature:** Financial Accounting is concerned with historical data. It records only those transactions which have already taken place. Thus the accounts prepared here are like postmortem report.
The management Accounting is concerned with both historical data and estimated data.
6. **Publication:** In Financial Accounting, Financial Statements are published annually for external parties interested in the accounting information.
In management Accounting the statements and reports are not published. They are meant for internal use of the management.
7. **Quickness:** In Financial Accounting, reporting is slow and time consuming one has to wait till the end of the accounting year.
In management accounting, reporting is very quick as it is meant for decision making.
8. **Nature of Information:** Financial Accounting is concerned with quantitative information expressed in terms of money. Management Accounting is concerned with both qualitative and quantitative information.
9. **Reporting:** In Financial Accounting, Financial reports are prepared not only for the organization but for others interested in the accounting information of the business.
In management Accounting the reports prepared for internal use only.
10. **Legal Comparison:** In Financial Accounting, preparation of financial accounts is compulsory to comply statutory requirements. In Management Accounting. It is not compulsory, it helps in the administration and smooth functioning.

1.6 ROLE OF MANAGEMENT ACCOUNTANT

The management accountant, obtain referred to as controller, is the manager of accounting information used in planning, control and decision making area. He is responsible for collecting, processing and reporting information that well help managers decision makers in their planning, controlling and decision making activities. He participates in all accounting activities within the organization.

The following are the Roles of Management Accountant:

1. **Participating in management process:** The management accountant occupies a pivotal position in the organization. He performs a staff function and also has line authority over the accountant and other employees in his office. He educates executives on the need for control information.
2. **Maintaining optimum Capital Structure:** Management accountant has a major role to play in raising of funds and their application. He has to decide about maintaining a proper mix between debt and equity raising of funds through debt is cheaper because of tax benefits.
3. **Investment opportunities:** A management accountant can assist either person or a firm regarding the investment in different ways. He can suggest how, when and where the investment should be made so that the investor or the firm will earn a maximum return.
4. **Financial Investigations:** A management accountant can assist the management about the financial investigations which is extremely desired to determine the financial position for the interested parties. Relating to issue of shares, amalgamation or mergers, or reconstructions etc to ascertain the reason of decreasing profit or increasing costs, it so happened.
5. **Long-term and Short –term planning:** Management accountant plays an important role in forecasting future business and economic events for making future plans i.e., long-term plans, strategic management accounting, formulating corporate strategy, market study etc.
6. **Participating in management process:** The management accountant occupies a pivotal position in the organisation. He performs a staff function and also has line over the accountant and other employees in his office. He educates executives on the need for control information and on the ways of using it. He shifts relevant information from the irrelevant and reports the same in a clear from to the management and sometime to interested external parties.
7. **Decision making;** Management accountant provides necessary information to management in taking short-term decision e.g. optimum product mix, make or buy, lease or buy, pricing of product discontinuing a product etc and long-term decisions e.g., capital budgeting. Investment appraisal, project financing. However, the job of management accountant is limited to provision of required information in a comprehensive as well as reliable form to the management for decision making purposes.

8. **Control:** The management accountant analysis accounts and prepares reports e.g., standard costs, budgets, variance analysis and interpretation, cash and funds flow analysis, management of liquidity, performance evaluation and responsibility accounting etc. for control.
9. **Developing management information System:** The routine reports as well as reports for long term decision making are forwarded to managerial personnel at all levels to take corrective action at the right time and also uses these reports for taking important decisions.
10. **Stewardship Accounting:** Management accountant designs the framework of cost and financial accounts and prepares reports for routine financial and operational decision making.
11. **Corporate planning:** He can assist management for long-term planning and advise management regarding amalgamation or mergers or reconstructions, including financial planning to see whether effective utilization of resources is made or not. Thus the role of management accountants cannot be ignored. Its such, there services are primarily desired for the efficient management of an undertaking.

1.7 BASIC COST TERMS AND CONCEPTS

1.7.1 Need for Accounting

Accounting is the Language of business. The oldest branch of accounting is the financial Accounting, which is concerned with recording day-to-day transactions of business and helps in preparation of financial statements like profit and loss Account and Balance Sheet. But it does not provide detailed information about costs of various products processes, services and operations which is very important for planning and controlling business activities. Due to this limitation of financial Accounting a separate branch of accounting has been developed which is known as cost Accounting.

Before beginning the study of Cost Accounting one must be clear in mind that he is going to read a subject which is immensely useful in all business activities if we analysis business activities we find mainly two aspects: Firstly the cost involved in it and secondly, the benefits obtained at of it. This analysis of costs and benefits is very important in all economic activities Cost Accounting involves a study of those principles, methods and techniques which help us in ascertaining, analyzing and controlling Costs.

Meaning of Cost accounting

Cost Accounting is the process of Accounting for costs. It begins with the recording of income and expenditure and ends with the preparation of periodical statements for ascertaining and controlling costs.

Definition of Cost Accounting

ICMA London defined Cost Accounting as “The process of accounting for cost from the point at which expenditure is incurred or committed to the establishment of its ultimate relationship with cost centres and cost units. In its widest usage, it embraces the preparation of statistics data, the application of Cost Control methods and the ascertainment of the profitability of activities carried out or planned”.

Objectives of Cost Accounting

The important objectives of Cost Accounting are as follows:

- (a) Ascertainment of cost –one of the important objectives of cost accounting is the ascertainment of cost at different stages of production. The Cost incurred for each department and activities are to be calculated. The standard cost for all types of costs are also to be calculated in order to compare the actual cost with the standard cost.
- (b) Internal Audit system: The objective of cost Accounting is to develop internal audit system which may help in effective working of different departments of the organization.
- (c) To classify Cost: Cost accounting classified total cost into different ways i.e., by element by functions, as direct or indirect, by variability, by normality, by controllability etc.
- (d) To control Cost: Cost Accounting aims at controlling costs by using various techniques such as Budgetary Control, Standard Costing, inventory control etc.
- (e) To provide information for Decision making: Cost accounting aims at providing information for various managerial decisions like, whether to make or buy a component, whether to retain or replace an existing machine, whether to process further or not etc.
- (f) To determine profit: Cost Accounting aims at ascertaining the costing profit or loss of any activity on an objective basis by matching cost with the revenue of that activity.
- (g) To Determine Selling Price: Cost Accounting provides cost information to determine the selling price of products or services. During the period of depression, it guides the management to decide. How much reduction in selling price may be made to meet the situation.

- (h) To provides preparation of Cost: Statements- Cost Accounting prepares Cost Statements as and when required by the management for review of costs and to plan future activities.
- (i) To evaluates the efficiency: Cost Accounting evaluates the relative efficiency of different departments, products, branches and plants so that necessary steps can be taken to improve their efficiency.
- (j) To give causes of wastage: Cost Accounting analysis and identifies the causes of wastage and helps to take necessary steps to check the wastage.
- (k) Minimum capital Stocks: Cost Accounting through various techniques like various levels of stock, analysis of slow moving material, continues stock taking can decide the objective to minimize the investment of capital in stocks of raw material, work-in-progress or finished goods.
- (l) Comparison: Cost Accounting helps in making comparisons of Cost or of profits one firm with other firm operating in the same industry. For the inter-firm comparison there should be the application of uniform costing system within that industry.
- (m) Report to the management: Cost Accounting reports to the management all information relating to costs and helps management to take decisions.

Installation of Costing System

A cost accountant will encounter the following practical difficulties at the time of installation of cost accounting system:

- (i) **Lack of trained staff:** This was no doubt a problem in olden days. Today this problem is overcome thinks to the establishment of the institute of cost and works Accountant of India in our country which offers professional course in costing and also offers training facilities through various companies to the candidates undergoing the course.
- (ii) **Lack of Support from management:** wherever costing system is installed it is essential to seek the support of various departmental managers. Very often the managers show hostile attitude towards the costing system. They feel that this system will interfere in their routine work and probably as a means of checking their efficiency under such circumstances it is better to convince them about the utility of costing system for the business as a whole.
- (iii) **Resistance by existing accounting staff:** Very often the existing accounting staff resist the installation of the cost accounting system on two grounds. Firstly they feel that the new system of accounting might lead to excess work. Secondly, they are trained of their job security. But this difficulty may be overcome by encouraging them about the usefulness of cost accounting as a supplement to financial accounts and the generation of more employment opportunities from the installation of cost accounting system.
- (iv) **Non-Cooperation from middle and bottom level management:** At times the middle and bottom level managers such as foremen, supervisors and inspectors also fail to extend their whole hearted cooperation fearing additional work which may be entrusted to them. This problem may be overcome by suggesting them about the simplicity of the system and the existence of a separate cost accounting department to look after costing matters.
- (v) **Heavy expenses in installing and maintaining the system:** The setting up of a separate costing department with staff often poses a problem. In addition to installation, the operating expenses in the form of printing and stationery, heating and lighting, depreciation and insurance, rent and rates are to be incurred. However as was mentioned earlier the system of cost accounting must be a useful investment i.e., benefits derived from it must be more than the investment made on it.

STEP TO OVERCOME PRACTICAL DIFFICULTIES

To overcome the above difficulties, following steps are suggested:

1. **Support from the top management:** Before the installation or operation of a costing system, there must be firm commitment to the system on the part of the top management. This will create cost consciousness and interest in cost improvement among technical, production and top management.
2. **Utility of system to existing staff:** The existing accounting staff should be impressed about the need to supplement the existing financial accounting system. It will broaden the job of an accountant and will create new opportunities for the accounting staff.

3. **Worker's confidence for cooperation:** The various employees must be properly educated regarding the benefits which can be obtained from such a system. Worker's confidence should be gained in the system to get their co-operation before steps are taken to put the system in practice.
4. **Training of existing accounting staff:** The existing staff working in the accounts department must be properly trained in costing methods and techniques with the help of the Institute of cost and works Accountants of India Calcutta.
5. **Cost System according to specific requirements of the concern:** The system should be installed and operated according to the requirements if a specific case, so that it may not entail heavy cost on the concern. It should avoid additional unnecessary work as far as possible. The system when installed and operated will provide many benefits of the concern as compared to the cost and improve beneficial to the concern.
6. **Proper supervision:** There should be proper supervision after installation and continuous efforts on the part of the cost accountant to make the system successful and to achieve the desired goal of cost ascertainment, cost presentation and cost control.

Methods of Costing

The various methods of costing are as follows:

1. **Job Costing:** This method where costs are collected and accumulated for each job separately. This is done because each job requires different mark and has separate identity and therefore it becomes essential to analyze and segregate costs according to each job separately.
2. **Costing:** Contract costing is a variant of job costing. The method of contract costing is applied where the job is big and of longer duration. Each contract is treated as a separate unit for the purpose of cost ascertainment and cost control, separate accounts are kept for each contract and all direct and indirect costs relating to the contract are collected.
3. **Batch Costing:** under this method, factories which have to produce a large number of parts in order to make a product undertake the production of each part in batches. Products are arranged in convenient batches and each batch is treated as one job and cost is calculated accordingly.
4. **Process Costing:** It is a method where costs are collected and accumulated according to department or processes and cost of each department or process is divided by the quantity of production to arrive at cost per unit. This method is useful in industries such as paper, soap, textiles etc.
5. **Operation Costing:** This is a more refinement and more detailed application of process costing. This involves costing by every operation instead of a process. Many operations are necessary to make an article. This method has greater accuracy and control.
6. **Single Costing:** This method is applied where production is uniform and consists of only a single product or two or three types of similar products with variation only in size, shape or quality. The information is presented in the form of a statement known as cost sheet.
7. **Operating Costing:** Where a business does not produce tangible goods but renders some service, the system of costing would be known as operating costing. This is used to determine the costs of services rendered by airways, roadways, rail ways, hospitals etc.
8. **Multiple costing:** This method is followed where the final product consists of a number of separate parts, e.g. radio set, motor car, bicycle etc. The cost of each part has to be ascertained and then the cost of assembling the parts will be tabulated. The cost of the final product will consist of the cost of all the parts plus the cost of assembling them.
9. **Uniform Costing:** where a number of firms in an industry agree to use the same costing principles, it is known as uniform costing. This method attempts to establish uniform costing method so that comparison of performance in various undertaking can be made to the common advantage of all the participating units.

1.7.2 Development of Accounting

Accounting is as old as money itself. However, the act of accounting was not as developed as it is today because in the early stages of civilisation, the number of transactions to be recorded was so small that each businessman was able to record and check for himself all his transactions. Accounting was practiced in India twenty-three centuries ago as is clear from the book named "Arthashastra" written by Kautilya, king Chandragupta's minister. This book not only relates to politics and economics but also explains the art of proper keeping up Accounts in the office of Accountants' describes records of accounts to be maintained in accountant's office and methods of checking accounts. However the modern system of Accounting based on the principles if

double Entry system owes its origin to Luco pacioli who first published the principles of double Entry System in 1994 at Venice in Italy. Thus the art of accounting has been practiced for centuries but it is only in the late thirties of 20th century that the study of the subject' Accounting has been taken up seriously.

In the recent years large scale production, cut throat competition, widening of the market and changes in the technology have brought remarkable changes in the field of accounting. In the words of Gordon and Gordon shilling law. It has come to be recognized as a tool for mastering the various economic problems which a business organization may have to face. It systematically writes the economic history of the organization. It provides information that can be drawn upon by those responsible for decisions affecting the organisation's future. This history is written mostly in quantitative terms. It Consists partly of files of data, partly of reports summarizing various portions of these data and partly of the plan established by management to guide its operations.

1.7.3 Definition and Functions of Accounting

Meaning of Accounting

Every person be he a salaried employee or a businessman, is involved in an economic activity. As the economic activity occurs, the person enters into various transactions and events. To derive the results of the economic activity be has to record such transactions and events and then determine its results. The process of recording transactions and events of a business in a useful manner so as to determine and analyse the financial performance and financial position is called accounting.

Definition of Accounting

A committee of the American Institute of Certified Public Accountants has defined Accounting as follows:

“Accounting is the art of recording, classifying and summarizing in a significant manner and in terms of money, transactions and events which are in part at least of a financial character and interpreting the results thereof.”

According to R.N. Anthony “Nearly every business enterprise has accounting system. It is a means of Collecting summarising analyzing and reporting in monetary terms information about business”.

According to Smith and Ashburn “Accounting is the science of recording and classifying business transactions and events, primarily of a financial character and the art of making significant summaries, analysis and interpretation of these transactions and events and communicating the results to persons who must take decisions or from judgments.”

Functions of Accounting

Above definition of accounting explains the main functions of Accounting. These can be summarized as under:

- 1. Recording:** Accounting involves recording of financial transactions in a systematic manner, such recording is done through journal or subsidiary books. In it accounting transactions are recorded through supporting vouchers such as purchase bills, payment vouchers, Deposit slips etc.
- 2. Classification:** second step in accounting is to put information regarding one type of transactions at one place. This is done by way of posting in the ledger. In it one finds different accounts relating to expenses classified us salary, Advertisement. Thus all expenses which are recorded in journal are classified under different account heads in ledger.
- 3. Summarising:** All the transactions recorded in journal and posted in the ledger are summarized in such a manner that these are useful for the user of accounts. This is done by preparing Trial Balance and final accounts.
- 4. In terms of Money:** Accounting records transactions in terms of money. Money represents the currency of the country where accounts are maintained money gives a common basis if measurement.
- 5. Transactions and Events:** In business, both transactions and events are recorded. If business is involved with outsiders, it is a transaction such as buying and selling of goods, taking a loan, paying salary, rent etc. There are a number of happenings that do not concern outsiders, these are called “Events” such as loss due to fire, depreciation of assets etc. Both transactions and events are recorded in accounts.
- 6. Financial Character:** The transaction or event to be recorded should have monetary value. If it cannot be measured in terms of money it will not be recorded in accounts. Thus, through the salary given to employee will be recorded, but how honestly and efficiently employee has worked will not be recorded.
- 7. Communication and Interpretation of results:** Accounting also involves communication and interpretation of the results of the business. Communication implies reporting to the end users. The accounting information in desired form so as to enable them to understand the historical information e.g.

preparation of profit and loss Account to understand the results, Balance Sheet to understand the financial position. Interpretation involves meaningful comparison which simplifies understanding of financial reports.

1.7.4 Book keeping and Accounting

Book keeping is defined as a process of recording business events in a systematic manner. It involves recording of transactions. It refers to the record making stage of accounting. This stage of accounting is mechanical and repetitive. However, maintenance of proper records help a business organization to know its health and performance. Accounting on the other hand, includes not only the maintenance of accounting records but also preparation of summary statements, their analysis and interpretation. Thus book-keeping is only a small and simple part of accounting.

But the term accounting is used in a broader sense Covering all the accounting activities including preparation of final statements and their reporting to interested parties. Thus book-keeping is an aspect of the accounting process. It is a sub-field of accounting.

1.7.5 Is Accounting a science or an Art?

Accounting is a science as well as an art because it contains the ingredients of both science and art.

Science is a systematic body of knowledge consisting of a number of principles, methods and techniques which have universal applications. Likewise, accounting has certain principles and rules that are followed all over the world. For example recording of transaction at cost is universally followed. However, accounting is not an exact science like physics and chemistry where cause and effect relationship is established. In accounting the cause and effect relationship is not studied. Thus to conclude accounting is a science but not an exact science. It is a social science.

On the other hand Art refers to the application of knowledge to achieve the desired objectives. Knowing the principles and rules is not enough. These rules should be applied intelligently to solve the real life problems. Rigorous practice is necessary to achieve a desired skill. For example, the more a dancer practices the more perfect he will be. Similarly the accountant must apply the principles of accounting again and again to gain efficiency. Application of accounting knowledge is of vital importance to prepare records and summary statements. Therefore accounting is also an art.

1.7.6 Accounting and others Disciplines

In order to appreciate fully the role of accounting in modern society, it is essential to consider the environment in which accounting functions. Accounting is related closely to economics and statistics. It is often greatly influenced by law and by government action, accounting is often considered to be mathematical at least arithmetical.

But economics and statistics touch fundamental nature of accounting. For the subject matter, accounting is inescapably economic and its basic methodology is unquestionably statistical in character.

1. Accounting and Statistics:

Accounting method is statistical in character because its central mechanism consists of accounts, and accounts are classification categories used for compressing and simplifying a mass of enterprise transactions. The chief function of statistical method is to classify, compress and simplify masses of data so that their significance may be understood. Accounting has the same functions.

Accounting has some statistical peculiarities of its own. Every ledger account is a dual category. Items on the debit are of one class, items on the credit are of an opposite class, yet both are related to the single class of data indicated by the account name. Internal transactions reallocate expenses and revenues among fiscal periods. Accounting is the connecting link, it ties the mass of activity data to the need for understanding activities. Accounting is a service that records, classifies, compresses, simplifies a mass of detail into a few understandable related totals and sub-totals.

2. Accounting and Economics:

From the definition of accounting quoted earlier it can be seen that the setting in which accounting serves, is an economic one because accounting is concerned with business transactions. Accounting is oriented most closely to economics.

It is an economic purpose of accounting to produce data helpful to business management and investors. Accounting contributes factual materials to the formation of business policies. Expenses and revenues result from buying policies, spending policies, pricing policies, selling policies, employment policies. The result of accounting, therefore can be clues to good and bad policies. According to Wheeler the mutuality of interests of the two fields is so great that it is often difficult to fall where accounting leaves off and economics begin.

3. Accounting and law:

According to Kester the influence of law on accounting “In as much as business must be carried on within the provisions of the law, principles or rules of law have exerted a powerful influence on the principles of accounting, they may well be said to have established. Some of the principles of accounting, obviously, accounting principles and rules dare run counter to established legal principles.

All economic activities of a business are effected by governing laws e.g. all transactions of purchase and sale are effected by contract act, transactions of Bills of exchange and Banking transactions are effected by negotiable instrument Act. Entry sometimes is itself created/governed by laws e.g. partnerships are governed by partnership Act, Companies by Companies Act, Banking Companies by Banking Regulation Act etc. governing laws provide strict compliance with stated provisions relating to book keeping, accounting and except the reporting be done in laid-down manner.

However in current scenario the accounting is not just effecting law. But laws are also been effected by accounting.

4. Accounting and Management:

Obviously the environment of accounting is one of business while accounting provides useful services to individual and fraternal, religious, government, and educational organizations, its principal service deals with the business enterprise. Kester has stated that accounting is primarily and basically a service tool of management.

The growth and development of accounting is closely parallel to that of business enterprise. With the growth of the large corporation come a corresponding growth of accounting services. Consequently the recognition of the public aspects of corporate administration brought a realization that accounting responsibilities transcend service to the owners and the management of corporations. Today accounting while serving the business enterprise, serves society.

5. Accounting and Mathematics:

Double entry book-keeping is based on an algebraic equation i.e. liabilities + capital = asset.

Arithmetical and algebraic calculations are required for making accounting computations. Therefore knowledge of arithmetic and algebra is necessary for accounting proficiency. Examples are calculation of interest, lease rent, depreciation creation of sinking fund etc. with the increasing use of computer accounting, knowledge of mathematics has been more essential. Further, statistical models are used for constructing various accounting models for the use of management.

1.7.7 End-users of Accounting Information

Accounting information is used by various persons. In addition to proprietors, such information is used by creditors, Government, financial institutions and others.

1. **Proprietor:** Proprietor is the main user of accounting, through accounts he ascertains operating result of his business. Further he knows his financial position. He uses accounting information to know amounts due to others and due from others.
2. **Management:** In large business organization, ownership and management are separate functions management has to plan, control and execute. Accounting information is used for fulfilling various management functions. Accounting data is useful in decision making at various stages.
3. **Suppliers of Goods and Services:** Persons who supply goods and services to business on credit are interested in knowing liquidity position of the business. They have to ensure repayment capacity of the business. They use accounting information for this purpose.
4. **Banks and Financial Institutions:** Banks and other financial Institutions who provide loan to the business are interested to know credit worthiness of the business. At the time of granting loan they are keen to know past performance of the firm, study profit and loss Account and Balance Sheet of the firm of previous years to know capacity of the firm to repay interest and principal amount.
5. **Prospective Investors:** Persons who are interested to make investments in some Company, may study annual reports of the Company before making final decision of investments. They may select the company in which investment is to be made by comparing past performance of these companies.
6. **Government:** Government uses accounting information for levying various taxes. In the absence of accounting data it is difficult to assess proper tax.
7. **Customers:** Customers who place orders and are dependent on a specific business organization for their supplies have to ensure the capability of the firm to execute the orders. This can be done by studying accounts of that business organisation.

8. **Employees:** Employees use accounting information for various purposes. They can assess their salary increase and bonus by studying profitability of the business. If business is constantly incurring Losses, they may decide to leave the organization and if business is constantly earning they may be more settled and expect career promotion in some enterprise.
9. **Regulatory Agencies:** Various regulatory agencies such as ROC, REI, IRDA, SEBI, require information to be filed with them under law. By examining these accounting information they ensure that concerned companies are following the rules and regulations.
10. **Courts:** In case of disputes regarding indebtedness insolvency etc. Courts use accounting information and other related data as evidence.
11. **Researchers and statisticians:** Research scholars who undertake research on any aspect of business activity, may use accounting information for the purpose of analysis. Accounting reports of various companies and of various years may be compared for this purpose.

1.8 RELEVANT COST

A cost may be said to be relevant, if it influences the decisions of the management. It is influenced by the decision to be taken or the decision under the consideration of management. It is a cost whose magnitude will be affected by a decision being made. While taking decisions, the management should consider only future costs and revenues that will differ under each alternative. Management is concerned with things it can fetch.

The following are the two main characteristics of relevant costs.

(i) Different Alternatives

Relevant cost differ in amount among two alternatives. In case some alternatives do not differ among themselves, they are not considered relevant. So only those costs that differ among decision alternatives are relevant to a decision.

(ii) Expected Future Costs

Relevant costs are future costs as they are expected to occur during the period covered by the decision. Decisions are based on the future expectations of cost and revenue. Selection of one alternative over another does not affect the past cash flows. Expected future costs are predicted from the available historical cost data. Historical cost may be irrelevant for decisions making as they represent the cost that have already been incurred.

1.9 STATEMENT OF COST

1.9.1 Meaning of Cost Sheet

A Cost Sheet is a statement showing various components of total cost of output of a particular product or service produced during a particular period. It may be prepared on actual basis or estimated basis.

1.9.2 Importance of Cost sheet

The following are the advantages:

1. It discloses the cost per unit as well as total cost of output.
2. It discloses the various elements of cost which to make up total cost.
3. By fixing selling price in advance it facilitates preparation of tender price.
4. It facilitates comparison of total cost with previous year's cost and standard cost and thereby help management in locating inefficiency in production.
5. It facilitates calculation of sales price when profit is taken as a fixed percentage on cost.
6. It helps an undertaking to submit quotation for an order with reasonable degree of accuracy.
7. It guides the management in formulating proper production policy.
8. Cost reduction can be made by analyzing and calculating the percentage of different overheads on total cost.

Proforma of Cost Sheet
Cost Sheet for the period

Total Cost Cost per Unit (`)

	Direct Material	xxx	
Add:	Direct labour	xxx	
Add:	Direct Expenses	xxx	
	Prime Cost	xxx	
Add:	Factory overheads		
	Factory Rent	Xxx	
	Foreman salary and wages	xxx	
	Drawing office salary	xxx	
	Consumables stores	xxx	
	Wages of watchman	xxx	
	Motive power	xxx	
	Factory Cost	xxx	
Add:	Administrative overhead		
	Office Rent	xxx	
	Depreciation office building	xxx	
	Manager or director salary	xxx	
	Counting house salary	xxx	
	Audit fees	xxx	
	Cost of production	xxx	
Add:	Selling and distribution overhead		
	Sales office expenses	xxx	
	Sales man salary	xxx	
	Showroom expenses	xxx	
	Advertisement charges	xxx	
	Warehouse Rent	xxx	
	Delivery van expenses	xxx	
	Rent of godown	xxx	
	Cost of sales	xxx	
	Total cost	xxx	
	Profit/Loss	xxx	
	Sales	xxx	

Illustration 1.8

Prepare a cost sheet form the following data relating to A ltd for the year ending 31.3.2015.

Raw material purchased	35,000
Direct wages	32,000
Factory wages	8,000
Power, fuel and haulage	12,000
Carriage inward	2,700
Carriage outward	3,000
Drawing expenses	2,200
Printing and stationery	3,300
Factory manager salary	6,000
Office manager salary	6,400
Factory Rent	1,600
Warehouse expenses	4,200
Office rent and taxes	3,800
Traveler's salary	5,200
Depreciation on plant	2,500
Income tax	3,200
Advertisement	6,200
Donation	11,000

Profit 20% on cost of Sales.

Solution:

Cost Sheet
For the year ending 31.3.2015

	Details (₹)	Total (₹)
Raw material purchased	35,000	
Add: Carriage inward	2,700	
	<u>37,700</u>	
Add: Direct wages	32,000	
Add: Direct Expenses Prime Cost		69,700
Add: Factory overheads		
Factory wages	8,000	
Power, fuel and haulage	12,000	
Draining expenses	2,200	
Factory manager's salary	6,000	
Factory Rent	1,600	
Depreciation on plant	2,500	32,300
		Factory Cost
Add: Administration overheads		1,02,000
Printing and stationery	3,300	
Office manager salary	6,400	
Office Rent and taxes	3,800	13,500
		Cost of Production
Add: Selling and distribution overhead		1,15,500
Carriage outward	3,000	
Warehouse expenses	4,200	
Traveler's Salary	5,200	
Advertisement	6,200	18,600
		Total Cost or Profit
$\left(\frac{20}{100} \times 34,100 \right)$		1,34,100
		26,820
		Sales
		<u>1,60,920</u>

Specimen of Cost Sheet with stock Treatment
Cost Sheet of _____
For the year _____

	Total Cost	Cost per Unit (₹)
Opening stock of Raw material	xxx	
Add: Purchase of raw material	xxx	
Less: Closing stock of raw material	xxx	
Value of raw material consumed	xxx	
Add: Direct Labour	xxx	
Add: Direct Expenses	xxx	
Prime cost	xxx	
Add: Factory overhead	xxx	
Add: Opening work-in-progress	xxx	
Less: Closing work-in-progress	xxx	
Factory Cost	xxx	
Add: Administrative overhead	xxx	
Add: Opening stock of finished goods	xxx	
Less: Closing stock of finished goods	xxx	
Cost of production	xxx	
Add: Selling and distribution overhead	xxx	
Total Cost or Cost of Sales	xxx	
Profit/Loss	xxx	
Sales	xxx	

Illustration 1.9

Opening Stock of Raw material	18,000
Closing Stock of Raw material	20,000
Opening work-in-progress	12,000
Closing work-in-progress	10,000
Opening stock of Finished goods	25,000
Closing Stock of finished goods	16,000
Purchase of Raw materials	1,35,000
Productive wages	70,000
Factory overhead	50,000
Administrative overhead	36,000
Selling and distribution overhead	46,000

If profit is 25% on cost find profit with cost sheet.

Solution:

Cost Sheet		
	Total Cost	
Opening stock of Raw material	18,000	
Add: Purchase of raw material	1,35,000	
	1,53,000	
Less: Closing stock of raw material	20,000	
	1,33,000	
Value of raw material consumed		
Add: Direct Labour/productive wages		70,000
Prime cost		2,03,000
Add: Factory overhead	50,000	
Add: Opening work-in-progress	12,000	
	62,000	
Less: Closing work-in-progress	10,500	
	51,500	
Factory Cost		
Add: Administrative overhead	36,000	2,54,500

Add: Opening stock of finished goods	25,000	
Less: Closing stock of finished goods	61,000	
	16,000	
		45,000
Cost of production		2,99,500
Add: Selling and distribution overhead		46,000
	Total Cost	3,45,500
	Profit (1/4×3,45,500)	86,375
	Sales	4,31,875

Illustration 1.10

From the following data you are required to prepare the Statement of profit under marginal costing system

Production units	10,000
Sales units	8,000
Raw material consumed (`)	50,000
Direct wages (`)	30,000
Factory Overheads:	
Variable overheads (`)	20,000
Fixed overheads (`)	20,000
Selling price (`)	15

Solution:

Profitability Statement under marginal Costing

Particulars	
Raw material consumed	50,000
Add: Direct wages	30,000
Add: Variable Factory overheads	20,000
	1,00,000
Total variable Cost	
Less: Value of closing stock (1,00,00/10,000×2,000)	20,000
Variable cost of goods Sold	80,000
Sales (8,000×15)	1,20,000
Contribution	40,000
Less: Fixed overheads	20,000
Profit	20,000

1.10 SUMMARY

- The make or buy decision is made to determine the alternatives which is most desirable.
- Differential Cost Analysis is also used when a business is confronted with the possibility of a Temporary shutdown.
- A key factor is one which generally limits the profit, output or sales.
- Book-keeping as a process of recording business events in a systematic manner.
- Contract costing is a variant of job costing.

1.11 KEY TERMS

- Buy decision: the make or buy decision is made to determine the alternative which is most desirable.
- Cost sheet: A cost sheet is a statement showing various components of total cost of output of a particular product or service produced during a particular period.
- Multiple costing: This method is followed where the final product consists of a number of separate parts.
- Single Costing: This method is applied where production is uniform and consists of only a single product.
- Process Costing: It is a method where costs are collected and accumulated according to department or process.
- Cost Accounting: Cost Accounting is the process of accounting for costs.

- Financial Accounting: Financial Accounting aims at recording business transaction systematically to ascertain profit or loss and financial position of the business.
- Management Accounting: Management Accounting is provide information to the management for decision making.

1.12 QUESTIONS AND EXERCISES

1. Explain the meaning of 'relevant costs'. What are the characteristics of such costs ?
2. Explain the steps that are to be taken for rational decision-making.
3. What factors would you take into consideration in closing or suspending the business activity
4. A company has to decide whether to 'Make or Buy'. Through differential cost analysis, how you will ascertain the net difference between the two alternatives so as to assist the management in their decision-making? Use hypothetical figures to illustrate.
5. 'The role of managerial accountant in deciding among alternative courses of action is crucial'. Examine this statement with special reference to special order acceptance.
6. Cost benefit analysis is needed for resolving many managerial problems. List the various items of cost and benefit that will quantify in respect of managerial decisions concerning (a) Change versus status quo. (b) Retain or replace, (c) Shut down or continue.
7. Define (i) Differential cost, and (ii) Marginal cost.
8. Briefly explain the relevant considerations involved in respect of :
 - (a) Make or Buy;
 - (b) Temporary closure of a business or part of a business;
 - (c) Choosing a channel of distribution for a product.
9. Define the following terms :
 - (i) Relevant cost, (ii) Differential cost, (iii) Opportunity cost, (iv) Sunk cost,
10. What are relevant costs ? Identify two common pitfalls in relevant cost analysis ?
11. It is said that the sales at a price less than the total cost sometimes fetch benefit to a business house. State the circumstances in which this is justified.

PRACTICAL PROBLEMS

Decision Regarding Sales Mix

1. Present the following information to show to the management (a) the marginal product cost and the contribution per unit; (b) the contribution and profit resulting from each of the following sales mixtures :

	Product	Per unit
Direct Materials	<i>P</i>	₹ 10.00
	<i>Q</i>	₹ 9.00
Direct Wages	<i>P</i>	₹ 3.00
	<i>Q</i>	₹ 3.00
Fixed Expenses :		₹ 800
	<i>Q</i>	₹ 2.0

(Variable expenses are allocated to products as 100% of direct wages)

Sales Price	<i>P</i>	20.00
	<i>Q</i>	15.00

Sales Mix :

- (i) 1,000 units of product *P* and 2,000 units of *Q*.
- (ii) 1,500 units of product *P* and 1,500 units of *Q*.
- (iii) 2,000 units of product *P* and 1,000 units of *Q*.

Recommend which of the sales mix should be adopted.

[Ans. Profit : (i) ₹ 7,200, (ii) ₹ 8,200, (iii) ₹ 9,200, Mix : (iii) is recommended.]

2. From the following data you are required to present to the management :

- (i) The marginal cost of product *A* and *B* and the contribution per unit.
- (ii) The total contribution and profit resulting from each of the suggested sales mix.

Direct Materials	₹ per unit	Direct Wages :	₹ per unit
Product A	10.50	Product A	3.00
Product B	8.50	Product B	2.00
Fixed Expenses (Total)	₹ 800	Selling price :	
Variable Expense		Product A	20.50
100% of direct wages per product		Product B	
<i>Suggested Sales Mix</i>		<i>No. of units</i>	
		Product A	Product B
(a)	100	200	
(b)	150	150	
(c)	200	100	

[Ans. Profit: (a) Nil, (b) ₹ 00, (c) ₹ 200; Mixture: (c) is recommended]

Exploring New Markets

3. Due to industrial depression, a plant is running, at present, at 50% of its capacity. The following details are available :

Cost of Production per unit

Direct Material	₹ 2
Direct Labour	₹ 1
Variable Overhead	₹ 3
Fixed Overhead	₹ 2
Total	<u>₹ 8</u>
Production per month	20,000 units
Total Cost of Production	₹ 1,60,000
Sale Price	₹ 1,40,000
Loss	₹ 20,000

An exporter offers to buy 5,000 units per month at the rate of ₹ 6.50 per unit and the company hesitates to accept the offer for fear of increasing its already large operating losses.

Advise whether the company should accept or decline this offer.

[Ans. The company should accept the offer since the amount of loss will stand reduced from ₹ 20,000 to ₹ 17,500.]

4. The 'PQR' company manufactures a product which costs:

Fixed (per month)	₹ 1,000
Variable (per unit)	10 paise.

Sales are at present 10,000 units per month at 30 paise per unit.

- (a) A proposal to extend the sale to a foreign market has come where demand for an additional 5,000 units per month is expected. However, in order to do this it will be necessary to absorb additional shipping cost and duties amounting to 12 paise per unit. Will the foreign business be profitable ?
- (b) A domestic chain store has offered to take 5,000 units per month at 18 paise unit. Should this order be accepted in place of the foreign order?
- (c) The sales department proposes to reduce the selling price of the product to increase sales. The following estimates of sales volume at various prices are made:
 - (i) 30 paise per unit (present price)

Assuming that the above estimates are correct, should you reduce the price? If so, to what level?

[Ans. (a) Additional Profit ' 400.

(b) (i) Total Profit ` 1,000; (ii) Total Profit ` 1,100; (iii) Total Profit ` 900.

Thus, ignoring the question of additional sale abroad or to domestic chain store, sale of 14,000 units gives the best results. It may be advisable to accept the order of 5,000 units from abroad, besides selling 14,000 units at ` 0.25 per unit, presuming availability.]

Discontinuance of a product line

5. A company which sells four products, some of them unprofitable, proposes discontinuing the sale of one of them.

The following information is available regarding income, costs and activity for the year ended 31st March, 1999:

	<i>Products</i>			
	<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>
Sales	₹ 3,00,000	5,00,000	2,50,000	4,50,000
Cost of sales at purchase price	₹ 2,00,000	4,50,000	2,10,000	2,25,000
Area of storage (sq. ft.)	50,000	40,000	80,000	30,000
Number of parcels sent	1,00,000	1,50,000	75,000.	1,75,000
Number of invoices sent	80,000	1,40,000	60,000	1,20,000

Its overhead cost and basis of allocation are :

Basis of allocation to products

Fixed Costs:

Rent and Insurance	₹ 30,000	Sq.ft.Occupied
Depreciation	10,000	Parcels Sent

Salemen's Salaries and Expenses	60,000	Sales Volume
Administration Wages and Salaries	50,000	No of Invoices

Administration Variable Costs:

Reckling Wages and Materials 20 paise per Barel

Packing, Wages and Materials	20 cents per
Commission	4% of Sales

Commission	4% of Sales
Stationery	10 paise per Invoice

Stationery

(a) Prepare Profit and Loss Statement, showing the percentage of profit or loss to sales for each product.
 (b) Compare the profit if the company discontinues sale of product 'Q' with the profit if it discontinues product 'R'.

[Ans. (a) P: Profit 9.5% Q: Loss 12.1% R: Loss 8.8%; S: Profit 26.4% (b) Total Profit if 'Q' is discontinued ₹ 79,000, Total Profit if 'R' is discontinued ₹ 56,000.]

6. A Limited manufactures three different products and the following information has been collected from the books of account :

	Products		
	P	Q	R
Sales Mix	35%	35%	30%
Selling Price	30	40	20
Variable Cost	₹15	20	12
Total Fixed Costs	₹1,80,000		
Total Sales	₹6,00,000		

The company has currently under discussion a proposal to discontinue the manufacture of product R and replace it with product M, when the following results are anticipated:

	Products		
	P	Q	R
Sales Mix	50%	25%	25%
Selling Price	₹30	40	30
Variable Cost	₹15	20	15
Total Fixed Costs	₹1,80,000		
Total Sales	₹6,40,000		

Will you advise the company to change over to production of M. Give reason for your answer.

[Ans. Present Profit 1,02,000; Present BEP ₹ 3,83,000; Profit under proposed situation ₹ 1,40,000; BEP ₹ 3,60,000. The Proposal to replace the Product R with Product M May be accepted.]

Make or Buy

7. A audio manufacturing company finds that while it costs ₹ 6.25 each to make component P 273 Q, the same is available in the market at ₹ 5.75 each, with an assurance of continued supply. The breakdown of costs is :

Materials	₹2.75 each
Labour	₹1.75 each
Other variable costs	₹0.50 each

Depreciation and other fixed cost ₹ -1.25 each

(a) Should you make or buy? ₹ 6.25 each

(b) What would be your decision if the supplier offered the component at ₹ 4.85 each?

[Ans. (a) Variable cost ₹ 5, hence not profitable to buy.
 (b) There is a saving of 15 p. per component, the offer may be accepted.]

8. Auto Parts Ltd. has an annual production of 90,000 units for a motor component. The component's cost structure is as given

	₹ per unit
Materials	270
Labour (25% fixed)	180
Expenses :	
Variable	90
Fixed	135
Total	675

(a) The Purchase Manager has an offer from a supplier who is willing to supply the component at ` 540. Should the component be purchased and production stopped?

(b) Assume the resources now used for this component's manufacture are to be used to produce another new product for which the selling price is ` 485.

In the latter case material price will be ` 200 per unit. 90,000 units of this product can be produced, at the same cost basis as above for labour and expenses. Discuss whether it would be advisable to divert the resources to manufacture that new product, on the footing that the component presently being produced would, instead of being produced, be purchased from the market.

[Ans. (a) Variable Cost per unit : ` 495, Purchases Price ` 540. It is beneficial to continue the production of the component. (b) Contribution per unit of the new product; ` 60 (i.e., ` 485 – ` 425). Additional cost of purchasing component per unit; ` 45 (i.e. 540-495). There is a net saving of ₹15. It is beneficial to buy the component.]

Change versus Status Quo

9. A company is producing two products 'A' and 'B' from a joint manufacturing process. The joint costs are ` 2,00,000 and it has given a production of 1 lakh kilogram of 'A' having a selling price ₹1 per kilogram and 2 lakh kilograms of 'B' having a selling price of ` 1.50 per kilogram.

The company is considering a proposal to process product 'A' into a new product 'Z' which sells at ` 3 per kilogram. The processing cost would amount to ` 1,75,000 for converting one lakh kilograms of product 'A' to product 'Z'.

You are required to advise the company about the acceptance or rejection of the above proposal.

[Ans. Transformation will result in an additional profit of ` 25,000. The proposal may, therefore, be accepted.]

10. (a) A company is manufacturing three products details of which for the year are given below :

Product	Price	Variable cost	Per Cent	
			of total	Sales value
	₹	₹		
A	20	10	40	
B	25	15	35	
C	20	12	25	
Total Fixed Costs per year			` 1,10,000	
Total Sales			` 5,00,000	

You are required to work out the break-even point in rupee sales for each product assuming that the sales mix is to be retained.

(b) The management has approved a proposal to substitute product C by product D in the coming year. The latter product has a selling price of ` 25 with a variable cost of ` 12.50 per unit. The new sales mix of A, B and D is expected to be 50: 30: 20. Next year fixed costs are expected to increase by ` 31,000. Total sales are expected to remain at ` 5,00,000. You are required to work out the new break-even point in rupees sales and units for each product.

(c) What is your comment on the decision of the management regarding changing product mix.

[Ans. (a) Total Contribution ` 2,20,000; Profit ` 1,10,000; Composite BEP ` 2,60,000

(b) Total Contribution ` 2,35,000; Profit ` 94,000; Composite BEP ` 3,00,000

(c) The decrease in net profit in second year is due to fixed costs and not because of change in Product Mix. The overall contribution has increased by `15,000. Hence, the management may change the product mix, as proposed.]

Shut down or Continue

11. B Ltd. has a factor which manufactures a product whose sales have declined to `40,000 per annum. Special purpose machinery is employed to make the product and there is no hope of this used for any other purpose. Nor is there any hope of stimulating demand of the existing product. The estimated life of the factory plant is 5 years and sales should continue at the same level for the whole period. Total variable costs per annum for the expected sales are `20,000. Fixed costs per annum total 15,000 including `7,000 as depreciation.

All sales and expenses accrue at the end of the year.

If the factory is sold "lock, stock and barrel" immediately, `30,000 may be obtained. On the other hand, if it is operated for 5 years, `4,000 is the estimated residual value.

Presuming 10% as the cost of capital, you are required to advise whether it will be appropriate to operate the factory or close it down immediately. The present value of an annuity of `1 at 10% discount for 5 years may be taken as `3.791 and the present value of `1 received after 5 years at 10% discount is `0.62.

[**Ans.** If plant is operated for five years total cash inflow would amount to `47,976. If it is sold only 30,000 would be realised. It is, therefore, advisable to continue the business to operate.]

[**Hint.** If factory operates, the annual cash inflow is `12,000, Moreover, `4,000 will be realised as scrap. The present value of cash inflows, therefore, amounts to `47,976 (i.e., $12,000 \times 3.791 + 4,000 \times .621$.)]

12. A paint manufacturing company manufactures 2,00,000 per annum medium sized tins of "Spray Lac Paints" when working at normal capacity. It incurs the following costs of manufacturing per unit :

Direct Material	7.80
Direct Labour	2.10
Variable Overhead	2.50
Fixed Overhead	4.00
Product Cost (per unit)	4.00
Total	16.40

Each unit (tin) of the product is sold for `21 with variable selling and administration expenses of 60 paise per tin. During the next quarter only `10,000 units can be produced and sold. Management plans to shut down the plant estimating that the fixed manufacturing cost can be reduced to `74,000 for the quarter.

When the plant is operating, the overhead are incurred at a uniform rate throughout the year. Additional costs of plant shut. Down for the quarter are estimated at `14,000.

You are required :

(a) to express your opinion, along with the calculations, as to whether the plant should be shut down during the quarter and

(b) to calculate the shutdown point for quarter in units of products (i.e., in terms of number of tins)

[**Ans.** (a) Loss when plant is operated `1,20,000, Loss when plant is shut down `88,000. The Management should shut down the plant.

(b) Shutdown point at output of 14,000 units (i.e., $1,12,000/8$)]

UNIT-2: ABSORPTION COSTING AND MARGINAL COSTING

Chapter Outlines

- 2.0 Learning Objectives
- 2.1 Introduction
- 2.2 Meaning of Marginal Cost
- 2.3 Marginal Costing
- 2.4 Absorption Costing
- 2.5 Special Terms for Marginal Cost
 - 2.5.1 Contribution
 - 2.5.2 Cost Volume Profit Analysis
 - 2.5.3 Break-Even Point
 - 2.5.4 Angle of Incidence
 - 2.5.5 Margin of Safety
 - 2.5.6 Key or Limiting factor
 - 2.5.7 Assumptions underlying CVP Analysis / Break - Even Charts
- 2.6 Managerial Application of CVP Analysis.
- 2.7 Summary
- 2.8 Key Terms
- 2.9 Questions and Exercises

2.0 LEARNING OBJECTIVES

After studying this chapter, you should be able to understand:

- Explain concept of absorption and marginal costing.
- Distinguish between absorption costing and marginal costing.
- Explain the managerial application of CVP analysis.
- Explain the concept of angle of incidence.

2.1 INTRODUCTION

In cost accounting, cost of production per unit of the goods produced or services provided is calculated with the help of the various methods such as Unit Costing Method, job costing, Batch Costing, contract Costing or Process Costing. Marginal costing is not a method of calculating the cost of production as the above given methods are but it is a technique applicable to the existing methods to find out the effect on profits if changes are made either in the volume of output or in the type of output. Thus marginal costing is a technique which helps the management in taking various routine and special or crucial decisions for running the organisational activities like (i) To continue with a product or not, (ii) To change the selling price as per the market conditions, (iii) To change the method of production, (iv) To make or buy decision, (v) To decide about sales mix.

2.2 MEANING OF MARGINAL COST

- (i) According to I.C.M.A. London, marginal cost is defined as “The amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit. In practice this is measured by the total variable attributable to one unit.” In this context, a ‘Unit’ may be single article, a batch of articles, an order, a stage of production capacity, a man-hour, a process or a department.
- (ii) According to Blocker and Weltmore, “Marginal cost is the increase or decrease in the total cost which result from producing or selling additional unit of a commodity or from a change in the method of production or distribution.”

Marginal cost is the aggregate of variable costs. It is the cost of producing one additional unit. The marginal cost concept is based on the distinction between fixed and variable costs. Marginal cost is the total of variable costs only and fixed costs only and fixed costs are ignored.

So, after analysing the definition we can say that with the increase in one unit of output, the total cost is increased and this increase in total cost from the existing to the new level is known as 'Marginal Cost'.

For example, for the production of 1,000 units of product, the variable costs per unit is `5 and fixed costs are `5,000 per annum. If the production is increased by one unit, the marginal cost will be:

Total cost of 1,000 units:

$$\begin{aligned}
 \text{Fixed costs} &= `5,000 \\
 \text{Variables costs } (1,000 \text{ units} \times 5) &= `5,000 \\
 \text{Total cost} &= \text{Fixed Costs} + \text{Variables Costs} \\
 &= `5,000 + `5,000 = `10,000 \\
 \text{Per unit costs} &= \frac{10,000}{1,000} = `10/-
 \end{aligned}$$

Total cost of 1,001 units:

$$\begin{aligned}
 \text{Fixed costs} &= `5,000 \\
 \text{Variable costs } (1,001 \text{ units} \times 5) &= \underline{\underline{`5,005}} \\
 \text{Total costs} &= `10,005 \\
 \text{Marginal cost} &= `10,005 - `10,000 = `5
 \end{aligned}$$

Hence, marginal cost is `5. This is the change in total cost due to change in one unit of output.

2.3 MEANING OF MARGINAL COSTING

According to the Institute of cost and management accountants, London, Marginal costing is defined as "The ascertainment of marginal cost and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable costs. In this technique of costing only variable cost are charged to operations, processes or products, while the fixed costs are to be written off against profits in the period in which they arise."

Thus, in this context, we can say that marginal costing is a technique which is concerned with the changes in costs and profits result from changes in volume of output. Marginal costing is also known as 'Variable Costing'.

2.4 ABSORPTION COSTING / TOTAL COSTING

Absorption costing is the total cost technique. It is the practice of charging all costs, both variable and fixed, to operations, processes or products. Under absorption costing all costs whether variable or fixed are treated as product cost. Absorption costing is also known as full costing technique.

This method employs highly arbitrary way of apportionment of overheads which reduces the practical utility of cost data for controlling purposes.

Illustration 2.1

The following information relates to a company:

Production 40,000 units
 Sales 40,000 units
 Selling Price `30 per unit
 Direct Material `5 per unit
 Direct Labour `4 per unit
 Overheads :
 Variables `3 per unit
 Fixed `1,00,000

Calculate net profit under :

(a) Absorption Costing Method : (b) Marginal Costing Method.

Solution:

Income Statement (Absorption Costing)

Sales	Particulars	
Sale (40,000 units `30)		12,00,000
Less : Cost of goods sold :		
Direct Material (40,000 × 5)		2,00,000
Direct Labour (40,000 × 4)		1,60,000
Overheads :		
Variable (40,000 × 3)		1,20,000
Fixed		1,00,000
Net Profit		5,80,000
		6,20,000

Income Statement (Marginal Costing)

Particulars	
Sale (40,000 × `30)	12,00,000
Less : Variable Cost :	
Direct Material (40,000 × 5)	2,00,000
Direct Labour (40,000 × 4)	1,60,000
Variable Overheads (40,000 × 3)	4,80,000
Contribution	7,20,000
Less : Fixed Cost	1,00,000
Net Profit	6,20,000

Illustration 2.2

The following information relates to a company:

Production	40,000 units
Sales	30,000 units
Selling Price	`30 per unit
Direct Materials	`5 per unit
Direct Labour	
Factory Overheads:	
Variable	`3 per unit
Fixed	1,00,000
Selling and Distribution overheads:	
Variable	`1 per unit
Fixed	45,000

Calculate:

- Net Profit under Absorption Costing Method.
- Net Profit under Marginal Costing Method.

Solution:

Income Statement (Absorption Costing)

Sales	Particulars	
Sale (30,000 × 30)		9,00,000
Less : Cost of Sales :		
Direct Material (40,000 × 5)		2,00,000
Direct Labour (40,000 × 4)		1,60,000
Factory overheads :		
Fixed		1,00,000
Variable (40,000 × 3)		1,20,000
Less : Closing Stock	{ 5,80,000 - 40,000 × 10,000 units }	5,80,000

		1,45,000
		4,35,000
Add : Selling and Distribution Overheads :		
Fixed		45,000
Variable ($30,000 \times 1$)		30,000
Net Profit		5,10,000
		3,90,000

Note : Closing stock value of Total Cost.

Income Statement (Marginal Costing Method)

Particulars	, ,
Sale ($30,000 \times 30$)	9,00,000
Less : Variable Cost :	
Direct Material ($40,000 \times 5$)	2,00,000
Direct Labour ($40,000 \times 4$)	1,60,000
Factory Overheads ($40,000 \times 3$)	1,20,000
Less: Closing Stock $\left(\frac{4,80,000}{40,000} \times 10,000 \text{ units} \right)$	4,80,000
	()
	1,20,000
	3,60,000
Add: Selling and Distribution ($30,000 \times 1$) :	30,000
Contribution	5,10,000
Less: Fixed Cost:	
Factory Overheads	1,00,000
Selling and Distribution Overheads	45,000
Net Profit	1,45,000
	3,65,000

Note: Closing stock value of Variable Cost.

2.5 SPECIAL TERMS FOR UNDERSTANDING MARGINAL COST

- (i) Contribution
- (ii) Profit Volume Ratio (P/V ratio)
- (iii) Break Even Analysis
- (iv) Break Even point (BEP)
- (v) Break Even Graph
- (vi) Angle of Incidence
- (vii) Sales for Desired Profit
- (viii) Margin of Safety (M/S)

2.5.1 Contribution

Contribution is the difference between Sales and Variable Cost or marginal cost. In other words, contribution is defined as the excess of sales over variable cost. Contribution first contributes to fixed cost and then to profit. Higher contribution means more profit and lower contribution means less profit. So the management of an organisation tries to increase contribution for higher earning.

Contribution can be represented as :

1. Contribution = Sales – Variable Cost (Marginal Cost)
2. Contribution = (per unit) = Selling price per unit – Variable cost per unit
3. Contribution = Fixed Cost \pm Profit / Loss
or C = F \pm P / L
4. Contribution = Sales \times P / V Ratio

For example, if the selling price of a product is R 100 per unit and its variable cost is R 60 per unit, contribution per unit is `40 (`100 – `60).

2.5.2 Profit Volume Ratio

The profit/volume ratio, also called the 'contribution ratio' or 'marginal ratio', is defined as the relationship between contribution and sales. In other words, profit/volume ratio is a ratio of contribution to sales and it can be expressed as under:

$$P/V \text{ Ratio} = \frac{\text{Contribution per unit}}{\text{Sales per unit}}$$

$$(i) P/V \text{ Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 \text{ or } = \frac{C}{S} \times 100$$

$$(ii) P/V \text{ Ratio} = \frac{\text{Sales} - \text{Variable Cost}}{\text{Sales}} \times 100$$

$$(iii) P/V \text{ Ratio} = \frac{\text{Fixed Cost} + \text{Profit}}{\text{Sales}} \times 100 \text{ or } = \frac{F+P}{S} \times 100$$

$$(iv) P/V \text{ Ratio} = \frac{\text{Change in profit contribution}}{\text{Change in sales}} \times 100$$

$$(v) P/V \text{ Ratio} = 1 - \text{variable Cost Ratio}$$

Example: If selling price of product is ` 100 and the variable cost is ` 75 per unit, then P/V ratio is :

Marginal costing and Break Even Analysis

$$P/V \text{ Ratio} = \frac{100 - 75}{100} \times 100 = \frac{25}{100} \times 100 = 25\%$$

2.5.3 Cost-Volume-Profit (CVP) Analysis or Break Even Analysis

CVP analysis is the relationship among cost, volume and profit. In CVP analysis, an attempt is made to measure variations of costs and profit with volume of production. In other words, it is a technique of management accounting which determines profit, cost and sale volume at different levels of production. When volume of production increases, cost per unit decreases because fixed cost remains constant. Again, with the increase in volume of output there are chances of decrease in cost per unit and increase in profit per unit. Thus, cost-volume profit analysis helps the management in profit planning because we can determine the amount of profits at different levels of activity and the volume of sales to earn desire profit can also be determined. In this regard, Herman C. Heiser rightly said 'the most significant single factor in profit planning of the average business is the relationship between the volume of business, costs and profits.'

The study of cost – volume – profit analysis is also known as break-even analysis because break-even analysis refers to the study of relationship between costs, volume and profit at different levels of production or sales.

2.5.4 Break-even Point:

Break-even point may be defined as the point of sales volume at which total revenue equals total costs. It is the point of no profit, no loss. When the total sales of a business is equal to its total costs, it is known to break-even point. At this point, contribution is equal to fixed costs. If a business is producing more than the break-even point there shall be profit to the business organisation otherwise it would suffer a loss. The detailed study of Break-even point is known as Break-even Analysis.

2.5.5 Break-even Chart: Graphic Method

Break-even chart is a tool of presentation of the information relating to production quantity, sales and profits of a business organisation. With the help of this chart the break-even point can be known as well as the amount of profit or loss at the various levels of output and margin of safety can be found out. It also provides us the knowledge about the relationship between fixed and variable costs as well as the contribution and profit-volume(P/V) relationship. Break-even chart shows the relationship between cost, volume and profit. Break-even point is the most important information out of the all above information and due to this reason, it is known as break-even chart.

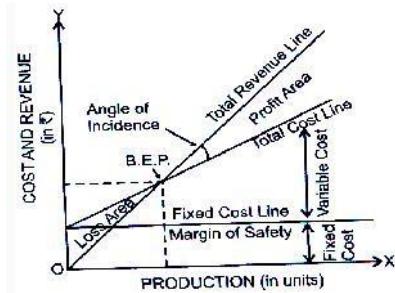
Methods of Drawing a Break-even chart

For drawing a break-even chart, one should have information regarding production capacity, variable costs and fixed costs of a business organisation.

Firstly, a table is prepared to know about the fixed cost, total costs and total sales at various levels of output.

First Method (BEP Chart) :

- (i) Volume of production/output or sales (in units/rupees) is plotted on X-axis (horizontal axis).
- (ii) Cost and sales revenue are shown in Y-axis (vertically).
- (iii) On Y-axis, fixed costs are shown first. A parallel line to X-axis is drawn which means that fixed costs remain constant at each level of input. Total cost line is drawn upward from the starting point of fixed cost line. To draw total cost line, the total costs points are plotted at various levels of output with the help of table and a line is drawn thereafter joining all these points. This line is called total cost line.
- (iv) Sales values at various levels of output are plotted and a line is drawn joining these points. This line is called total revenue line.
- (v) The point at which total cost line and total revenue line intersect each other is called break-even point.
- (vi) A perpendicular is drawn, from this point, to X-axis to know the break-even point in units and sales revenue at break-even point can be known by a perpendicular Y-axis from this point.
- (vii) The area on the left of break-even point represent the loss area and on the right of BEP indicates the profit area.
- (viii) The angle between sales or total revenue line and total cost line in profit area is called 'angle of incidence'. The wider the angle the greater is the profit and vice-versa.
- (ix) Difference between the present sales and Break-even sales on the graph shows the margin of safety.



Second Method (BEP Chart) :

In this method, variable costs are shown first and fixed cost line is drawn parallel and upward to the variable cost line. The fixed cost line drawn represents the total cost of various levels of output. With the help of this chart, contribution can be known at various levels of output by the differences between total sales (revenue) line and variable cost line.

Third Method (Contribution Chart):

In this method, fixed cost line is drawn parallel to X-axis. The contribution line is drawn from the origin point which increases with the increase in the output. The contribution line and fixed cost line intersect each other that points are called break-even point:

2.5.6 Angle of Incidence:

The angle formed at the intersection of the total sales curve and the total cost curve is known as angle of incidence. Bigger the angle of incidence higher will be the profits and smaller the angle of incidence the lower will be the profits. To improve this angle contribution should be increased either:

- (i) By raising the selling price or
- (ii) By reducing Variable cost or
- (iii) By both the way.

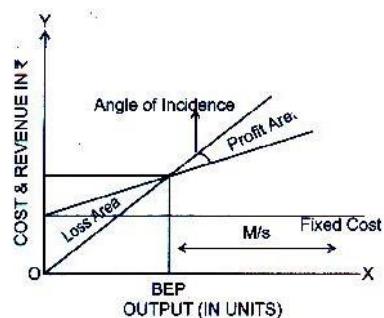
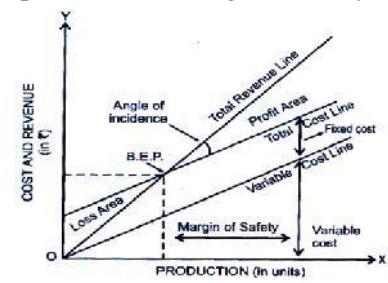
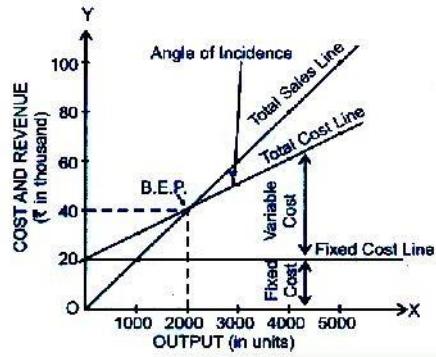


Illustration 2.3

Plot the following data on a graph and determine break-even point: selling price = ` 20 per unit, Variable Cost = ` 10 per unit, Fixed Cost = 20,000.

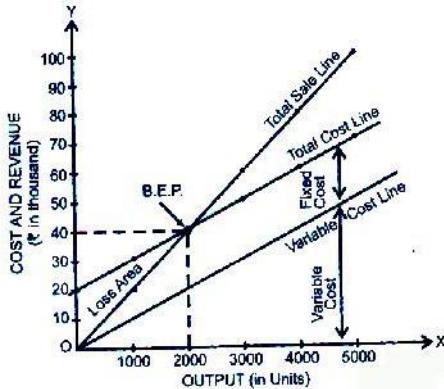
Output (in units)	Variable Cost (10 per unit)	Fixed Expenses	Total Cost	Total Sales	Contribution	Profits
0	0	20,000	20,000	0	0	-20,000
1,000	10,000	20,000	30,000	20,000	10,000	-10,000
2,000	20,000	20,000	40,000	40,000	20,000	-
3,000	30,000	20,000	50,000	60,000	30,000	10,000
4,000	40,000	20,000	60,000	80,000	40,000	20,000
5,000	50,000	20,000	70,000	1,00,000	50,000	30,000

First Method



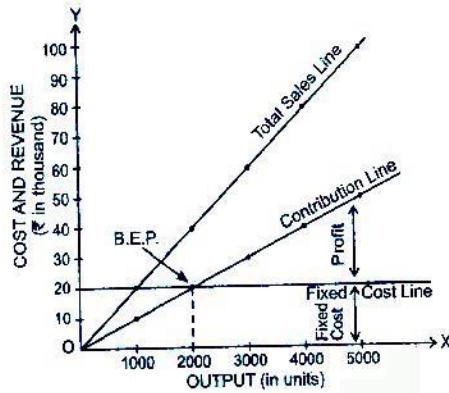
B.E.P. = 2,000 units or `40,000

Second Method



B.E.P. = 2,000 units or `40,000

Third Method



B.E.P. = 2,000 units or `40,000

Calculation of Break-even point: Algebraic Method

1. **Break-even Point in units :** It can be calculated with the help of following formula:

Break – even point (in units) =	$\frac{\text{Fixed Cost}}{\text{Selling Price per unit} - \text{Variable Cost per unit}}$
or	$\text{B.E.P.} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$
or	$\text{B.E.P.} = \text{FC} / \text{C}$

2. Break-even point in terms of money value :

Break – even point (Rupees) =	$\frac{\text{Fixed Cost} \times \text{Sales}}{\text{Sales} - \text{Variable Cost}}$
or	$\text{B.E.P.} = \frac{\text{Fixed Cost} \times \text{Sales}}{\text{Contribution}}$

With the help of P / V ratio, B.E.P can be calculated as follows :

$\text{B.E.P.} = \frac{\text{Fixed Cost}}{\text{P} / \text{V Ratio}}$

New Break-even Point : If the selling price of a product changes, contribution will be changed. As a result, new Break-even point will be as follows:

(i) New B.E.P. (in units) =	$\frac{\text{Fixed Cost}}{\text{New Selling Price} - \text{Variable Cost}}$
or	$= \frac{\text{FC}}{\text{New Contribution}}$
(ii) New B.E.P. (Rupees)	$= \frac{\text{Fixed Cost}}{\text{New P} / \text{V Ratio}}$

Calculation of selling price when Break-even point is shifted

When break-even point is shifted, selling price will be calculated in the following manner:

New Contribution=	$\frac{\text{Fixed Cost}}{\text{New BEP (in units)}}$
Sales=	$\text{New Contribution} + \text{Variable cost}$

Illustration 2.4

From the following information, calculate:

- BEP (in units)
- BEP (in `)

Sales of 50,000 units @ ` 6
 Variable Costs @ ` 4
 Total Fixed Costs ` 80,000

Solution:

$$(i) \text{ B.E.P. (in units)} = \frac{\text{Fixed Costs}}{\text{Contribution Per unit}} = \frac{80,000}{2(6 - 4)} = 40,000 \text{ units}$$

Contribution = selling price – Variable Cost

or $C = S - V$
 $C = ` 6 - ` 4 = ` 2$

$$\begin{aligned}
 \text{(ii) B.E.P. (in Rs)} &= \frac{\text{Fixed Cost} \times \text{Sales}}{\text{Sales} - \text{Variable Cost}} \\
 &= \frac{80,000 \times (50,000 \times 6)}{(50,000 \times 6) - (50,000 \times 4)} = \frac{80,000 \times 3,00,000}{3,00,000 - 2,00,000} \\
 &= \frac{80,000 \times 3,00,000}{1,00,000} = `2,40,000
 \end{aligned}$$

or with the help of P/V ratio, BEP is :

$$\begin{aligned}
 \text{BEP (in `)} &= \frac{\text{Fixed Costs}}{\text{P} / \text{V Ratio}} \\
 \text{P} / \text{V Ratio} &= \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{C}{S} \times 100 [\text{C} = \text{S} - \text{V}]
 \end{aligned}$$

Marginal Costing and Break Even Analysis

$$\begin{aligned}
 \text{and C} &= \text{Selling Price per unit} - \text{Variable Cost} \\
 &= `6 - `4 = `2
 \end{aligned}$$

$$\therefore \text{P/V Ratio} = \frac{2}{6} \times 100 = 33.33\%$$

$$\text{BEP (in `)} = \frac{\text{Fixed Costs}}{\text{P} / \text{V Ratio}} = \frac{80,000 \times 100}{33.33} = `2,40,000$$

2.5.7 Sales for Desired Profit

Marginal Costing technique can be applied for maintaining a desired level of profit. Due to competition, the price of the products may have to be reduced. The change in sales price affects the profitability of a concern. Marginal costing helps the management to know how many units have to be sold to maintain the desired level of profits. In order to achieve the desired level of profit the required sales can be calculated by the following formula:

(a) When total amount of desired profit is given :

$$\text{(i) Required sales to earn desired profit (in units)} = \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{Contribution per unit}}$$

$$\text{(ii) Required sales to earn desired profit} = \frac{\text{Fixed Cost} + \text{Desired profit}}{\text{P} / \text{V Ratio}}$$

(b) When desired profit per unit is given :

$$\text{(i) Sales (in units)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit} - \text{Profit per unit}}$$

$$\text{(ii) Sales (in Rs)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit} - \text{Profit per unit}} \times \text{Selling Price per unit}$$

Illustration 2.5

Following data are collected from the record of a manufacturing unit of scooter :

Selling price of a scooter is ` 32,000

Fixed cost of a scooter is ` 2,000

Variable cost of a scooter is ` 23,000

In the given period 1000 scooters were sold.

Calculate break-even point of the company and how many scooters should be sold to earn the same profit, if company reduces the selling price of scooter by ` 2000 per scooter?

Solution:

$$\text{Total Fixed} = ` 2000 \times 1000 = ` 20,00,000$$

$$\text{Break-even point} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$$

$$= \frac{20,00,000}{9,000} = 222.22 [C = S - V = `32,000 - `23,000 = `9,000] \text{ or } = 222 \text{ Scooters.}$$

The present profit of the company is as follows:

Variable cost per scooter	`23,000
Fixed cost per scooter	`2,000
Total cost per scooter	<u>`25,000</u>

Selling price of a scooter is `32,000

Profit of the company per scooter is `32,000 - `25,000 = `7,000

Total profit is (`7,000 × 1,000) = `70,00,000

To earn the same profit with a reduced price by `2,000, the number of scooters can be found out as follows:

New Selling Price = `32,000 - `2,000 = `30,000

Fixed Cost = `20,00,000

Described profit = `70,00,000

New contribution per unit = `30,000 - `23,000
= `7,000

$$\text{Sales} = \frac{\text{FC} + \text{Desired profit}}{\text{Contribution per unit}} = \frac{20,00,000 + 70,00,000}{7,000}$$

$$= 1,285.71 \text{ or } = 1,286 \text{ scooters.}$$

2.5.8 Margin of Safety:

Margin of safety is the difference between actual sales and sales at break-even point. For example, if actual sales of a company is `10,00,000 and the sales at break-even point is `4,00,000 the difference between these two figures `6,00,000 (10,00,000 - 4,00,000) is margin of safety. Margin of safety can be calculated by the following formulae:

- (i) Margin of safety (in units) = Actual sales (in units) - sales at B.E.P. (in units)
- (ii) Margin of sales (in Rupees) = Actual sales (in Rupees) - sales at B.E.P. (in Rupees)
- (iii) Margin of safety = $\frac{\text{Profit}}{\text{P/V Ratio}} \times 100$
- (iv) Margin of safety (%) = $\frac{\text{Margin of Safety}}{\text{Actual Sales}} \times 100$

Illustration 2.6

The data below relate to a company:

Sales	`1,50,000
Fixed Cost	`45,000
Profit	`15,000

Calculate:

- (i) P/V ratio at present
- (ii) P/V ratio, if selling price is increased by 10%.
- (iii) P/V ratio, if selling price is decreased by 20%.

Solution:

Sales(S) = `1,50,000.

Fixed Cost(FC) = `45,000

Profit(P) = `15,000

$S - V = FC + P$

$$`1,50,000 - V = `45,000 + `15,000$$

or $V = `1,50,000 - `60,000 = `90,000$

(i) P/V ratio at present is:

$$\begin{aligned} \text{Since P/V ratio} &= \frac{C}{S} \times 100 = \frac{1,50,000 - 90,000}{1,50,000} \times 100 \quad \square C = S - V \\ &= \frac{60,000}{1,50,000} \times 100 = 40\% \end{aligned}$$

(ii) Calculation of P/V Ratio, if selling price is increased by 10%:

$$\begin{aligned} \text{Sales Value} &= `1,50,000 + `1,50,000 \times \frac{10}{100} \\ &= `1,50,000 + 15,000 = `1,65,000 \end{aligned}$$

$$\begin{aligned} \text{P/V ratio} &= \frac{S - V}{S} \times 100 = \frac{1,65,000 - 90,000}{1,65,000} \times 100 \\ &= \frac{75,000}{1,65,000} \times 100 = 45.45\% \end{aligned}$$

(iii) Calculation of P/V ratio, if selling price is decreased by 20%:

In this case, sale value would be $`1,50,000 - `30,000 = `1,20,000$

$$\begin{aligned} \text{P/V Ratio} &= \frac{S - V}{S} \times 100 \\ &= \frac{1,20,000 - 90,000}{1,20,000} \times 100 = \frac{30,000}{1,20,000} \times 100 = 25\% \end{aligned}$$

Illustration 2.7

Following information is available from the records of a company:

Year	Sales (`)	Profit/Loss (`)
I	5,00,000	2,000 (Loss)
II	7,00,000	2,000 (Profit)

Selling price is given ` 100 per unit

Calculate:

- Fixed Cost
- Break-even point in units
- Sale in units for desired profit of ` 28,000.

Solution:

$$\text{P/V Ratio} = \frac{\text{Change in profit / Contribution}}{\text{Change in Sales}} \times 100 = \frac{4000}{2,00,000} \times 100 = 2\%$$

(i) **Fixed Cost:**

$$S \times \text{P/V Ratio} = P + FC$$

$$\text{I Year: } 5,00,000 \times \frac{2}{100} = FC + (-2,000)$$

$$10,000 = FC - 2,000$$

$$FC = 10,000 + 2,000 = 12,000$$

$$\text{II Year: } 7,00,000 \times \frac{2}{100} = FC + 2,000$$

$$14,000 = FC + 2,000$$

$$FC = 14,000 - 2,000 = 12,000$$

$$(ii) \text{ B.E.P.} = \frac{\text{FC}}{\text{P / V Ratio}} = \frac{12,000}{2} \times 100 = `6,00,000$$

$$\text{B.E.P.(in units)} = \frac{6,00,000}{100} = 6,000 \text{ units}$$

(iii) Sale of units for a profit of ` 28,000:

$$\text{Sale} = \frac{\text{FC} + \text{DP}}{\text{P / V Ratio}} = \frac{12,000 + 28,000}{2} \times 100$$

$$= \frac{40,000}{2} \times 100 = `20,00,000$$

$$\text{Sales (in units)} = \frac{20,00,000}{100} = 20,000 \text{ units}$$

2.6 MANAGERIAL APPLICATION OF CVP ANALYSIS

2.6.1 Fixation of Selling Price:

Fixation of selling price is an important function of management. Under normal circumstances, the price is fixed to cover the fixed as well as variable cost and to earn the profit. But under other circumstances, the product may be sold at a price below the total cost. These circumstances may arise due to stiff competition, trade depression, for accepting additional orders, for exporting, etc. In such circumstances, the price should be fixed on the basis of marginal cost in such a manner so as to cover the marginal cost and contribute something towards the fixed costs. In the following circumstances production may be continued even if the selling price is below the marginal cost:

- (i) To dispose of surplus stocks.
- (ii) To eliminate the competitor from the market.
- (iii) To utilise idle capacity.
- (iv) To explore new markets.
- (v) To explore foreign markets in order to earn foreign exchange.
- (vi) when company deals with perishable products.
- (vii) when company wants to introduce a new product in the market.
- (viii) when the labour cannot be retrenched.
- (ix) when company wants to avoid extra losses by closing down the business.

Illustration 2.8

The P/V Ratio of a company is 75%. Marginal cost of the product is `50. Determine the selling price of the product.

Solution:

If selling price is `100

Variable cost will be `25

and contribution is `75

Selling price of the product, when the marginal cost is `50, will be:

$$= \frac{100}{25} \times 50 = `200$$

Assumptions Underlying Break-Even Charts

There are a number of assumptions which are made while drawing a break-even chart, such as :

- (i) All costs can be separated into fixed and variable costs.
- (ii) Fixed costs remain constant at all levels of activity.
- (iii) Variable cost fluctuates directly in proportion to changes in the volume of output.
- (iv) Selling prices per unit remain constant at all levels of activity.
- (v) There is no opening or closing stock.
- (vi) There will be no change in opening efficiency.

- (vii) Product mix remains unchanged or there is only one product.
- (viii) The volume of output or production is the only factor which influences the cost.

Advantages Or Uses of Break-Even Charts

Computation of break-even point or presentation of cost, volume and profit relationship by way of break-even charts has the following advantages:

1. Information provided by the break-even chart is in a simple form and is clearly understandable even to a layman. The whole idea of the problem is presented at a glance.
2. The break-even chart is very useful to management for taking managerial decisions because the chart studies the relationship of cost, volume and profit at various levels of output. The effects of changes in fixed costs and variables costs at various levels of output and that of changes in the selling price on the profits can be depicted very clearly by way of break-even charts.
3. The break-even charts help in knowing and analysing the profitability of different products under various circumstances.
4. A break-even chart is very useful for forecasting (the costs and profits), planning and growth.
5. The break-even chart is a managerial tool for control of costs as it shows the relative importance of fixed cost in the total cost of a product.
6. Besides determining the break-even point, profits at various levels of output can also be determined with the help of break-even charts.
7. The break-even charts can also be used to study the comparative plant efficiencies of business.

Limitations of Break-Even Charts

Despite many advantages, a break-even chart suffers from the following limitations:

1. A break-even chart is based upon a number of assumptions, discussed above, which may not hold good under all circumstances. For example, fixed costs do not remain constant after a certain level of activity; variable costs do not always vary in direct proportion to changes in the volume of output because of the laws of diminishing and increasing returns; selling prices do not remain the same forever and for all levels of output due to competition and changes in general price level; etc.
2. A break-even chart provides only a limited information. We have to draw a number of charts to study the effects of changes in the fixed costs, variable costs and selling prices on the profitability. In such cases, it becomes rather more complicated and difficult to understand.
3. Break-even charts present only cost-volume profit relationships but ignore other important considerations such as the amount of capital investment, marketing problems and government policies, etc.
4. A break-even chart does not suggest any action or remedies to the management as a tool of management decisions.
5. More often, a break-even chart presents only a static view of the problem under consideration.

2.6.2 Maintaining a Desired Level of Profit

Marginal Costing techniques can be applied for maintaining a desired level of profit. Due to competition, the price of the products may have to be reduced. The change in sales price, variable cost and product mix affects the profitability of a concern. Marginal costing helps the management to know of profit the sales can be ascertained by the following formula;

$$\text{Fixed Cost} + \text{Desired Profit}$$

$$\text{Sales} = \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P} / \text{V Ratio}}$$

Illustration 2.9

The price structure of a cycle made by a company is as follows:

	Per Cycle
Materials	600
Labour	200
Variable overheads	200
	<hr/>
Fixed overheads	500

Profit	500
Selling price	<u>2,000</u>

This is based on the manufacture of one lakh cycles per annum. The company expects that due to competition they will have to reduce selling prices, but they want to keep the total profit intact. How many cycles will have to be made to get the same amount of profit if:

- (a) the selling price is reduced by 10%.
- (b) the selling price is reduced by 20%.

Solution:

$$\text{Total Fixed Costs} = 500 \times 1 \text{ lakh} = 500 \text{ lakhs}$$

$$\text{Total Present Profit} = 500 \text{ lakhs}$$

$$\text{Fixed Cost} + \text{Desired Profit}$$

$$\text{Sales} = \frac{\text{Contribution per unit}}{\text{Contribution per unit}}$$

(a) If selling price is reduced by 10%: Use

$$\begin{aligned} \text{New selling price} &= (2,000 - 10\% \text{ of } 2,000) \\ &= 2,000 - 200 = `1,800 \end{aligned}$$

$$\begin{aligned} \text{Sales} &= \frac{500 + 500}{1,800 - 1,000} \\ &= \frac{1000}{800} \times 1,00,000 = 1,25,000 \text{ Cycles} \end{aligned}$$

(b) If selling price is reduced by 20%:

$$\begin{aligned} \text{New selling price} &= (2,000 - 20\% \text{ of } 2,000) \\ &= 2,000 - 400 = `1,600 \end{aligned}$$

$$\begin{aligned} \text{Sales} &= \frac{500 + 500}{1,600 - 1,000} \\ &= \frac{1000}{600} \times 1,00,000 = 1,66,667 \text{ Cycles} \end{aligned}$$

2.6.3 Key or Limiting Factor:

A key factor or limiting factor is a factor which limits or puts a restriction on production or sales and restricts a company from making unlimited profits. Limiting factors may be availability of raw material, labour, sales finance, plant capacity, etc. When contribution and key factors are known, the profitability of a product can be measured as under:

$$\text{Profitability} = \frac{\text{Contribution}}{\text{Key Factor}}$$

For example:

(i) When limiting factor is the availability of labour:

$$\text{Profitability} = \frac{\text{Contribution}}{\text{Key Hours}}$$

(ii) When limiting factor is raw material:

$$\text{Profitability} = \frac{\text{Contribution}}{\text{Materials in Kg}}$$

Illustration 2.10

A company is producing two products A and B. The particulars of the company are as follows:

	Product A (` per unit)	Product B (` per unit)
Sales	75	80
Material Cost	15	20
Labour Cost	20	15
Direct Expense	10	12
Variable overheads	10	15
Machine Hours used	3 hrs	2 hrs
Consumption of material	2 kg	3 kg

Comment on profitability of each product, if both use the same raw material, when:

- Total sales potential in units is key factor.
- Total sales potential in values is key factor.
- Raw material is in short supply.
- Production Capacity (in terms of machine hrs.) is the key factor.

Solution:

	Product A (` per unit)	Product B (` per unit)
Sales	75	80
Marginal Cost		
Materials	15	20
Wages	20	15
Direct expense	10	12
Variable overheads	10	15
Total Marginal Cost	55	62
Contribution (Sales – Total marginal cost)	20	18
Contribution (per ` of Sales)	20/75	18/80
(Contribution/Sales)	= ` 0.266	= ` 0.225
Material consumed contribution per kg of materials	20/2kg = ` 10	18/3kg ` 6
Contribution per hour	20/3 hrs = ` 6.6	18/2 hrs ` 9

Comments:

- When total sales potential in units is limited, product A is more profitable as its contribution per unit is more than that of product B.
- When total sales potential in value is limiting factor, product A is more profitable as it has more contribution as per sales in rupees than that of product B.
- Product A is more profitable than product B, when raw material is in short supply.
- Product B is more profitable than product A, when production capacity in terms of machine hours is the key factor.

2.7 SUMMARY

- Marginal cost is the aggregate of variable costs. It is the cost of producing one additional unit.
- Absorption costing is the total cost technique. It is the practice of charging all costs, both variable and fixed, to operations, processes or products.
- Contribution is the difference between Sales and Variable Cost or marginal cost.
- Break-even chart is a tool of presentation of the information relating to production quantity, sales and profits of a business organisation.
- The angle formed at the intersection of the total sales curve and the total cost curve is known as angle of incidence.

- Marginal Costing techniques can be applied for maintaining a desired level of profit.
- Fixation of selling price is an important function of management. Under normal circumstances, the price is fixed to cover the fixed as well as variable cost and to earn the profit.

2.8 KEY TERMS

Marginal cost -Marginal cost is the aggregate of variable costs.

Marginal costing- marginal costing is a technique which is concerned with the changes in costs and profits result from changes in volume of output.

Absorption Costing- Absorption costing is the total cost technique. It is the practice of charging all costs, both variable and fixed, to operations, processes or products.

Higher contribution- Higher contribution means more profit

Break-even Analysis- In CVP analysis, an attempt is made to measure variations of costs and profit with volume of production.

Break-even point- Break-even point may be as the point of sales volume at which total revenue equals total costs.

2.9 QUESTIONS AND EXERCISES

1. What is 'cost and profit'? Bring out its importance.
2. 'Profit-Volume analysis' is a technique of analysing the costs and profits at various 'level of volume'. Explain how such analysis helps management.
3. (a) Your boss is looking over a Break-even Chart which you have constructed to portray the cost volume profit relationship of proposed plan of operations. He comments 'The chart only tells me more we sell more profits we make'. What is your reply?
(b) What are the limitations of a break even chart.
4. Explain the technique of marginal costing and state its importance in decision-making.
5. (a) State distinction between Marginal Costing and Absorption Costing as regards valuation of finished goods inventories.
(b) State the circumstances in which 'contribution approach to price is most suitable'. If this approach is adopted, what are the special items of cost or revenue that have to be considered when quotation for an export order is made ?
6. (a) What benefits are gained from Marginal Costing ? Are there any pitfalls in the application of Marginal Costing ? Discuss these matters critically.
(b) Give a brief account of practical application of marginal costing which you consider sound from a policy point of view.
7. What is Break-even Analysis ? Discuss its assumptions and uses.
8. State the implications of selling the product of a multiple firm at a price less than the marginal cost. When would you advocate selling below the marginal cost ?
9. 'Cost-Volume-Profit' relationship provides the management with a simplified framework for an organization which is thinking on a number of its problems. Discuss.
10. 'The proper treatment of fixed costs presents a problem in full cost pricing'. Explain this statement. Give suitable illustrations.
11. Explain with suitable illustrations the following statements:
(a) 'In the very long run all costs are differential'.
(b) 'In the long run profit calculated under absorption costing will be the same as that under variable costing'.
12. State four different methods of finding out the break-even point graphically.
13. Explain how semi-variable costs could be split into fixed and variable costs.
14. What is meant by differential cost? Explain the practical utility of differential cost analysis.

15. What is meant by break-even analysis? Explain the important assumptions and practical significance of break-even analysis.
16. What are the uses of break-even analysis and direct costing?
17. Mention the types of problems which a Management Accountant can expect to solve with break-even analysis.
18. 'Marginal Costing is an administrative tool for the management to achieve higher profits and efficient operation'. Discuss.
19. Explain under what circumstances marginal costing plays important role in price fixation ?
20. Explain how marginal costing technique is useful in day-to-day decision making.
21. What are the chief advantages of break-even analysis ? Outline the assumptions behind this analysis.
22. Write briefly about Cost-Volume-Profit Analysis'.
23. Examine the concept of 'Margin of Safety' and give its uses for decision-making.
24. Explain the concept of *BEP* and *CVP*. Explain as to how are they useful for the managers for their decision-making.
25. What are the limitations of marginal costing? Explain.
26. Distinguish between Marginal Costing and Total Costing techniques of cost Analysis. How are the Profit Statements under the two techniques Present ?
27. Mention any four important factors to be considered in Marginal Costing Decisions.
28. Discuss the relationship between Angle of Incidence, Break-even and Margin of Safety.

PRACTICAL PROBLEMS

1. K Ltd. produces one standard type of article. The result of the Last 4 months of the year 2008 are as follows :

<i>Output (units)</i>	
September 2008	200
October 2008	300
November 2008	400
December 2008	600

Prime cost is `10 per unit. Variable expenses are `2 per unit. Fixed expenses are `36,000 per annum. Find out cost per unit of each month.

[Ans. September `27, October `22, November `19.50, December `17.00]

2. From the following data prepare statements of cost according to both absorption costing and marginal costing system :

	<i>Product P</i>	<i>Product Q</i>	<i>Product R</i>
Sales	30,000	60,000	80,000
Direct Material	12,000	25,000	36,000
Direct Labour	8,000	10,000	14,000
Factory Overheads :			
Fixed	6,000	8,000	6,000
Variable	2,000	3,000	5,000
Administration Overheads Fixed	1,000	2,000	2,000

Selling Overheads

Fixed	2,000	2,000	3,000
Variable	1,000	3,000	3,000

[Ans. Absorption Costing-Profit (Loss) : Product P (` 2,000), Product Q ` 7,000; Product R ` 11,000; Marginal Costing-Contribution; Product P ` 7,000, Product Q ` 19,000, Product R ` 22,000]

3. Production costs of Oriental Enterprises Limited are as following :

	Levels of activity		
	60%	70%	80%
Output (in units)	1,200	1,400	1,600
Cost (in `)			
Direct Material	24,000	28,000	32,000
Direct Labour	7,200	8,400	9,600
Factory Overheads	12,800	13,600	14,400
Works Cost	44,000	50,000	56,000

A proposal to increase production to 90% of its capacity and produces 13,500 units per annum. It operates a flexible budgetary control system. The following figures are obtained from its budget :

[Ans. Prime Cost ` 46,800, Marginal Cost ` 54,000, Works Cost ` 62,000]

[Hint. Fixed overheads ` 8,000]

4. A company is at present working at 90% of its capacity and produces 13,500 units per annum. It operates a flexible budgetary control system. The following figures are obtained from its budget :

	90%	100%
	13,500 units	15,000 units
Sales	15,00,000	16,00,000
Fixed Expenses	3,00,500	3,00,500
Semi-variable Expenses	97,500	1,00,500
Variable Expenses (other than material and labour)	1,45,000	1,49,500

Labour and material cost per unit remain the same under present conditions. Profit margin has been 10% on sales.

- (i) You are required to determine the differential cost of producing 1,500 units by increasing capacity to 100%.
- (ii) What would you suggest for an export price for these 1,500 units taking into account that the overseas prices are lower than those of the home market ?

[Ans. (i) ` 97,170 (ii) Cost per unit comes to ` 64.78. The selling price should not be less than this price.]

[Hint: Cost of materials and labour of 13,500 units comes to ` 8,07,000 by working backward.]

5. A firm has two factories, the product being the same in both cases. The following is the relevant information about the two factories.

	<i>I</i>	<i>II</i>
Capacity p.a.	10,000 units	15,000 units

Variable Cost per unit	70	55
Fixed Cost p.a.	4,00,000	9,00,000

The demand is only 20,000 units. State how the capacity in two factories should be utilized.

[Ans. Both factories have to be operated for meeting demand in full. However, Factory *II* has a lower variable cost per unit. Hence, Factory *II* should produce 15,000 units and Factory *I* should produce 5,000 units]

6. Sales of a product amount to 200 units per month at `10 per unit. Fixed overhead is `400 per month and variable cost 6 per unit. There is a proposal to reduce price by 10% Calculate the present and future P/V ratio and find by applying P/V ratios, how many units must be sold to maintain total profit.

[Ans. Present P/V Ratio 40% Future P/V Ratio units to be sold 267]

7. Merry Manufacturers Ltd., has supplied you the following information in respect of one of its products :

Total Fixed Costs	18,000
Total Variable Costs	30,000
Total Sales	60,000
Unit Sold	20,000

Find out (a) contribution per unit, (b) break-even point, (c) margin of safety, (d) profit, and (e) volume of sales to earn a profit of `24,000.

[Ans. (a) `1.50, (b) 12,000 units, (c) 8,000 units or `24,000, (d) `12,000, (e) 28,000 units]

8. From the following data, calculate :

- (i) Break-even point expressed in amount of sales in rupees.
- (ii) Number of units that must be sold earn a profit of 60,000 per year. ?
- (iii) How many units must be sold to earn a net income of 10% of sales ?

Selling price	20 per unit
Variable manufacturing costs	11 per unit
Variable selling costs	3 per unit
Fixed factory overheads	5,40,000 per year
Fixed selling costs	2,52,000 per year

[Ans. (i) `26,40,000; (ii) 1,42,000 units; (iii) 1,98,000 units]

[Hint. For (iii) Presume x as the number of units to be sold.]

9. A Khan sells a popular brand of men's sports shirts at an average price of `28/ each. He purchases the shirts from a commission to his salesman at the rate of `1 for every shirt sold through the particular salesman.

Required

- (i) How many shirts must be sold in a year to break-even ?
- (ii) Compute the sales revenue at the break-even.
- (iii) Compute the monthly sales revenue required to earn a net profit before tax of `45,000 in a year.

[Ans. (i) 6,000 shirts, (ii) `1,68,000, (iii) `25,667]

10. (a) A company has fixed expenses of 90,000 with sales at `3,00,000 and a profit of 60,000. Calculate the profit/volume ratio. If in the next period, the company suffered a loss of `30,000. Calculate the sales volume.

(b) What is the margin of safety for a profit of 60,000 in (a) above ?

[Ans. (a) 50% `1,20,000; (b) `1,80,000]

11. An analysis of Sultan Manufacturing Co. Ltd. Led to the following information :

Cost element	Variable cost (% of Sales)	Fixed costs
Direct Material	32.8	
Direct Labour	28.4	
Factory Overheads	12.6	1,89,900
Distribution Overheads	4.1	58,400
General Administration Overheads	1.1	66,700

Budgeted Sales are ` 18,50,000. You are required to determine :

- (i) The break-even sales volume;
- (ii) The profit at the budgeted sales volume; and
- (iii) The profit if actual sales :
 - (a) drop by 10% and
 - (b) increase by 5% from budgeted sale

[Ans. (i) `15,00,000, (ii) `73,500, (iii) (a) `34,650, (b) `92,925]

12. Company X and Company Y, both under the same management, make and sell the same type of product. Their budgeted Profit and Loss Account for January-June 1988 are as under :

	Company X	Company Y	
Sales	3,00,000		3,00,000
Less : Variable cost	2,40,000	2,70,000	
Fixed Cost	30,000	2,70,000	2,70,000
	30,000	30,000	

You are required to :

- (i) Calculate the Break-even Point for each company.
- (ii) Calculate the sales volume at which each of the two companies will profit by ` 10,000
- (iii) Assess how the profitability will change with decrease or increase in volume :

[Ans. Company X	Company Y]
(i) `1,50,000	(i) `2,10,000
(ii) `2,00,000	(ii) `2,40,000
(iii) P/V Ratio 20%	(iii)]

13. The budgeted sales of three products of a company are as follows :

	Products		
	P	Q	R
Budgeted sales in unit	10,000	15,000	20,000
Budgeted selling price per unit	4	4	4
Budgeted variable cost per unit	2.5	3	3.5

Budgeted fixed expenses (total)	2,000	9,000	7,500
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From the information you are required to compute the following for each product:

- (a) The budgeted profit.
- (b) The budget break-even sales.
- (c) The budgeted margin of safety in terms of sales value.

	<i>P</i>	<i>Q</i>	<i>R</i>
[Ans. (a)	` 3,000	` 6,000	` 2,500
(b)	` 32,000	` 36,000	` 60,000
(c)	` 8,000	` 24,000	` 20,000

14. From the following information calculate the break-even point and the turnover required to earn a profit of 36,000. Fixed overheads.

Fixed overheads	` 1,80,000
Variable cost per unit	2
Selling price	20

If the company is earning a profit of ` 36,000 express the 'margin of safety available to it.

[Ans. BEP 10,000 units. Turnover required for desired profit ` 2,40,000, Margin of Safety ` 40,000]

15. The Reliable Battery Co. Furnishes you the following information :

Year 1996

	<i>First half</i>	<i>Second half</i>
Sales	` 8,10,000	` 10,26,000
Profit earned	21,600	64,800

From the above you are required to compute the following assuming that the fixed cost remains the same in both the period :

- (i) Profit/Volume Ratio
- (ii) Fixed cost.
- (iii) The amount of profit or loss where sales are ` 6,48,000.
- (iv) The amount of sales required to earn a profit of ` 1,08,000.

[Ans. (i) 20%; (ii) ` 1,40,400; (iii) Loss ` 10,800; (iv) ` 12,42,000.]

16. T Ltd. have been an installed capacity of 5,000 tractors per annum. They are presently operating 35 percent of installed capacity. For the coming year, they have budgeted as follows :

Production/Sales	<i>4,000 units</i>
Costs :	` (Crores)
Direct Materials	8.00
Direct Wages	0.60
Factory Expenses	0.80
Administration expenses	0.20
Selling Expenses	0.20
Profit	1.00

Factory expenses as well as selling expenses are variable to the extent of 20 per cent.

Calculate break-even capacity utilization percentage.

[Ans. BEP 2,000 units, BEP as a percentage of installed capacity 40%]

17. Calculate from the following data (i) the value of output at which the business break-even, and (ii) the percentage capacity at which it break-even :

<i>Budget for year</i> <i>1990 based on</i> <i>100% capacity</i>	<i>Estimated</i> <i>shut-down</i> <i>expenditure</i>	<i>,</i>
Direct Wages	2,09,964	—
Direct Materials	2,44,552	
Works Expenses	1,81,820	93,528
Selling and Distribution Expenses	61,188	40,188
Administration Expenses	30,000	20,508
Net Sales	8,40,000	

[Ans. ` 4,85,74,6; (ii) 53.8%]

[Hint. Shut-down costs are Fixed Costs.]

18. From the following data, you are required to calculate the break-even point and net sales value at this point :

Selling Price per unit	25
Direct Material Cost per unit	8
Direct Labour Cost per unit	5
Fixed Overheads	24,000

Variable Overheads @60% on direct labour Trade discount 4%

If sales are 15% and 20% above the break-even volume, determine the net profits.

[Ans. BEP (units) 3,000 B.E. Sales (Net) ` 72,000, Net Profit when Sales are above 15% of B.E. Volume ` 3,600, Net Profit when Sales are above 20% of B.E. Volume ` 4,80,000]

19. The Taylor Company produces two products, *B* and *C*. Expected data for the first year of operations are :

	<i>B</i>	<i>C</i>
Expected Sales (units)	8,000	12,000
Selling Price	` 45	` 55
Variable Costs	` 30	` 35

Total fixed costs are expected to be ` 3,60,000 for the year. You are required to answer the following :

- It sales, prices and costs are as expected, what will be the operating income and the break-even volume in sales revenue ?
- Assume that prices and costs were as expected but Taylor sold 12,000 units of *B* and 8,000 units of *C*. Calculate the operating income and the break-even volume in sales revenue.

[Ans. (i) Operating Income Nil; Break-even Sales 10,20,000

(ii) Loss ` 20,000; Composite Break-even Sales ` 10,37,763 comprising sales of Product *B* ` 6,22,658 and sales of Product *C* ` 4,15,105]

20. The Kisan's Implements Factory which has been specialising in the production of a patented plough-share finds its sales dropping due to increasing competition from other concerns producing similar products. It is felt that the reduction of the selling price from ` 3 per share to ` 2.50 will

increase the volume of sales and enable the profit to be maintained at the same level as in the previous year.

Assuming that the total fixed charges of the concern are `2,00,000 per annum, variable cost per unit `1.50 and the volume of sales `4,50,000; indicate the number of units that the concern should plan to produce and sell.

Tabulate the results of the previous year and the current year showing (a) the number of units produced, (b) selling price realized, (c) cost price (including fixed and variable costs), and (d) the profit at the end of the year.

[Ans. (a) Previous Year : 1,50,000 units, Current Year `5,62,500;

(b) Selling Price : Previous Year `4,50,000, Current Year `5,62,500;

(d) Profit : Previous Year `25,000; Current Year `25,000.]

21. The particulars of two plants producing an identical product with the selling price are as under :

<i>Plant P</i>	<i>Plant Q</i>	
<i>Capacity utilization</i>	70%	60%
	(`Lacs)	(`Lacs)
Sales	150	90
Variable Costs	105	75
Fixed Costs	30	20

It has been decided to merge Plant 'Q' with Plant 'P'. The additional fixed expenses involved in the merger amount to `2 lacs.

Required :

- Find the break-even point of Plant 'P' and Plant 'Q' before merger and the break-even point of the merged plant.
- Find the capacity utilization of the integrated plant required to earn a profit of `18 lacs.

Ans. (i) Break-even point Plant P `100 lacs. Plant Q `120 lacs. Merged Plant `212.16 lacs,

(ii) Sales for desired profit `285.61 lacs, capacity utilization 78.4%]

22. D. Ltd. furnishes you the following information relating to the half year ended 30th June, 1990 :

Fixed Expenses	45,000
Sales Value	1,50,000
Profit	30,000

During the second half of the year, the company has projected a loss of `10,000.

Calculate :

- The break-even point and margin of safety for six months ending 30th June, 1990.
- Expected sales volume for second half of the year assuming that the P/V ratio and fixed expenses remain constant in the second half year also.
- The break-even point and margin of safety for the whole year 1990.

[Ans. BEP `90,000; M.S. `60,000; (ii) `70,000; (iii) BEP 1,80,000; M.S. `40,000]

23. The following estimated data are given :

(a) Cost of investigation of variance	= ` 800
(b) Cost of correcting the out of control process	= ` 2,000
(c) Cost of allowing the process to remain out of control	= ` 10,000
(d) Probability of being in control	= 0.95
(e) Probability of being out of control	= 0.05

Calculate the expected values of investigating and not investigating.

[Ans. Cost of investigation and rectifying out of control situation ` 900, cost of rectification without investigation ` 500. Hence, it is cheaper not to investigate but carry out the rectification, whenever the process goes out of control.]

24. Draw a break-even chart on the basis of following data :

Plant capacity : 1,60,000 units per year

Fixed cost : ` 4,00,000 Variable cost : ` 5 per unit

Selling price : ` 10 per unit

[Ans. BEP 80,000 units]

25. From the following particulars draw a break-even chart and find out the break-even point :

Variable Cost per unit	15
Fixed Expenses	54,000
Selling Price per unit	20

We should be the selling price per unit, if the break-even point is to be brought down to 6,000 units?

[Ans. Old BEP 10,800 units; New Selling Price ` 24 per unit]

26. (a) Plot the following data on a graph and determine the break-even point :

Direct labour	` 100 per unit
Direct material	` 40 per unit
Variable overheads	100% of direct labour
Fixed overheads	` 60,000
Selling price	` 400 per unit

(b) In order to increase efficiency in production, the concern installs improved machinery which results in fixed overhead of ` 20,000 but the variable overhead is reduced by 40%.

You are required to plot the data on the above graph and to determine the new break-even point assuming that there is no change in sale price.

[Ans. Old BEP at 50% capacity ` 1,50,000, New BEP ` 1,60,000]

27. From the following data, which product would you recommend to be manufactured in a factory, time being the key factor ?

	Per unit of Product 'P'	Per unit of Product 'Q'
Direct Material	` 24	` 14
Direct labour at ` 1 per hour	2	3
Variable Overheads at ` 2 per hour	4	6
Selling Price	100	110
Standard Time to produce	2 hours	3 hours

[Ans. Product P recommended]

28. From the following data, recommend the most profitable product mix, presuming that direct labour hours available are only 700 :

	<i>Products</i>	
	R	S
Contribution per unit	‘30	‘20
Direct Labour per unit	10 hrs.	5 hrs.

The maximum production possible for each of the products A and B 100 units.

The fixed overheads are ‘1,000

[Ans. Product R 20 units; Product S 100 units. Net profit ‘1,600]

29. (a) From the following data, which product would you recommend for manufacture in the factory ?

Per unit of	<i>Product P</i>	<i>Product Q</i>
Standard Manufacturing Time	2 hours	3 hours
Direct Materials	‘50	‘30
Direct Labour @ 10 per hour	20	30
Variable Overheads @ 6 per hour	12	18
Selling Price	200	240

Total Machine Hours available in the factory are 60,000.

(b) Calculate the effect on profit of proposed change in ‘Sales Mix’ from the following data :

Existing Sales mix	<i>M</i>	<i>N</i>	<i>O</i>	<i>P</i>	<i>Total</i>
Sales (in)	80,000	1,00,000	40,000	20,000	2,40,000
Variable Cost (in)	48,000	68,000	32,000	8,000	1,56,000
Fixed Cost (in)	—	—	—	—	—
Proposed Sales Mix	‘60,000	88,000	80,000	12,000	2,40,000

[Ans. (a) Product P is recommended (b) Decrease in Profit 8,640, Present Profit ‘25,200, Proposed Profit 16,560]

30. Polestar Electronics decides to effect a 10% reduction in the price of its product because it is felt that such a step may lead to a greater volume of sales.

It is anticipated that there are no prospects of a change in total fixed costs and variable cost per unit. The directors wish to maintain the net profits at the present level.

Sales : 10,000 units	‘2,00,000
Variable Costs	‘15 per unit
Fixed Costs	‘40,000

How would management proceed to implement this decision ?

[Ans. Profit ‘10,000; Units to be sold 16,667. Management should reduce selling price only when it is sure of increasing sales by 6,667 units]

31. Evenkeel Limited manufactures and sells a single product X whose selling price is ‘40 per unit and the variable cost is 16 per unit.

(a) If the fixed costs for this year are ‘4,80,000 and the annual sales are at 50% margin of safety, calculate the rate of net return on sales assuming an income-tax level of 40%

(b) For the next year, it is proposed to add another product line whose selling price would be `50 per unit and the variable cost 10 per unit. The total fixed costs are estimated at `6,66,600. The sales mix of X : Y would be 7 : 3. At what sales next year, would Evenkeel Ltd. break-even; give separately for both X and Y the break-even sales in rupees and quantities.

[Ans. (a) $4,32,000/20,00,000 = 21.6\%$ (b) Break-even Sales `10,00,000. The mix would consist of x 17,675 units of `7,07,000 y 6,065 units of `3,03,000]

32. With a view to increase the volume of sales, Ambitious Enterprises has in mind a proposal to reduce the price of its products by 20% No change in total fixed costs or variable costs per unit is estimated. The directors, however, desire the 'present level of profit to be maintained.

The following information has been provided :

Sales 50,000 units	` 5,00,000
Variable Costs	` 5 per unit
Fixed Costs	` 50,000

Advise management on the basis of the various calculations made from the data given

[Ans. Present P/V Ratio 50%, Future P/V Ratio 37.5% Sales required to maintain present profit 6,66,667]

33. Quality Products Ltd. manufactures and markets a single product. The following data are available :

Per unit	16
Materials	12
Conversion Costs (variable)	4
Dealer's Margin	40
Selling Price	` 5 lakhs
Present Sales	90,000 units
Capacity utilization	60 percent

There is acute competition. Extra efforts are necessary to sell. Suggestions have been made for increasing sales :

(a) By reducing sale price by 5 per cent
 (b) By increasing dealer's margin by 25 per cent over the existing rate.

Which of these two suggestions you would recommend, if the company desires to maintain the present profit ? Give reasons

[Ans. The second proposal, i.e., increasing dealer's margin is recommended because of higher contribution per unit and lower volume of sales required to earn the same profit]

[Hint. Contribution per unit is `6 in the (a) case as compared to `7 in the (b) case.]

34. Murugesan Ltd. manufacturing single product, is facing severe competition in selling it at `50 per unit. The company is operating at 60% level of activity at which level sales are `12,00,000. Variable costs are `30 per unit. Semi-variable costs may be considered as fixed at `90,000 when output is nil and the variable element is 250 for each additional 1% level of activity. Fixed costs are `1,50,000 at the present level of activity, but at a level of activity of 80% or above these costs are expected to increase by `50,000.

To cope with the competition, the management of the company is considering a proposal to reduce the selling price by 5%. You are required to prepare a statement showing the operating profit at levels of activity of 60%, 70%, and 80% assuming that :

(a) the selling price remains at `50
 (b) the selling price is reduced 5%

Show also the number of units which will be required to be sold to maintain the present profit if the company decided to reduce the selling price of the product by 5%.

[Ans. Capacity levels 60% 70% 80%

(i) Profit at selling price of 50 2,25,000 3,02,500 3,30,000
 (ii) Profit if selling price is reduced by 5% 1,65,000 2,32,500 2,50,000
 (iii) Sales for desired profit of ` 2,25,000 : 27,556 units]

35. The trading results of Oxfam Ltd. for the first year of business which ended on 31st December, 1991 are :

Sales (at ` 40 per unit)	32,00,000
Less :	
Material	12,00,000
Labour	4,80,000
Variable Overhead	2,40,000
Fixed Overhead	5,00,000 24,20,000
	7,80,000

During 1991 the factory has been working at 50% capacity and the marketing manager has estimated that the quantity sold could be doubled in 1992 if the selling price was reduced to 35 per unit. No change is anticipated in unit variable cost, but certain administration change to cope with the additional volume of work would increase fixed overheads by ` 40,000.

You are required to :

- Evaluate the marketing manager's proposal; and
- Assuming the selling price was reduced, as proposed, unit variable cost remaining as in 1991, and fixed overhead increased by ` 40,000, calculate what quantity would need to be sold in 1992, in order to yield a profit of ` 10,00,000.

[Ans. (a) The proposal should be accepted since this will increase profit by ` 4,40,000; (b) 1,40,000 units]

UNIT- 3: JOB ORDER COST SYSTEMS

Chapter Outlines

- 3.0 Learning Objectives
- 3.1 Introduction
- 3.2 Job Costing
- 3.3 Cost Allocation and Activity - Based Costing
- 3.4 Process Cost System Normal Loss and Abnormal Loss
- 3.5 Joint product and By-products
- 3.6 Equivalent Production
- 3.7 Summary
- 3.8 Key Terms
- 3.9 Questions and Exercises

3.0 LEARNING OBJECTIVES

After studying this chapter, you should be able to understand:

- Describe job costing, objectives and its advantages and disadvantages.
- Distinction between job costing and process costing.
- Understand the importance of process costing.
- Normal and abnormal loss in process.
- Explain the by-products and joint products.

3.1 INTRODUCTION

Job costing is that form of specific order costing under which each job is treated as a cost unit and cost are accumulated and ascertained separately for each job. A job may consist of a job, product, batch of products, contract, a service or any other specific order.

In the second system production takes place on the special order of the customer known as specific order production. In job costing system production is done as per the special need and requirement of the customer as per the customer's choice and preference or liking. In the specific costing goods are produced for each customer as per the special requirement, design, size, or colour, price etc. as per the desire of customer. So the production cannot be standardised. So specific costing is also known as order costing. Under this method cost of production is accumulated and calculated as per the production need of the goods. CIMA, London defines job costing as "that form of specific order costing which applies where work is undertaken according to customer's specification."

Specific order costing can be (1) Job costing (2) Batch costing (3) Contract costing.

3.2 JOB COSTING

(i) Objectives of Job Costing:

- (i) It helps to find out the cost of production for each job or order.
- (ii) Comparison is possible for actual cost and estimated cost to help to find out the efficiency or inefficiency in execution of jobs carried out.
- (iii) Future quotation for similar jobs may becomes easier for the management on the basis of cost Data.
- (iv) Valuation of work in progress becomes easier for each job.
- (v) To calculate accurate cost of production for each job is possible because identity number of job.

(ii) Advantages of Job Costing:

- (i) It helps to find out cost of production of each job as per the elements of cost like material, labour, direct expenses and other overheads are recorded for each job separately.
- (ii) Accurate recording of cost for each job is possible as each job has distinct identity number and thus control on cost is easier.
- (iii) Application of Budgetary Control system is possible as predetermined overhead rate is applied for absorbing overheads for each job.
- (iv) Jobs which are profitable and jobs which are not profitable can be distinguished for managerial control decision.

- (v) Job costing helps in identifying spoilage and defective work with each job and this helps in fixing responsibility of the concerned department or person in the department.
- (vi) Fixation of selling price or quotation price of the jobs becomes easier for the management.
- (vii) Job costing helps in the application of cost plus pricing of the jobs undertaken as per the agreement between the buyer and the producer.

(iii) Disadvantages or Weaknesses of Job Costing:

The following may be the disadvantages of the system:

- (i) The job Costing ascertain the cost after the job is complete and thus it is Historical Cost. So the cost of production cannot be controlled during the production process.
- (ii) Comparison of one job with another job may not be possible as the job differs in their nature and there are changes either in cost or in method of production.
- (iii) Job costing involves a lot of clerical work in daily recording of cost so chances of errors are more and the system becomes expensive.
- (iv) At every stage of production each job needs separate identity to be maintained which is very difficult so many times.
- (v) So many pre-requisites are needed for job costing for getting the accurate results. These pre-requisites may be like time-booking, rate of recovery of overheads, clearly defined material issue method etc.

(iv) Procedure of Job Order Cost Accounting:

The system adopted should help to calculate, and provide cost data for the job performed. The cost components for each job should be discussed in detail on the Cost Sheet which is prepared for every order or job. The production procedure requires special planning, routing, scheduling and controlling system.

There may be the following points for a job:

- (i) **Receiving an Enquiry:** First of all various enquires about the job to be performed are sought by the customer from the producer. These enquires may relate to quantity of output quality of product, price of the product, time needed to fulfill the order, packing, delivery terms etc.
- (ii) **Estimation of the Cost:** Estimation of cost is required for arriving at the price of the job to be quoted to the customer by adding profit to the cost of production. These estimates of the cost, element wise are recorded on the cost sheet. Estimated cost are also compared with actual to calculate the variances if there is any and to control these variances.
- (iii) **Receiving of Order:** If the customer is satisfied with the various terms and conditions of the producer regarding quality, price, delivery date etc. then the customer will place the order with supplier.
- (iv) **Job Order Number:** When the order is placed by the customer then job number like 101, 102, 103, etc. are allotted to each job to maintain separate identity and for recording various items of expenses for the concerned job.
- (v) **Production Order or Job Order:** When a job ordered by the customer is accepted then Production Planning Department prepares a production or job Order. It is a written order to the production department or manufacturing department to carry out the job as per the special requirement or specifications of the customers. It is containing all the information to the former regarding job i.e. material, labour, departments, routing, scheduling, tools etc.:
- (vi) **Recording of Cost:** For each job costs are collected and recorded. For this purpose a job Cost Sheet (or job Cost Card) is prepared for each job. In the job cost card the record for material, labour and other overheads is maintained to calculate the cost of production. Completion Report is sent to the Costing Department for recording, analysis of cost in its ledger and to fix the selling price.
- (vii) **Profit or Loss on Job:** It is the difference in the selling price and the cost of job completed in the production Department.
- (viii) **Completion of Job:** When the job is completed a report known as Job. Cost Sheet or Job Report is prepared.

Illustration 3.1

The following information is given from cost record of a factory for Job No. 103.

Direct Material ` 8,020

Wages :

Department A : 120 Hrs. @ ` per Hour

Department B : 80 Hrs. @ ` per Hour

Department C : 40 Hrs. @ ` 5 per Hour

The variable overheads are as follows :

Department A : ` 5,000 for 5000 Hours.

Department B : ` 3,000 for 1500 Hours.

Department C : ` 2,000 for 500 Hours.

Fixed expenses estimated at ` 20,000 for 10,000 working hours. Calculate the cost for Job No. 103 and the price for the job to give a profit of 25% on the selling price.

Solution:

Job Cost Sheet (Job No. 103)

	Particulars	Amount (`)
Material		8,020
Wages		
Dept. A	120 × 4 = 480	
Dept B	80 × 3 = 240	
Dept.C	40 × 5 = 200	
Overheads-variable		920
	Dept A 120 × 1 = 120	Prime Cost
	Dept. B 80 × 2 = 160	8,940
	Dept. C 40 × 4 = 160	440
Overheads Fixed	240 × 2	480
		9,860
Profit (25% on S.P. or 33.3% on cost)		<u>3,287</u>
		<u>Selling Price</u>
		<u>13,147</u>

Working Notes :

(i) Variable overhead rates have been calculated as follows:

$$V.O.R. = \frac{\text{Variable Overheads}}{\text{Direct Labour Hours}}$$

$$\text{Dept. A} = \frac{5,000}{5,000} = ` 1$$

$$\text{Dept. B} = \frac{3,000}{1,500} = ` 2$$

$$\text{Dept. C} = \frac{2,000}{500} = ` 4$$

(ii) Fixed overhead rate has been calculated

$$F.O.R. = \frac{\text{Fixed Expenses}}{\text{Working Hours}} = \frac{20,000}{10,000} = ` 2$$

Total hours for job = 120 + 80 + 40 = 240

Total fixed overheads $240 \times 2 = ` 480$ (hrs × Rate per hour)

Contract price of the job is `525 and it requires 180 machine hours to complete.

Show the job cost sheet for job 101:

- (a) as it would appear if the job had been completed prior to 1st January, 2014
- (b) as it would appear if the job were completed in January, 2014.

Solution :

(a) Job Cost Sheet for Job 101

Particulars	Date of completion : 31. 12. 2013
	Amount (`)
Direct Material Cost	90
Direct Wages :	
Machinery 200 hours @ ` 0.60	120
Assembly 100 hours @ ` 0.40	40
Prime Cost	250
Production overhead 300 hours @ ` 0.50	150
Production Cost	400
Selling & Distribution overhead 25% of ` 400	100
Total Cost	500
Profit	25
Selling Price	525

(b) Job Cost Sheet for Job 101

Particulars	Date of completion : Jan. 2014
	Amount (`)
Direct Material Cost	90
Storekeeping & Material handling 10% of ` 90	9
Machinery :	
Direct wages 200 hours @ ` 0.60	= 120
Assembly :	
Direct wages 100 hours @ ` 0.40	= 40
Overhead 100 hours @ ` 0.30	= 30
Production Cost	424
Selling & Distribution overhead 25% of ` 424	106
Total cost	530
Selling price	5
	525

3.3 COST ALLOCATION AND ACTIVITY BASED-COSTING

Allocation

After the overheads are collected from various sources they are to be identified to a particular product, process, job, cost centre for which these have been incurred. If it can be (The department) identified easily for which these overheads relate then they are charged to that department. This process of charging the overhead to a particular department is known as allocation.

Allocation of Overhead

Allocation of overhead is the process of charging the full amount of an item of cost directly to a cost centre for which the item of cost was incurred. According to I.C.M.A., "Allocation means the allotment of whole item of cost to cost centre or cost unit".

Thus, allocation of cost means charging the full amount of a cost to a cost centre. The nature of the expenses is such that it can be easily identified and allocated to the cost centre or to the cost unit of production. As repair to machinery, repair to factory etc. are production overhead these are to be allocated to production centre. Salary to sales manager is a selling overhead and so on.

Activity - Based Cost Allocation

Activity - Based Costing (ABC) is a method of charging overheads to cost units (such as products, services or customers) on the basis of activities performed for the cost unit. There are different activities involved in manufacturing a product or rendering of services. Each activity consumes some resources of the organization which incur costs. Thus, cost of resources is all allocated to each product / service on the basis of activities in manufacturing product or providing service. ^

The CIMA technology defines ABC as a "cost attribution to cost units on the basis of benefit received from indirect activities"

Thus, ABC is the process of tracing costs first from resources to activities and then from activities to specific products. The technique of ABC lays the importance of different costs for different purposes and the identification of just those costs which are relevant to a particular decision

3.4 PROCESS COST SYSTEM: NORMAL AND ABNORMAL LOSS

(i) Rules/Principles of Process Cost Accounting:

The following principles or rules are generally applied to calculate process costing for each process carried out in the organisation:

- (i) A separate account for each process is opened and each process is considered as a separate department or cost centre to calculate cost of each process.
- (ii) All the direct and indirect expenses related to a specific process are shown in debit of the concerned process.
- (iii) All the losses which takes place in a process are shown in the credit of that process account.
- (iv) If there is any by-product in any process and the by-product has any sale price or market price then it is shown on the credit of the process concerned.
- (v) The output of the previous process is transferred to the next process, and the final product is then transferred to Finished Stock account.
- (vi) When total cost of the process is divided by the units produced in that process it results into per unit cost of that process.
- (vii) In process costing system the units produced in each process are also recorded and hence there is a separate column for units introduced and units produced in every process. The normal loss, abnormal loss or abnormal effective are also recorded in units in the process account as the case may be.
- (viii) If the half manufactured goods or work in progress is sold during any process then it is shown in the credit of the concerned process account.
- (ix) If the product of one process is transferred to another process by adding profit then the goods transferred in the credit by adding profit in that and the profit is shown in the debit of the process account.

Difference between Job Costing and Process Costing

	Job Costing	Process Costing
1. Performance	In Job costing work is performed generally inside the factory or at the work	Work, in process costing is performed within the factory premises.
2. Production Order	Generally work is started after receiving the special order from the customer.	In process costing work is performed for stock purpose on the continuous basis.
3. Transfer	In the Job costing every contract is separate and independent from each job.	In process costing work of the next process depends on the work of the previous process. So the processes are interrelated to each other.
4- Cost Control	Being every job is separate and each job has special characteristics and the job is not standardised so cost control is difficult.	Being each process is standardised and stable and can be predetermined so control is easier.
5. Cost Calculation	In contract costing actual cost can be known only after the Job is complete.	In process costing, costs are calculated on the basis of period after the completion of the process.
6. Per unit cost	In Job costing, the total cost of each Job is calculated.	In process costing, per unit cost is calculated after the process is complete.

7. Separate Entity	In Job costing, every Job is a separate entity.	In process costing, as the process is a continuous process so the products lose their separate identity.
8. Nature	Each job may be different.	Production is homogenous and standardized.
9. Cost Centre	The cost centre is a job.	The cost centre is a process.
10. Work-in progress	There may or may not be work-in-progress.	There is always some work in process being production is continuous,
11. Degree of control	Higher degree of control is required because of homogenous job.	Lower degree of control is required because of homogenous products and standardized process.

Illustration 3.4

The product of a process has to pass through three processes known as X, Y and Z. The cost books reveals the following information.

Process	X	Y	Z
Direct Material	15,000	9,000	7,000
Direct Labour	7,000	6,000	4,000
Direct Expenses	4,000	5,000	3,000

The indirect expenses were `5,100 for the period. The by-product of process Y was sold for `600 and the residue of process Z for `400. The output was of 500 units during the period. Prepare Process account.

Solution:

Process X Account (output 500 units)

Particulars	Amount (`)	Particulars	Amount (`)
To Direct Material	15,000	By Process Y	28,100
To Direct Labour	7,000	@ ` 56.20	
To Direct Expenses	4,000		
To Indirect Expenses	2,100	(Output Transferred)	
	28,100		28,100

Process Y Account

Particulars	Amount (`)	Particulars	Amount (`)
To Process X	28,100	By Sale of by-product	600
To Direct Material	9,000	By Process Z	49,300
To Direct Labour	6,000	@ ` 98.60	
To Direct Expenses	6,000	(Output Transferred)	
To Indirect Expenses	1,800		
	<u>49,900</u>		<u>49,900</u>

Process Z Account

Particulars	Amount (`)	Particulars	Amount (`)
To Process Y	49,300	By Sale of Residue	400
To Direct Material	7,000	By Finished Stock A/c	64,100
To Direct Labour	4,000	@ ` 128.20	
To Direct Expenses	3,000		
To Indirect Expenses	1,200		
	64,500		64,500

Working Note: Indirect expenses have been apportioned in the ratio of direct labour.

Loss in Weight and Sale of Scrap

In so many industries when the goods are in manufacturing process there can be loss in weight of the input of material due to evaporation, moisture like chemicals, spirit, alcohol, essence etc. There can be weight loss also in the material because of working as furniture making from wood, or boring and drilling on iron bars etc. This is known as scrap. The scrap sometime is sold at a nominal value in the market or may not having any value. But it results into weight loss of the quantity in output. This loss is shown in the credit of process account. This loss increases the cost of production of the product produced in the process. If the scrap is sold then the sale value of scrap is also shown on the credit of process account which results into decreasing the cost of production.

Illustration 3.5

The Bengal Chemical Co. Ltd. produced three chemicals during the month of July 2014 by the consecutive processes. In each process 2% of the total weight put in is lost and 10% is scrap which from process I and II realise `100 per ton and from process III `20 per ton. The products of three processes are dealt with as follows:

Process	I	II	III
Passed to the Next process	75%	50%	-
Stock Kept for sale	25%	50%	100%
Expenses Incurred			

	Process I		Process II		Process III	
	(`)	Tons	(`)	Tons	(`)	Tons
Raw Material	1,20,000	1,000	28,000	140	1,07,840	1,348
Manufacturing and General Expenses	30,800		28,760		18,100	-

Prepare process cost accounts showing the cost per ton of each product.

Solution:

Process I Account

Particular	Tons	Amount (`)	Particular	Tons	Amount (`)
To Material issued	1,000	1,20,000	By Loss in weight $\left(\frac{1000 \times 2}{100} \right)$	20	-
		30,800	By sales of scrap $\left(\frac{1000 \times 10}{100} \right)$	100	10,000
			By Transfer to Stock	220	35,200
			$(1000 - 100 - 20) = 880 \times \frac{25}{100}$		
			@ ` 160 per ton		
			By Process II	660	1,05,600
			$880 - 220 = 660$ tons @ ` 160	<u>1,000</u>	<u>1,50,800</u>

Note: Cost per ton = $\frac{\text{Total Cost} - \text{Sale of Scrap}}{\text{Output in units}} = \frac{1,50,800 - 10,000}{880} = ` 160 \text{ per ton.}$

Process II Account

Particular	Tons	Amount (`)	Particular	Tons	Amount (`)
To Process I	660	1,05,600	By Loss in weight (2% of 800 ton) $800 \times \frac{2}{100}$	16	-
To Material Issued	140	28,000	By sales of scrap $800 \times \frac{10}{100}$	80	8,000
To Manufacturing Exp.	-	25,760	By Transfer to Stock $(800 - 16 - 80)704 \times \frac{50}{100}$	352	76,680
		<u>800</u>	By Transfer to Process III @ 215 per ton	352	76,680
		<u>1,59,360</u>		<u>800</u>	<u>1,59,360</u>

Note : Cost per ton = $\frac{1,59,360 - 8000}{704}$ = ` 215 per ton.

Process III Account

Particular	Tons	Amount (`)	Particular	Tons	Amount (`)
To Transfer from Process II	352	75,580	By Loss in Weight (2% of 1700 tons)	34	-
To Material Issued	1346	1,07,840	By Sale of Scrap (10% of 1700 tons)	170	3,400
To Manufacturing Expenses	-	18,100	By Transfer to Stocks	1,496	1,98,220
	<u>1,700</u>	<u>2,01,620</u>		<u>1,700</u>	<u>2,01,620</u>

Note: Cost per ton = $\frac{2,01,620 - 3400}{1496}$ = ` 132.50 per ton.

Loss in Production

During production process there may be some losses in processing of raw material into finished foods. This loss sometime may be natural or inherent (due to the nature of product) or unnatural. The loss in production results into loss in weight of the output then input. This loss can be of two types :

- (i) Normal Loss
- (ii) Abnormal Loss

(i) **Normal Loss :** The loss which is expected in advance by the management due to the nature of product, process or the loss which cannot be controlled or the loss which cannot be prevented or the loss which is to take place during production process is known as Normal Loss. As for example some cloth is wasted while dress is prepared from a piece of cloth, some leather pieces remain unutilised while preparing shoes from leather or wood pieces are left unused while doors, windows or furniture are made by the carpenter. All this is a natural phenomenon while production take place. This loss decreases the output. This loss may have sale value process account. The normal loss increases the cost of the useable goods (or good units produced) in the process. As for example.

In a process 2,000 units of raw material @ ` 8 per unit are used. The normal loss is expected 10% the market value of the normal loss is ` 3 per unit. Then

Input	= 2,000 units
Less: Normal Loss 10%	= 200 units
Normal output	= 1,800 units
Cost of the Input	= $2000 \times 8 = ` 16,000$
Sale value of the normal loss 200×3	= 600
Cost of the normal output	= <u>15,400</u>

$$\text{Cost per unit of output} = \frac{15,400}{1800} = `8.55$$

If there is no sale value of the normal loss in the market then the cost per unit of the good units produced will be $\frac{16,000}{1800 \text{ units}} = `8.88$

Note: Thus the sale price, if there is any of the normal loss, helps to reduce the cost of production of the good units produced.

Some special features of the normal loss:

- This loss is expected to take place in advance on the basis of past experience.
- This loss cannot be prevented or avoided or it cannot be controlled.
- Normal loss in production results into increase in cost of production.
- This loss is shown in the credit of the related process account.
- This loss may have; or may not have some sale value in the market.

Accounting treatment of Natural Loss

1. For realizable value of normal loss (Units of normal loss \times recovery price per unit)	Normal Loss A/c To Process A/c	Dr.
2. For adjustment of abnormal gain against normal loss (Units of abnormal gain \times sale price of normal loss per unit in the same process)	Abnormal gain A/c To Normal Loss A/c	Dr.
3. For closing the normal loss account and the balance transferred to Cash / Debtors A/c	Cash / Debtors A/c To Normal Loss A/c	Dr.

(ii) **Abnormal Loss:** It is an avoidable loss which occurs due to abnormal reasons like using sub-standard materials, carelessness of workers, breakdown of machinery, poor or defective design of plant etc. Such losses are in excess of predetermined normal losses. Such losses cannot be estimated in advance. Such losses arise when actual losses are more than the expected losses, i.e., normal losses.

Units of abnormal loss = Units of actual Loss – Units of normal Loss

Or

= Expected output (i.e., Input – Normal loss) – Actual Output

$$\text{Value of Abnormal loss} = \frac{\text{Normal cost of normal Output}}{\text{normal output}} \times \text{Units of abnormal loss}$$

$$= \frac{\text{Total cost incurred} - \text{Scrap value of normal loss}}{\text{Total input} - \text{Units of normal Loss}} \times \text{Units of abnormal loss}$$

Illustration 3.6

From the following prepare process account and abnormal loss account.

Material Issued 8,000 units @ ` 12 per unit.

Labour Charges ` 44,000.

Other Expenses ` 25,000.

Normal Loss 10% of units introduced.

Sale price of normal loss @ 6 per unit.

Actual output 6,900 units.

Solution:

PROCESS ACCOUNT

Particulars	Units	Amount (₹)	Particulars	Units	Amount (₹)
To Material @ `12 per unit	8,000	96,000	By Normal Loss 10%	800	4,800
To Labour		44,000	By Abnormal Loss @ `22.25 per unit	300	6,675
To Other Expenses		25,000	(8,000 – 800) = 72,000		
			7200-6900 = 300 units		
			By Next Process @ `22.25 per unit	6900	1,53,525
				8,000	1,65,000

Working Notes:

$$\text{Abnormal Loss} = (9,000 - 800 - 6900) = 300 \text{ unit}$$

$$\text{Normal Cost of Normal output} = 1,65,000 - 4,800 = `1,60,200$$

$$\text{Normal output} = 8,000 - 800 = 7200 \text{ units}$$

$$\text{Cost of Abnormal Loss} = \frac{\text{Normal Cost of Normal Output}}{\text{Normal Output}} \times \text{Abnormal Loss of Units}$$

$$= \frac{1,60,200}{7,200} \times 300 = `6,675$$

$$\text{Cost per unit of good units produced} = \frac{1,53,525}{6900} = `22.25$$

Abnormal Loss Account

Particulars	Units	Amount (₹)	Particulars	Units	Amount (₹)
To Process A/c	300	6,675	By Cash Sale price of 300 units @ `6 per unit	300	1,800
	<u>300</u>	<u>6,675</u>	By Profit & Loss A/c	<u>300</u>	<u>4,875</u>

Abnormal Gain or Abnormal Effective:

When the actual output is more than the expected output or when the actual loss is less than the normal loss the difference between the two is known as abnormal gain. This situation may arise due to various reasons like extra efficiency of the workers, better working environment, satisfied staff, or when due recognition is given for better performance of the workers.

Cost of Abnormal Gain: The cost calculation is important as the benefit of this extra efficiency should not be absorbed in the process but it should be separately accounted for, and hence the profit due to abnormal gain should be credited to Costing profit and loss account.

$$\text{Cost of Abnormal Gain} = \frac{\text{Normal Cost of the Normal Output}}{\text{Normal Output}} \times \text{Abnormal Gain (in units)}$$

Illustration 3.7

Mandex Ltd. Process a patent material used in buildings. The material is produced in three grades namely, soft, medium and hard. Figures are given for year 2010 as follows:

	Process I	Process II	Process III
Raw material used	1,000 tonnes		
Cost per tonne	`200		
Wages & Manufacturing Exp.	`72,500	`40,800	`10,710
Weight lost	5%	10%	20%
Scrap Sold at `50 per tonne	50 tonnes	30 tonnes	51 tonnes
Sale Price of the Product per tonne	`350	`500	`800

Management expenses were `17,500, selling expenses `10,000 and interest on borrowed capital `4,000. $\frac{2}{3}$ rd of process I and $\frac{1}{2}$ of process II are passed on to the next process and the balance are sold.

Prepare the process account in suitable form to be presented to directors in the next meeting.

Solution:

Process I Account

Particulars	Tonnes	Amount (`)	Particulars	Tonnes	Amount (`)
To Material @ `200 per tonne	1,000	2,00,000	By Sale of scrap @ `50 per tonne	50	2,500
To Wages & Salaries	-	72,500	By Loss in Weight 5%	50	-
	<u>1,000</u>	<u>2,72,500</u>	By Transfer to stock A/c @ `300 per tonne	900	2,70,000

Stock Account Process I

Particulars	Tonnes	Amount (`)	Particulars	Tonnes	Amount (`)
To Process I	900	2,70,000	By Sale @ `350 per tonne	300	1,05,000
To Profit @ `50 per tonne on 300 tonne	-	15,000	By Process II $900 \times 2/3$	900	1,80,000
	<u>900</u>	<u>2,85,000</u>		<u>900</u>	<u>2,85,000</u>

Process II Account

Particulars	Tonnes	Amount (`)	Particulars	Tonnes	Amount (`)
To Process I Stock A/c	600	1,80,000	By Sale of scrap @ `50 per tonne	30	1,500
To Wages & Expenses	-	40,800	By Loss in Weight 10%	60	-
	<u>600</u>	<u>2,20,800</u>	By Stock A/c @ `430 per tonne	510	2,19,300

Stock Account

Particulars	Tonnes	Amount (`)	Particulars	Tonnes	Amount (`)
To Process II	510	2,19,300	By Sale @ `500 per tonne	255	1,27,500
To Profit @ `70 per tonne on 225 tonne	-	17,850	By Process III $510 \times 1/2$	255	1,09,650
	<u>510</u>	<u>2,37,150</u>		<u>510</u>	<u>2,37,150</u>

Process III Account

Particulars	Tonnes	Amount (`)	Particulars	Tonnes	Amount (`)
To Process I Stock A/c	255	1,09,650	By Sale of scrap @ `50 per tonne	51	2,550
To Wages & Expenses	-	10,710	By Loss in Weight 20%	51	-
	<u>255</u>	<u>1,20,360</u>	By Stock A/c @ `770 per tonne	153	1,17,810

Stock Account

Particulars	Tonnes	Amount (`)	Particulars	Tonnes	Amount (`)
To Process III	153	1,17,810	By Sale @ `800 per tonne	153	1,22,400
To Profit @ `30 per tonne	-	4,590		<u>153</u>	<u>1,22,400</u>
	<u>153</u>	<u>1,22,400</u>			

Profit and Loss Account

Particulars	Amount	Particulars	Amount
To Management Expenses	17,500	By Process I Stock A/c	15,000
To Selling Expenses	10,000	By Process II Stock A/c	17,800
To Interest on Capital	4,000	By Process III Stock A/c	4,500
To Net Profit	5,940		
	<u>37,440</u>		<u>37,440</u>

3.5 JOINT PRODUCTS AND BY-PRODUCTS

Sometime when the production of a product is process there may be the production of two or more than two products produced simultaneously from the same raw material and in the same process.

When the two or more products simultaneously are of equal marketable value they are known as joint products. These products may be saleable without further processing or after further processing.

Methods of Apportioning Joint Costs over Joint Products

So the basic and fundamental problem in Joint Product is that of the Apportioning Joint Cost. The methods used for the purpose can be:

1. Physical Unit method
2. Physical Unit Cost Method
3. Market Price Method
 - (a) At Point of Separation
 - (b) After Further Processing
4. Sales Value Method
5. Survey Method/Weight Point Value Method
6. Contribution Margin Method
7. Net Realisable Value Method
8. Reverse Cost Method

1. Physical Unit Method

Under this system the joint expenses prior to split off point are distributed among the products on the basis of some physical units like quantity of material or weight of material etc. consumes 40% material and product B consumes 60% material then the joint expenses between A and B will be divided in the ratio of 4 : 6. In this method it is presumed that material is of vital importance as far as the cost of production is concerned.

Suitability: This method is suitable where the physical units of Joint products are same.

Illustration 3.8

Apportion the Joint Cost of the products X, Y and Z from the following data under physical unit method. The joint cost are ` 1,20,000.

Product	Raw Material units used
X	10,000
Y	15,000
Z	<u>15,000</u>
	<u>40,000</u>

Solution:

Cost per unit of raw material will be calculated by the method

$$= \frac{\text{Joint Cost (Total)}}{\text{Total of Material units consumed}} = \frac{1,20,000}{40,000} = ` 3$$

Product	Raw Material units used	Cost per unit (`)	Joint Expenses(`)
X	10,000	3	30,000
Y	15,000	3	45,000
Z	15,000	3	45,000
			<u>1,20,000</u>

2. Physical Unit Cost method

Under this method the joint cost before the point of split off are divided by the total units produced to find out the average cost per unit produced. This method thus is applied where the units produced are of the standard quality and the units are of the same nature.

Illustration 3.9

Apportion the joint expenses on the basis of physical unit cost method from the following data.
Joint expenses ` 90,000.

Product	Units produced
A	2,000
B	1,000
C	3,000
	<u>6,000</u>

Solution:

$$\text{Average joint cost per unit} = \frac{90,000}{6,000(\text{units})} = `15 \text{ per unit}$$

Product	Units Produced	Cost per unit (`)	Joint Cost(`)
A	2,000	15	30,000
B	1,000	15	15,000
C	3,000	15	45,000
			<u>90,000</u>

3. Market Price Method

(a) At the point of Separation: The products produced if are saleable in the market at the point of separation then the joint cost may be apportioned on the basis of market-price of the product at the separation point

Illustration 3.10

From the following information apportion the joint cost of ` 1,35,000 under the market price method at the point of separation

Product	Units Produced	Market Price
A	6,000	30
B	2,000	20
C	5,000	40

Solution:

Market Price Method

Product	Units Produced	Market Price (`)	Joint Cost (`)(3 : 2 : 4)	Cost Per Unit (`)
A	6,000	30	45,000	7.50
B	2,000	20	30,000	15.00
C	5,000	40	60,000	12.00

(b) After Further Processing: This method is more useful and practical as selling price may be easily available from the market when the product is saleable and ready as a finished product. Further processing costs are deducted from the sales value in order to calculate the ratio in which the joint cost are apportioned.

Illustration 3.11

Asha Ltd. Manufactures two joint products X and Y and sells them at `12 and `8 per unit respectively during a particular period. 800 units of X and 1,000 units of Y were produced and sold. The joint cost incurred was `7,000 and the further processing cost for product X and Y were `4,600 and `4,000. Apportion the joint expenses.

Solution:

Product	Units Produced	Selling Price per unit(`)	Sales(`)	Less further Processing Cost (`)	Sales Value less further Processing Cost (`)	Ratio	Joint Cost (`)
X	800	12	9,600	4,600	5,000	5/9	4,000
Y	1,000	8	8,000	4,000	4,000	4/9	3,200

4. Sales Value Method

Under this method the joint cost before the point of split off can be apportioned among the products on the basis of the sales value of the product. This method is easy and popular for the absorption of these expenses (joint expenses) into the products.

Illustration 3.12

From the following information apportion the joint expenses of 1,20,000 under the Sales Value Method.

Product	Units Produced	Market Price per Unit (`)
A	6,000	40
B	2,000	30
C	3,000	20

Solution:

Product	Units Produced	Market Price per Unit (`)	Sales Value (`)	Apportioning of Joint Cost (`) 1,20,000 24:6:6	Joint Cost per unit (`)
A	6,000	40	2,40,000	80,000	13.33
B	2,000	30	60,000	20,000	16.00
C	3,000	20	20,000	20,000	6.66

5. Survey Method/Weight Point Value Method

Under this method all the important factors related to product like quantity, quality, selling price demand, advertisement, method or products and other technical aspect etc. are estimated and collected by conducting a survey. Point value is given to each product and cost is apportioned on the basis of these points. These survey are conducted regularly to revise and include then necessary changes as per the time.

Illustration 3.13

The joint cost for a period for product A, B and C are `34,800

Production during the period were

Product

A-800 units

B-1,000 units

C-1,200 units

As per technical survey the points allotted to product A, B and C are 5, 4 and 3 respectively. Apportion the joint cost and calculate cost per unit.

Solution:

Product	Units	Technical Point	Point value	Ratio	Apportionment `34,800	Cost per Units (`)
A	800	5	4,000	10	12,000	15
B	1,000	4	4,000	10	12,000	12
C	1,200	3	3,600	9	10,800	9
Total					<u>34,800</u>	

6. Contribution Margin Method

Under this method the marginal cost (variable cost) of the joint cost are apportioned on the basis of weight or quantity of each product and fixed cost on the basis of marginal contribution made by each of the products. This method helps to provide useful information to the management for taking various managerial decisions like maximization of profit or deciding about sales mix or to discontinue a specific product or not.

Illustration 3.14

JRS Enterprises operates a chemical process which produce four products P, Q, R and S from a basic raw material and provides you the following data.

1. Basic raw material 1,25,000 units @ `2
2. Initial processing wages `1,50,000
3. Initial processing overheads `1,00,000
4. Output, selling prices and additional processing costs.

Products	Output (units)	Selling per unit at split-off point (`)	Selling price per unit after further processing(`)	Additional Processing Costs after split off (`)
P	10,000	40	70	2,50,000
Q	20,000	30	65	3,00,000
R	30,000	20	40	7,50,000
S	40,000	10	20	2,00,000

You are required to:

- (a) Prepare a statement showing the apportionment of joint costs **on the basis of net realizable value at split off point.**
- (b) Prepare a statement showing the product wise and total profitability if all the products are **sold at split-off point.**
- (c) Prepare a statement showing the product-wise and total profitability if all the products are **sold after further processing.**

Solution:

(a) Statement showing the Apportionment of Joint Costs

Products	Output (units)	Selling price per units after further processing (`)	Sales Value (`)	Further processing Costs (`)	Net Realizable value at Split off point (`)	Joint cost apportioned (in the ratio of 45:100:45:60) (`)
						A
P	10,000	70	7,00,000	2,50,000	4,50,000	90,000
Q	20,000	65	13,00,000	3,00,000	10,00,000	2,00,000
R	30,000	40	12,00,000	7,50,000	4,50,000	90,000
S	40,000	20	8,00,000	2,00,000	6,00,000	1,20,000
					25,00,000	5,00,000

- (b) Statement showing the profitability
(If all products are sold at split off point)

Products	Output (units)	Sales Value (`)	Selling price per units after further processing (`)	Joint Cost Apportioned(`)	Profit
				A	B
P	10,000	4,00,000	70	90,000	3,10,000
Q	20,000	6,00,000	65	2,00,000	4,00,000
R	30,000	6,00,000	40	90,000	5,10,000
S	40,000	4,00,000	20	1,20,000	2,80,000
		<u>20,00,000</u>		<u>5,00,000</u>	<u>15,00,000</u>

(c) Statement showing the Profitability
(If all products are sold after further processing)

Products	Output (units)	Selling value after further processing (`)	Joint costs apportioned (`)	Further processing Costs (`)	Total Costs (`)	Profit (loss) (`)
	A	B	C	D	E=C+D	F=B-E
P	10,000	7,00,000	90,000	2,50,000	3,40,000	3,60,000
Q	20,000	13,00,000	2,00,000	3,00,000	5,00,000	8,00,000
R	30,000	12,00,000	90,000	7,50,000	8,40,000	3,60,000
S	40,000	8,00,000	1,20,000	2,00,000	3,20,000	4,80,000
		40,00,000	5,00,000	15,00,000	2000,000	20,00,000

8. Reverse Cost Method

Illustration 3.15

In processing a basic raw materials, three joint products, P, Q, R are produced after incurring joint costs of ` 5,10,000. All the three products are processed further after separation and sold as per details given below:

Particulars	P	Q	R
Output (units)	10,000	20,000	30,000
Selling price per unit	30	20	10
Further processing costs	7	6	2
Estimated profit as % of sales	10%	20%	30%

Assume the selling expenses are apportioned over the products as a percentage to **cost of sales**.

You are required to:

- Prepare a statement showing the apportionment of joint costs.
- Prepare a statement showing product wise and total cost of production, **cost of sales and profitability**.

Solution:

(a) statement showing the Apportionment of Joint Costs

Particulars	P(`)	Q(`)	R(`)	Total (`)
A. Sales value after further processing	3,00,00	4,00,000	3,00,000	10,00,000
B. Less: Estimated profit	30,000	80,000	90,000	2,00,000
C. Total Cost of Sales (A-B)	2,70,000	3,20,000	2,10,000	8,00,000
D. Less: Selling and Distribution expenses @5%	13,500	16,000	10,500	40,000
E. Total Cost of goods sold (C-D)	2,56,500	3,04,000	1,99,500	7,60,000
F. Less: Further processing costs	70,000	1,20,000	60,000	2,50,000
G. Net value (E-F)	1,86,800	1,84,000	1,39,500	5,10,000

(b) Statement showing the Cost of Production, Cost of Sales and Profitability

Particulars	P(`)	Q(`)	R(`)	Total (`)
A. Joint Costs	1,86,500	1,84,000	1,39,000	5,10,000
B. Further processing costs	70,000	1,20,000	60,000	2,50,000
C. Cost of production (A+B)	2,56,500	3,04,000	1,99,500	7,50,000
D. Selling Expenses	13,500	16,000	10,500	40,000
E. Cost of Sales (C+D)	2,70,000	3,20,000	2,10,000	8,00,000
F. Sales	3,00,000	4,00,000	60,000	10,00,000
G. Profit (F-E)	30,000	60,000	1,39,500	2,00,000

Working Note: Calculation of selling expenses

A. Total cost of sales (Total Sales- Total Profit) 8,00,000

B. Less: Total cost of production (joint Cost + Further Processing Costs)

(5,10,000 + 2,50,000) 7,60,000

C. Selling Expenses 40,000

D. Selling expenses as % of cost of sales = $\frac{40,000}{8,00,000} \times 100 = 5\%$

3.6 EQUIVALENT PRODUCTION

In a manufacturing unit generally it is not possible to complete the work on all the units on which work has been started. Along with the completed units in all respect at the end of the specific period (may be the month or six months (or a year) there may remain some unit on which work has been started and may be finished upto an advance stage in respect of material labour or overheads but which are not fully complete.

Thus, incomplete production units represent those production units on which percentage of completion with regard to all elements of cost is not 100%. Such incomplete production units are known as work-in-progress. Work-in-progress is valued in terms of equivalent or effective units. In other words, equivalent production units represent incomplete production units expressed in terms of equivalent completed units.

Illustration 3.16

In December 2016 the following is available relating to process-2

Opening WIP 9,000 units (60% of work completed),

Units produced during the period -40,000 units,

Closing WIP -5,000 units (70% of work completed),

Calculate equivalent production units under different methods.

Solution:

Method-1

Particulars	Units
Opening WIP $\left(9,000 \times \frac{40}{100} \right)$	3,600
Add: Units introduced and completed $(40,000 - 5,000)$	35,000
Add: Closing WIP $\left(5,000 \times \frac{70}{100} \right)$	3,500
Equivalent Units	42,100

Method-2

Particulars	Units
Units completed during the period $(40,000 + 9,000 - 5,000)$	44,000
Add: Closing WIP $\left(5,000 \times \frac{70}{100} \right)$	3,500
Add: Opening WIP $\left(9,000 \times \frac{60}{100} \right)$	5,400
Equivalent Units	42,100

Method-3

Particulars	Units
Opening WIP $\left(9,000 \times \frac{40}{100} \right)$	3,600
Add: Units introduced	40,000
Add: Closing WIP $\left(5,000 \times \frac{30}{100} \right)$	1,500
Equivalent Units	42,100

Steps Involved in the Preparation of Process Account when there is WIP

Step-1: Prepare Statement of Equivalent production.

(To find out equivalent production units for the period)

Step-2: Prepare Statement of cost per Equivalent unit
 (To calculate cost per unit for each element of cost)

Step-3: Prepare Statement of evaluation
 (To find out the cost of equivalent units of opening stock, completed units and closing stock)

Step-4: Prepare Process Account.

Preparation of Process Account when there are both Opening Stock and Closing Stock of Work-in-Progress and FIFO Method is used

The following points are worth noting in this regard:

- Equivalent units of opening work-in-progress are calculated with reference to the percentage of work needed to complete the unfinished work of the previous period. For example, if there are 800 units of opening WIP which are 100% completed as to materials, 60% as to labour and 40% as to overheads, then equivalent units will be Nil as to materials (since there is no incomplete work as to materials), 320 units (i.e., 40% of 800 unit) as to labour and 480 units (i.e. 60% of 800 units) as to overheads.
- Complete Cost units of opening WIP is calculated as follows:

$$= \text{Cost of opening WIP incurred during previous period} + \text{Proportionate cost incurred during current period to complete the incomplete work of previous period.}$$
- Completed cost of units completed and transferred is calculated as follows:

$$= \text{Completed cost of units of Opening WIP} + \text{Cost of units introduced and completed during the current period.}$$

Illustration 3.17

From the following data calculate:

- Equivalent Production
- Cost per unit
- Statement of Evaluation

Units Introduced in the process	2,000
Units completed and transferred to next process	1,500
Units work in Progress	400
Level of completion of work in progress	
Materials	80%
Labour	70%
Overheads	70%
Normal Loss has a scrap value of ` 15 per unit	,
Cost of Material	91,500
Wages	1,20,000
Overheads	72,000

Solution:

Statement of Equivalent Production

Particulars	Total Units	Materials		Labour		Overheads	
		Units	%	Units	%	Units	%
Completed Units	1,500	1,500	100%	1,500	100%	1500	100%
Closing Work in Progress	400	320	80%	280	70%	280	70%
Normal Loss	100	-	-	-	-	-	-
Equivalent Units	2,00	1,820		1,780		1,780	

Statement of Cost

Element of Cost	Cost (`)	Equivalent Units	Cost per Unit(`)
Material	91,500		
Loss: Scrap Sold (100x15)	1,500		
	90,000	1,820	49.45
Labour	1,20,000	1,780	67.42
Overheads	72,000	1,780	40.45
	<u>2,82,000</u>		<u>157.32</u>

Statement of Evaluation

Particulars	
Finished goods 1500×157.32	2,35,980
Work in Progress	
Material 320×49.45	= 15.824
Labour 280×67.42	= 18.878
Overhead 280×40.45	= 11.326
	46,028
	<u>2,82,008</u>

Illustration 3.18

From the following information prepare: (a) Statement of Equivalent production, (b) Statement of Cost per Equivalent unit, (c) Statement of Evaluation, (d) Process Account

1. Opening work-in-progress: 800 units valued as under
Material ` 3,200, Labour ` 960, Overheads ` 320
2. Input Materials: 9,200 units
3. Current cost incurred in process: Material ` 36,800
Labour ` 16,740
Overhead ` 7,930
4. Normal loss: 8% of total input (i.e., opening WIP + units put in)
5. Scrap realized @ ` 40 per 10 units
6. Closing Work-in-progress: 900 units
7. Transfer to next process: 7,900 units
8. Degree of completion

Elements	Opening stock(%)	Closing Stock (%)	Scrapped units (%)
Material	100	100	100
Labour	60	70	80
Overheads	40	30	20

9. Method of valuation: FIFO

Solution:

(a) Statement of Equivalent Production

Output	Units	Material		Labour		Overheads	
		% Completion	Units	% Completion	Units	% Completion	Units
A. Opening WIP	800	-	-	40	320	60	480
B. Units introduced & completely processed (7,900-800)	7,100	100	7,100	100	7,100	100	710
C. Closing WIP	900	100	900	70	630	30	270
D. Abnormal Loss	400	100	400	80	320	20	80
E. Equivalent Units (A+B C+D)	<u>9,200</u>		<u>8,400</u>		<u>8,370</u>		<u>7,930</u>

(b) Statement of Cost per Equivalent Unit

Element of Cost	Cost (`)	Equivalent Units	Cost per Equivalent Unit(`)
Net material Cost	33,600	8,400	4
Labour Cost	16,740	8,370	2
Overheads	7,930	7,930	1

*Net Material Cost = `36,800 - `3,200 = `33,600

(c) Statement of Evaluation

Particulars	Elements of Cost	Equivalent Units	Cost per Equivalent Unit(`)	Cost of Equivalent Units(`)	Total
Opening WIP (800 units) Cost introduced during previous period					4,480
Cost incurred during current period					
Material	-		-	-	
Labour		320	2	640	
Overhead		480	1	480	1,120
Units introduced and completed (7,100 units)					
Material		7,100	4	28,400	
Labour		7,100	2	14,200	
Overhead		7,100	1	7,100	49,700
Total cost of 7,900 units to next process:					55,300
Closing WIP (900 units)					
Material		900	4	3,600	
Labour		630	2	1,260	
Overhead		270	1	270	5,130
Abnormal Gain (400 units)					
Material		400	4	1,600	
Labour		320	2	640	
Overhead		80	1	80	2,320

(d) Process I Account

Particulars	Units		Particulars		
To opening WIP	800	4,480	By Normal Loss	800	3,200
To Direct Material	9,200	36,800	By Abnormal Loss A/c	400(B/F)	2,320
To Direct Labour	-	16,740	By Process #A/c (transfer to next process)	7,900	55,300
To Overheads	-	7,930	By Closing WIP	900	5,130
	<u>10,000</u>	<u>65,950</u>		<u>10,000</u>	<u>65,950</u>

Abnormal Loss Account

Particulars	Units		Particulars		
By Process I	400	2,320	By Bank A/c	400	1,600
	<u>400</u>	<u>2,320</u>	By Costing P & LA/c (B/F)	<u>400</u>	<u>720</u>

3.7 SUMMARY

- A job may consist of a job, product, batch of products, contract a service or any other specific order.
- Specific order costing can be job costing, batch costing, contract costing.
- Process costing as that from of operation costing which applies where standardized goods are produced.
- When two or more products produced at a time are of equal marketable value they are known as joint products.
- When two or more products are produced simultaneously from the same raw materials from the same process but one product is having very very high value in the market in comparison to other products is known as by-products.

3.8 KEY TERMS

- Normal loss: the loss which is expected in advance by the management due to the nature of product, process is known as Normal loss.
- Abnormal Gain: when the actual output is more than the expected output or when the actual loss is less than the normal loss the difference between the two is known as abnormal gain.
- Abnormal loss:It is an avoidable loss which occurs due to abnormal reasons like using sub-standard materials, carelessness of workers etc.
- Equivalent Production: Equivalent production units represent incomplete production units expressed in terms of equivalent completed units.
- Job Costing: It helps to find out cost of production of each job as per the elements of cost.

3.9 QUESTIONS AND EXERCISES

1. What is 'Job Costing'? What are its objectives ?
2. What are the main features of job costing ? Give a proforma of cost sheet under this system.
3. What are the characteristics of process costing system ?
4. What is process costing ? Give an example.
5. What are the reasons for process losses ?
6. What is a normal process losses ?
7. What are inter-process profits ?
8. What is meant by equivalent production ? How is it Computed ?
9. What are the two most common methods of apportioning joint costs ?
10. Explain the term 'Abnormal Effectives'.
11. Distinguish between 'Job Costing' and 'Process'.
12. How would you deal with by-products in costing :
 - (i) When they are of small total value ?
 - (ii) Where they are of considerable total value ?
 - (iii) Where they require further processing ?
13. Explain the following types of processing with illustrations :
 - (i) Continuous Sequential Processing
 - (ii) Discontinuous Processing
 - (iii) Parallel Processing
 - (iv) Selective Processing
14. Write short notes on “ :
 - (i) Equivalent Production
 - (ii) Joint products and by-products
 - (iii) Abnormal gain in process costing
15. List out various methods of accounting for by-products.
16. 'The value of scrap generated in a process should be credited to the process account.' Do you agree ?

PRACTICAL PROBLEMS

Job Costing

1. B factory uses a job costing system. The following data are available from the books sit (he year ending 31st March, 1998 :

Direct Material	9,00,000
Direct Wages	7,50,000
Profit	6,09,000
Selling and Distribution Overhead	5,25,000
Administrative Overhead	4,20,000
Factory Overhead	4,50,000

Required

(a) Prepare a Cost Sheet indicating the Prime Cost, Works Cost, Production Cost, Cost of Sales and Sales Value.

(b) In 1998-99, the factory has received an order for a number of jobs. It is estimated that the direct materials would be ` 12,00,000 and direct labour would cost ` 7,50,000. What would be the price for these jobs if the factory intends to earn the same rate of profit on sales, assuming that the selling and distribution overhead has gone up by 15% ? The factory recovers factory overheads as a percentage of direct wages and administrative and selling and distribution overhead as a percentage of works cost, based on the cost rates prevalent in the previous year.

[Ans. (a) Prime cost ` 16,50,000; Works Cost ` 21,000; Production Cost ` 25,20,000; Cost of Sales ` 30,45,000; Sales ` 36,54,000. (b) Prime Cost ` 19,50,000; Works Cost ` 24,00,000; Production Cost ` 28,80,000; Cost of Sales ` 35,70,000; Sales ` 42,84,000]

2. Combers Limited is engaged in job work that varies with the nature of customer's orders. During the last week of March 1998, it completed a job with the following details regarding its factory cost :

Raw Materials	4,000
Direct Labour Hours	20,000 and 8,000 hours
Machine Hours	3,800

The information obtained from its annual budget is given below :

Direct Labour Cost	6,00,000
Direct Labour Hours	2,00,000
Machine Hours	90,000
Manufacturing Costs :	

Direct Materials	2,00,000
Direct Labour	6,00,000
Indirect Labour	1,00,000
Electric Power	40,000
Machine Maintenance and Repair	15,200
Municipal Taxes	22,800

Factory Supplies	6,000
Factory Heat and Light	4,000
Depreciation and Insurance	
Factory Building	1,30,000
Machinery	4,02,000
Total	15,20,000

It is required to :

(i) Prepare a Cost Sheet showing the Factory Cost of the job Completed during the last week of March 1992 using the method, that you consider appropriate on the basis of the information available, for the absorption of its share of factory overheads, and

(ii) Explain the reasons for the selection of the method of absorption.

[Ans. Total cost of the job `52,800. Labour plays a dominant part in production, Hence direct labour hour rate has been used absorption of factory overheads. The rate comes to `3.60 per hour.]

3. The following information for the year ending December 31, 1998 is obtained from the books and records of a factory :

	<i>Completed Jobs</i>	<i>Work-in-progress</i>
Raw materials supplied from stores	90,000	30,000
Wages	1,00,000	40,000
Chargeable Expenses	10,000	4,000
Materials transferred to work-in-progress	2,000	4,000
Materials returned to stores	1,000	2,000

Factory overheads is 80% of wages and office overheads 25% of factory cost. The value of executed contracts during 1998 was 4,10,000. Prepare (i) Consolidated Completed jobs Account and (ii) Consolidated Work-in-progress Account.

[Ans . (i) Profit ` 63,750; (ii) Balance ` 1,35,000]

4. Budgeted figures :

Estimated Factory Overheads for the year ` 1,16,000.

Estimated Direct Labour Hours for the year 2,69,200.

Estimated Direct Labour Cost for the year ` 1,95,600

Estimated Machine Hours 1,01,00.

Prepare a comparative statement of cost showing the result of application of above rates to job No. 101 from the data given below :

Cost of Material Consumed	` 840
Direct Labour Wages	` 9,000
Direct Labour Hours	300
Machine Hours	200

[Ans. Percentage of factory overhead to wages 59.3, Labour hour rate ` 0.43. Machine hour rate, ` 1.15; Comparative statement of cost under these rates ` 2,273.70; ` 1,869; ` 1,970]

5. A company uses job costing system. The following information has been collected for jobs 101,102 for the purpose of quoting the price to a customer :

	<i>Job 10</i>	<i>Job 11</i>
Materials	` 200	` 300
Labour hours required in each department		
Machine Department	60	30

Assembly Department	20	30
Finishing Department	10	20

Rates of Pay for direct labour :

Machine Department	1.30 per hour
Assembly Department	0.90 per hour
Finishing Department	1.20 per hour

Machine hours required in each department :

Machine Department	100	80
Assembly Department	10	10

Factory overheads are recovered on the following basis :

Machine Department	50. per machine hour
Assembly Department	2.50 per direct labour hour
Finishing Department	2.00 per direct labour hour

20% of factory cost is added for general administration and a further 10% of total cost is added for profit. You are required to calculate the prices to be quoted for the jobs.

[Ans. price for job 10 ` 696.96 job 11 ` 869.88]

6. The following particular are drawn from the costing books of a contract for the month of December 1997 "

(a) Stores Abstract :

Balance on 30th November, 1998	21,146
Purchases	4,360
From Job No. 11	342
Issued to Job No. 12	2,112
Balance on 31 December, 1998	23,736

(b) Wages Abstract :

Job No. 11	230
Job No. 12	2,876
Establishment	256
	3,362

On 30th November, 1998 Jobs Nos. 11 and 12 showed balances of ` 1, 28,632 and ` 56,746 respectively. A certificate of completion was obtained for job No. 11, of the balance on this account standing on 30th November, 1998 ` 24,600 specially bought for this job was sold for ` 800 during December, 1998 Of the balance of Plant and Machinery ` 16,000 worth had been utilized on the job 8 month and the rest for 6 months. Of the former, half was transferred to Job No. 12 and the whole of the remaining plant was returned to stores. The price for Job No. 11 was fixed at ` 1,50,000.

Prepare Job Accounts and work out the profit made on the Job certified as completed, allowing depreciation on Machinery at 15% per annum. Assume 10% for establishment charges on cost of wages and materials consumed.

[Ans. Profit on Job No.11 : ` 32,208; Balance of work in progress on job 12 : 68,934]

[Hint. Establishment cost charged to Job No. 11 @ 10% of material and wages ` 10,392; Job No. 12 has not been charged with establishment charges since it is incomplete. Plant transferred from Job 11 to job 12 ` 7,200 and to stores ` 13, 120.]

Process Losses

7. From the following figures show the cost of three processes of manufacture. The production of each process is passed on to the next process immediately on completion.

Process Process Process
 , , ,

ABC Wages and materials	30,400	12,000	29,250
Works Overhads	5,600	5,250	6,000
Production in units	36,000	37,000	48,000
Process – 1st July, 1998		4,000	16,5000
Stock (units from precess – 31st July, 1998)			

[Ans. Cost per unit of finished goods ` 2.25]

8. In Process 4,100 units of raw materials were introduced at a cost of ` 1,000. The other expenditure incurred by the process was ` 600. Of the units introduced, 10% are normally lost in the course of manufacture, and they possess a scrap value of ` 3 each. The output of Process was only 75 units. Calculate the value of abnormal loss.

[Ans. Abnormal Loss 262]

9. In a certain month 6,000 kg of raw material A costing ` 150 per kg. Were processed through unit No.3 for manufacture of solvent X. The total operating cost of unit No. 3 for the month was ` 12,00,000. Out of the output 10% was unusable and was disposed of at ` 25 per kg. Prepare an account for the month's Operation Unit No 3 assuming that the spoilage was

- Part of normal production process.
- An abnormal loss due to poor quality material.

[Ans. (i) Cost per unit ` 386; (ii) Cost per unit ` 350]

10. (a) The Neodrug manufactures process a product 'plant food' through three distinct processes, the product of one process Raw materials, labour and direct expenses incurred on each of the processes are given below :

	Process P	Process Q	Process R
Raw Materials	1,000	800	200
Labour	500	600	700
Direct Expenses	150	250	500

The overhead expenses for the period amounted to 3,600 and is to be distributed to the processes on the... basis of labour wages.

There were no stocks in any of the processes at the beginning or at the close of the period. Ignore wastages. Assuming that the output was 1,000 kilos, show the process accounts P Q and R indicating also the unit cost per kilo under each element of cost and the output in each process.

(b) If 10% of the output is estimated to be lost in the course of sale and sampling, what should be the selling price per unit (correct to two decimal places) so as provide or gross profit of 33-1.3% on selling price.

[Ans. Cost of Process – P ` 2.65 per Unit

Q – ` 5.50 per Unit

R – ` 8.30 per Unit

Selling Price ` 13.83 per Unit]

11. A Product process through three Processes *I*, *II*, and *III*. The Normal wastage of each process is as follows :

Process *I* : 3% Process *II* :5% and Process *III* 8% Wastage of Process *I* was sold at 25 paise per unit that of Process at 50 Paise per unit and that of Process *III* at ` 1 per unit. 10,000 units were

issued to Process/ at the beginning of June 1995 at a cost `1 per unit. The other expenses were as follows :

	I	II	III
Sundry Materials	1,000	1,500	500
Labour	5,000	8,000	6,500
Direct Expenses	1,050	1,118	2,009
Actual Output	9,500	9,100	8,100

Prepare the process accounts assuming that there was no opening or closing stock.

[Ans. Process I. Abnormal loss 200 units @ `1.75 per unit. Process II,
Abnormal effectives 75 units @ 3 per unit and Process III.
Abnormal loss 272 units @ `4.25 per unit. Total cost `34,435

12. A product passes through three processes – P, Q and R. The details of expenses incurred on the three processes during the year 1998 were as under :

Process	P	Q	R
Unit issued/ introduced	10,000		
Cost per unit `100		,	,
Sundry Materials	10,000	15,000	5,000
Labour	30,000	80,000	65,000
Direct Expenses	6,000	13,150	27,200
Selling price per unit of output	120	165	250

Management expenses during the year were `80,000 and selling expenses were `50,000. These are not allocable to the processes.

Actual output of the three processes was :

P : 9,300 units; Q : 5,400 units; and R 2,100 units. Two-thirds of the output of Process P and one-half the output of Process Q was passed on the next process and the balance was sold. The entire output of Process R was sold.

The normal loss of the three processes, calculated on the input of every process was : Process P : 5% Q : 15% and R: 20%.

The loss of Process P was sold at `2 per unit, that of Q at `5 per unit and of Process R at 10 per unit.

Prepare the three Processes Accounts and the Profit and Loss Account.

[Ans. Profit (Loss) : Process P : `31,000 Process Q : `40,500; Process R : `42,000. Total after charging Management and Selling Expenses (`32,450)]

13. The finished product of a factory has to pass through three processes (A, B and C). The normal wastage of each process is 2% in A, 5% in B and 10% in C. The percentage of wastege is computed on the number of units entering each process. The scrap values of wastage of processes, A, B, and C are `10, `40 and `20 per 100 units respectively.

The output of each process is transferred to the next process and the finished products are transferred from process C into stock. The following is the further information obtained :

Raw Materials	12,000	4,000	4,000
Direct Labour	8,000	6,000	2,000
Manufacturing Expenses	2,000	4,000	2,000

20,000 units were put into process A at a cost of ` 16,000. The output of each process has been : A – 19,600 units, B – 18,400 units and C – 16,700 units. There was no stock of work-in-progress in any process. Prepare the process account.

[Ans. Process, A – ` 37,960; B – ` 50,959; C – ` 63,120]

14. The product of a company passes through three distinct processes to completion. From past experience, it is ascertained that wastage is incurred in each process as under :

The wastage of process A and B is sold at ` 20 per 100 units and that of process C at ` 160 per 100 units. Following is the information regarding the production in March, 1997 :

	Process A	Process B	Process C
Materials	24,000	16,000	8,000
Direct Labour	32,000	24,000	12,000
Other Factory Expenses	7,000	7,600	8,400

20,000 units have been issued to process A at a cost of ` 40,000. The output of each process has been as under :

Process A 19,500 units, Process B 18,800, and Process C 16,000. There was no stock in any process in the beginning and at the end of March. Prepare process cost accounts.

[Ans. Process A : Abnormal wastage 100 units @ ` 5.46 per units, Process B : Abnormal effectiveness 275 units @ ` 8.52 per unit, and Process C : Abnormal wastage 920 units @ ` 11.32 per unit]

15. A Product is obtained after it passes through three distinct processes. You are required to prepare Process Accounts from the following information :

Particulars	Process A	Process B	Process C
Materials	7,300	6,060	7,900
Direct wages	6,750	8,750	10,750
Direct expenses	940	840	750
Manufacturing Expenses	3,375	4,375	5,375

2,000 units at ` 10 per unit were introduced in Process A. Other details are :

Process	Actual Output	Normal Loss	Value of scrap per unit
A1,880	5%	5.00	
B1,690	10%	10.00	
C1,530	10%	15.00	

Also prepare abnormal loss or gain account if it arises in any process.

[Ans. Process A : Abnormal loss 20 units @ ` 19.928 per unit; Process B : Abnormal loss 2 units @ ` 32.886 per unit Process C : Abnormal gain 9 units ` 51 per unit]

16. You are given the following information Input, 3,800 units; output 3,000 units; closing work-in-progress 800 units.

	<i>Degree of Completion</i>	<i>Process Costs</i>
Materials	80%	14,560
Labour	70%	21,360
Overhead	70%	14,240

Find out (a) Equivalent production, (b) Cost per unit of equivalent production and (c) Prepare Process Account assuming that there is no opening work-in-progress and process loss.

[Ans. Equivalent units : Materials 3,640; Labour and Overhead 3,560 each; Cost per unit : Materials `4, Labour 6 Overhead `4]

17.	Units put into process	2,500
	Units Completed	2,000
	Work-in progress at close	500

Process costs :

Materials	22,500
Labour	6,750
Overhead	2,250

Work-in-progress is completed 40% as to materials, labour and overhead. Find out the (i) Equivalent production, (ii) cost per unit of equivalent production, and Process Account.

[Ans. Equivalent units : Materials, labour and overhead 2,200 unit each; Materials `10,227, Labour `3,068 and Overhead `1,022 per unit]

18. In a given period, the production data and costs for a process

Production 2,100 units fully complete.

Production 700 units partly complete

The degree of completion of the partly complete units was :

Materials 80% complete.

Labour 60% complete.

Overheads 50% complete.

The costs for the period were :

Materials	24,800
Labour	16,750
Overhead	36,200

Calculate the total equivalent production, the cost per complete unit and the value of the W.I.P/

[Ans. Materials, Labour and Overhead Equivalent Units : 2,660, 2,520 and 2,450 each; Cost per unit 9,32,6,65 and `14.77 each. W.I.P. `13,181]

19. A manufacturing concern engaged in mass production, produces standardized electric motors in one of its departments. From the following particulars of a job of 50 motors, you are required to value the work-in-progress and finished goods :

(a) Cost incurred as per job card :

Direct materials	75,000
Direct labour	20,000
Overheads	60,000

- (b) Selling and distribution expenses are at 30% of sales value.
- (c) Selling price per motor ` 4,500.
- (d) 25 motors are complete and transferred to finished goods.
- (e) Completion stage of work-in-progress :
 - Direct materials 100%
 - Direct labour and overheads 60%

[Ans. Equivalent units : Materials 50, labour and Overheads 40 each; Cost per unit ` 1,500, 500, ` 1,500; Value of finished goods at close 25 units valued at ` 3,150 each (cost or market value whichever is lower) ` 78,750; Material component of WIP value at ` 1,500 each 25 units and labour overhead 15 units at ` 1,650 each (market value); Total value of stock at Close ` 1,41,000]

20. XYZ Company has a single process :

Work-in-progress (opening)	8,000 units
Cost : Material ` 29,600	
Wages ` 6,600	
Overheads ` 5,800	

During the period the input was 32,000 units.

Additional costs were : Material ` 1,12,400; Wages ` 33,400; Overhead ` 30,200. At the end of the year 28,000 units were fully processed and 12,000 units were in process. The value of the closing stock includes the full cost of materials and only-third of the cost of wages and overheads.

Tabulate the production and cost figures to give quantities, unit value, total value of completed output and detailed value for the closing work-in-progress.

[Ans. Rate per completed unit as regards materials ` 3.55 per unit, as regards wages ` 1.25, as regards overhead ` 1.125]

[Hint. Apply Average Method]

21. From the following data of Kiran Processing Industry Ltd., calculate (a) Equivalent Production, (b) Cost per unit of Equivalent Production and (c) Cost of units completed and awaiting completion :

Number of units introduced in the process	4,000
Number of units completed and transferred to next process	3,000
Number of units process at the end of the period	800

Stage of Completion :

Material	80%
Labour	70%
Overheads	70%

Normal process loss at the end of the process	200 units
Value of scrap	` 1 per unit
Value of raw materials	` 7,480
Wages	` 10,680
Overheads	` 7,120

[Ans. (a) Materials 3,640; Labour 3,560; Overhead 3,650 units; (b) ` 2, ` 3 and ` 2 respectively (c) ` 21,000; ` 4,080]

By-Products and Joint Products

22. The following details are extracted from the costing records of an oil mill for the year ended 31st March, 1994 :

Purchase of 500 tonnes copra `2,00,000

	<i>Crushing</i>	<i>Refining</i>	<i>Finishing</i>
Cost of labour	2,500	1,000	1,500
Electric power	600	360	240
Sundry materials	100	2,000	—
Steam	600	450	450
Repairs of machinery	280	330	140
Factory expenses	1,320	660	220
Cost of casks			7,500

300 tonnes of crude oil were produced.

250 tonnes of oil were produced by the refining process.

248 tonnes of refined oil were finished for delivery.

Copra sacks sold for `400

175 tonnes of copra residue sold for `11,000.

Loss in weight in crushing 25 tonnes.

45 tonnes of by-products obtained from refining process `6,750.

You are required to show the accounts in respect of each of the following stages of manufacture for the purpose of arriving at the cost per tonne of each process and the total cost per tonne of the finished oil :

(a) Copra crushing process.

(b) Refining process.

(c) Finishing process including casking.

[Ans. Cost per tonne : (a) `646.67; (b) `768.20; (c) `814.92 (including casking)]

23. A factory is engaged in the production of a chemical *X* and in the course of its manufacture a by-product *Y* is produced, which after a separate process has a commercial value. For the month of January, 1998, the following are the summarized costing data :

	<i>Joint Expenses</i>	<i>Separate Expenses</i>		
			<i>X</i>	<i>Y</i>
Materials	19,200	7,360	780	
Labour	11,700	7,680	2,642	
Overhead	3,450	1,500	544	

The output of the month was 142 tonnes of *A* and 49 tonnes of *Y* and the selling price of *Y* averaged 280 per tonne. Assuming that the profit on *Y* is estimated at 50% of the selling price, prepare an account showing the cost of *A* per tonne.

[Ans. Cost of *X* per tonne `338; of *Y* `140 per tonne]

24. A factory produces three products *A*, *B* and *C* which originate from a joint process. The joint processing costs amount to `1,40,000. The output of *A*, *B* and *C* is 30,000, 32,000 and 20,000 units.

Apportion the joint costs amongst the products according to the survey method, assuming that the joint products are weighted as follows :

Product A	3 points
Product B	2 points
Product C	4 points

[Ans. Product A = `53,846; Product B = `38,290; Product C = `47,864]

25. Product X Yields by-products Y and Z. The joint expenses to manufacture are : Materials 10,000, Labour 8,000, Overhead 9,000 (Total 27,000). Subsequent expenses are as follows :

	X	Y	Z
	,	,	,
Materials	2,000	1,600	1,800
Labour	2,400	1,400	1,700
Overhead	2,600	1,000	1,500
	7,000	4,000	5,000
The selling prices are	42,000	20,000	18,000
The estimated profits on : Sales are	50%	50%	33.33%

Show how you would apportion the joint expenses of manufacture.

[Ans. Share in joint expenses `14,000; `6,000; `7,000]

26. In an Oil Mill four products emerge from a refining process. The total cost of input during the quarter ending March 1998 is `1,48,000. The output sales and additional processing costs are as under :

Product	Output in litres	Additional Processing cost after split-off point	Total value
AOXE	8,000	43,000	1,72,500
BOXE	4,000	9,000	15,000
COXE	2,000	—	6,000
DOXE	4,000	1,500	45,000

In case these products were disposed of at the split-off point, that is, before further processing, the selling prices would have been :

AOXE	BOXE	COXE	DOXE
`15.00	`6.00	`3.00	`7.50

Prepare a statement of profitability based on :

(i) If the products are sold after further processing is carried out in the mill. (ii) If they are sold at the split-off point.

[Ans. (i) Profit `37,000 (ii) Profit `32,000]

27. Three joint products are produced by passing chemicals through two consecutive processes. Output from process/ is transferred to process from which the three joint products are produced and immediately sold. The data regarding the processes for April, 1998 is given below :

	Process I	Process II
Direct Materials 2,500 kilos at `4 per kilo	`10,000	`6,900
Direct Labour	`6,250	`6,900
Overheads	`4,500	`6,900

Normal Loss	10% of input	Nil
Scrap Value of Loss	` 2 per kilo	—
Output	2,300 kilos	Joint-products
		<i>A</i> : 900 Kilos
		<i>B</i> : 800 Kilos
		<i>C</i> : 600 Kilos

There were no opening or closing stocks in either process and the selling prices of the output from process II were :

Joint Product A	` 24 per Kilo
Joint Product B	` 18 per Kilo
Joint Product C	` 12 per Kilo

Required :

- Prepare an account for process/ together with any Loss or Gain Account you consider necessary to record the month's activities.
- Calculate the profit attributable to each of the Joint Products by apportioning the total costs from process II :
 - According to weight of output;
 - By the market value of production

[Ans. (a) Transfer from Process I to Process II, 2,300 kg of 20,700; (b) (i) Profit (Loss) : *A* : ` 8,100, *B* : ` 2,400, (c) : (` 1,800), (b) (ii) Profit (Loss) *A* : ` 4,350, *B* : ` 2,900, *C* : ` 1,450]

28. The Modern Metals and Minerals operates a silver mine which yields copper and silver as joint products A summary of expenses and the turnover for the year 1998 is given below :

Opening Stock of ores at cost	5,00,000
Opening Stock of material in process	8,00,000
Excavation Costs	78,00,000
Milling and Concentrations	57,00,000
Melting	75,00,000
Closing Stock of ores	7,00,000
Closing Stock of metals-in-process	9,00,000
Estimated value of depletion	1,80,00,000
Further expenses on silver extraction and refinement	42,35,000
Further expenses on further processing of residual for copper	11,35,000
Further expenses on joint product (before split-off)	1,00,000
General Expenses on silver extraction	75,000
Selling and Distribution Expenses :	
Silver	45,000
Copper	30,000
Gross Realization on the sales of the total output of	
Silver	5,84,59,000
Copper	72,46,000

Required a consolidated Statement of the (1) Cost of production; (2) Cost of sales, and (3) Net profits (subject to taxation for both silver and copper).

	<i>Silver</i>	<i>Copper</i>
[Ans.] (1)	` 3,92,000;	` 50,90,000;
(2)	` 3,93,25,000;	` 51,20,000;
(3)	` 1,91,34,000;	` 21,26,000]

[Hint. Joint-costs apportioned according to sales value at Split-off Point. Share in Joint Costs silver 90% Copper 10%]

29. JB Limited produces four joint products, *A*, *B*, *C*, and *D*, all of which emerge from the processing of one raw material. The following are the relevant data :

Production for the period :

<i>Joint Product</i>	<i>Number of Units</i>	<i>Selling Price per unit</i>
<i>A</i>	500	18.00
<i>B</i>	900	8.00
<i>C</i>	400	4.00
<i>D</i>	200	11.00

The company budgets for a profit of 10% on sales value. The other estimated costs are :

Carriage Inwards ` 1,000 Manufacturing Overhead ` 2,000

Direct Wages ` 3,000 Administration Overhead 10 % of the sales value

You are required to ;

- (a) Calculate the maximum price that may be paid for the raw material.
- (b) Prepare a comprehensive cost statement for each of the products allocating the materials and other costs based upon; (i) number of units, (ii) sales value.

[Ans. (a) ` 10,000; (b) (i) Total cost *A*. ` 4,500; *B* : 8,100; *C* : 3,000, *D* : ` 1,800; (ii) Total Cost *A*. ` 8100, *S*480, *C*. ` 1,440, *D* ` 1,980]

Unit -4: SEGMENT PERFORMANCE ANALYSIS

Chapter Outlines

- 4.0 Learning Objectives
- 4.1 Introduction
- 4.2 Responsibility Accounting System
- 4.3 Variance Analysis
 - 4.3.1 Evaluation of Cost and Sales Variances
- 4.4 Summary
- 4.5 Key Terms
- 4.6 Questions and Exercises

4.0 LEARNING OBJECTIVES

After studying this chapter, you should be able to understand:

- Explain material variance.
- Meaning material cost variance.
- Explain meaning of labour variance.
- Explain idle time variance.
- Explain Responsibility Accounting System.
- Explain Responsibility centres.
- Meaning of overhead cost variance.
- Explain Disposition of variances

4.1 INTRODUCTION

At regular intervals, actual cost of material, labour and overheads are compared with the standard cost of respective elements. Deviations of actual cost from standard cost are investigated and reported to appropriate executive for necessary action. In the language of cost accounting, these deviations are usually known as variances. The act of computing and interpreting variances is called variance analysis.

Thus variance analysis is the process of analysing variances by subdividing the total variance in such a way that management can assign responsibility for any deviation from the standard fixed.

According to CIMA, London, "Variance analysis is the process of computing the amount of variance and isolating the cause of variance between actual and standard."

For example, if the standard cost specified is ` 15,000 and the actual cost incurred is ` 13,500, then such difference of ` 1,500 (i.e. ` 15,000 - ` 13,500) is treated as variance. There can be cost variances, profit variances and sales value variances.

4.2 RESPONSIBILITY ACCOUNTING SYSTEM

Meaning

The concept of responsibility centers is very useful for the better understanding of zero based budgeting and performance budgeting. Responsibility accounting is an underlying concept of accounting performance measurement systems. The basic idea is that large diversified organizations are difficult, to manage as a single segment, if not impossible. Thus they must be decentralized or separated into manageable parts. Responsibility centres have their root in what is called responsibility accounting. It is a system of control in which costs are identified with the person responsible for them. It lays emphasis upon the decision of an organization among different centres in such a way that each level / centre becomes the responsibility of an individual manager. Each manager is held responsible for these activities which are under his direct control. Thus it is an accounting system which collects and reports both planned and actual accounting data in terms of sub units which are recognized as responsibility centers.

These segments are referred to as responsibility centers that include:

1. Revenue centers,
2. Cost centers,
3. Profit centers and
4. Investment centers.

This approach allows responsibility to be assigned to the segment managers that have the greatest amount of influence over the key elements to be managed. These elements include revenue for a revenue center (a segment that mainly generates revenue with relatively little costs), costs for a cost center (a segment that generates costs, but no revenue), a measure of profitability for a profit center (a segment that generates both revenue and costs) and return of investment for an investment center.

Definition: According to Charles, T. Horngren

"Responsibility accounting recognizes various decision centres throughout organization and traces costs to the individual managers who are primarily responsible for making decision about the costs in question."

STEPS INVOLVED IN RESPONSIBILITY ACCOUNTING

The objective of responsibility accounting is to communicate the correct information to the right person at the right time. It is a control device over the people who incur the expenses instead of controlling the costs. The steps to be followed are as follows:

1. Targets are set and communicated to each manager.
2. Actual performance is continuously appraised and the results are conveyed to the manager of the concerned responsibility centre.
3. The variances are reported to higher management along with the names of the managers of the responsibility centres.
4. Corrective measures are taken and the same is communicated to the concerned managers of the centres.

Responsibility Centres

As a system of control, responsibility accounting focuses attention on the responsibility centres. Any unit of an organization which is headed by a responsible manager is referred to as responsibility centre. An organization has four types of responsibility centres established in an organization which are as follows:

- (a) **Revenue centre:** It is a smallest segment of activity for which revenues are accumulated. The responsibility of the manager of revenue centre is to generate sales revenue only. He does not have any control over other activities such as cost of product or investment in an asset. Marketing department is considered as a revenue centre as it is concerned with raising sales revenue.
- (b) **Expense centre:** It is a cost centre which is a smaller segment of activity for which costs can be accumulated. It records only the cost incurred and not the revenue earned. All production centres and service centres are called separate cost centres.
- (c) **Profit centre:** It is a big segment of activity for which both revenues and costs are accumulated. This centre takes into account the expenses incurred and revenue it earns. Most of the responsibility centres are viewed as profit centres as they take the difference between revenue and expenses as profit and the manager of this centre takes both cost and revenue.
- (d) **Investment centre:** Investment centre is a segment of activity in which the manager is held responsible for the use of assets and profit. It is his responsibility for maintaining a satisfactory return on investment in his responsibility centre.

4.3 VARIANCE ANALYSIS

Variances may be classified into:

- (i) Favourable and Unfavourable Variances, and
- (ii) Controllable and Uncontrollable Variances

(i) Favourable and Unfavourable Variances: When the actual cost incurred is less than the standard cost, the deviation is known as '**favourable variance**' whereas, when the actual cost incurred is more than the standard cost, the variance is treated as '**unfavourable* or adverse***'. A favourable variance reflects the efficiency while unfavourable variance indicates inefficiency. Favourable variance is also known as positive (+) or credit variance and viewed only as profits whereas adverse variance is known as negative (-) or debit variance and is viewed as losses. In other words, any variance which increases the actual profit is favourable variances and any variance which decreases the actual profit is unavoidable variable. Favourable variance is designated by (F) and unfavourable or adverse by (A).

(ii) Controllable and Uncontrollable Variances: A variance is said to be controllable if primary responsibility of a specified person or department can be identified. For example, excess usage of materials by production department is controllable being the responsibility of the foreman of the said department. On the other hand, when variance is due to the factors beyond the control of the concerned person, it is said to be uncontrollable. For example, increase in wage rate of workers on account of strike or government policy, etc. No individual person or department can be held responsible for uncontrollable variances.

Variance analysis is a process of analysing variances by sub-dividing the total cost variance in such a way that the management of the concern can assign the responsibility for off standard performance. It also leads to ascertain the magnitude of each of the variances and reasons thereof. In variance analysis, the attention of the management is drawn not only to the monetary value of unfavourable and favourable managerial performance but also the responsibility and reasons for the same.

Material Variances

Material forms a very high percentage of the total cost. It is very important to study its cost variance. Material variances consist of the following variances:

- (1) Material Cost Variance (MCV)
- (2) Material Price Variance (MPV)
- (3) Material Usage/Quantity/Volume Variance (MQV)
- (4) Material Mix Variance (MMV)
- (5) Material sub-usage Variance/Revised Material Quantity Variance {RMQV}
- (6) Material Yield Variance (MYV)

Classification of Cost Variances

(1) Material Cost Variance (MCV): *"Material cost variance is the difference between the standard cost of materials specified for the actual output and actual cost of materials used."* — **I.C.M.A., London**

It is expressed as:

MCV = Standard Cost of Material for Actual Output — Actual Cost of Material

or
$$(SQ \times SP) - (AQ \times AP)$$

SQ stands for Standard Quantity for Actual Output

SP stands for Standard Price

AQ stands for Actual Quantity

AP stands for Actual Price

Standard Quantity for Actual Output is computed as follows

$$\frac{\text{Standard Quantity}}{\text{Standard Output}} \times \text{Actual output}$$

(2) Material Price Variance (MPV): Material price variance is the portion of the Material Cost Variance which arises due to the difference between the standard price specified and actual price paid. It can be expressed as:

Material Price Variance - Actual Quantity (Standard Price - Actual Price) or MPV = AQ (SP - AP)

The **reasons** for the material price variance may be the following:

- (i) Change in market price

- (ii) Change in quantity of purchase
- (iii) Change in quality of material purchased
- (iv) Emergency purchases leading to higher prices
- (v) Discounts not availed
- (vi) Rush order to meet shortage of supply, etc.

(3) Material Usage/Quantity/Volume Variance: Material usage variance is the difference between the standard quantity specified and the actual quantity used. This variance may arise due to the following **reasons:**

- (i) Use of inferior material
- (ii) Poor inspection of material
- (iii) Lack of due care in the handling of materials
- (iv) Abnormal wastage, theft, pilferage of materials
- (v) Setting of improper standards
- (vi) Improper maintenance of machine, etc.

It may be expressed as:

Material Usage Variance = Standard Price (Standard Quantity for Actual Output - Actual Quantity)
or MUV = SP(SQ-AQ)

Relationship among MCV, MPV and MUV:

$$MCV = MPV + MUV$$

Illustration 4.1

The standard material required for production is 5,200 kg. A price of ` 2 per kg has been fixed for the materials. The actual quantity of materials used for the product is 5,600 kg. A sum of ` 14,000 has been paid for the materials.

Calculate: (a) Material Cost Variance; (b) Material Price Variance; (c) Material Usage Variance.

Solution:

$$\text{Standard Quantity} = 5,200 \text{ kg}$$

$$\text{Standard Price} = ` 2 \text{ per kg}$$

$$\text{Actual Quantity} = 5,600 \text{ kg}$$

$$\text{Actual Price} = \frac{14,000}{5,600} = ` 2.50 \text{ per kg}$$

(a) Material Cost Variance (MCV):

$$\begin{aligned} MCV &= (SQ \times SP) - (AQ \times AP) \\ &= (5,200 \times 2) - (5,600 \times 2.50) \\ &= ` 10,400 - ` 14,000 = ` 3,600 \text{ (Adverse)} \end{aligned}$$

(b) Material Price Variance (MPV):

$$MPV = AQ\{SP - AP\} = 5,600 \{2 - 2.50\} = 5600 \times (-0.50) = ` 2,800 \text{ (Adverse)}$$

(c) Material usage variance (MUV):

$$\begin{aligned} MUV &= SP(SQ - AQ) \\ &= 2(5,200 - 5,600) \\ &= 2 \times (-400) = ` 800 \text{ (Adverse)} \end{aligned}$$

Verification:

$$MCV = MPV + MUV = ` 3,600 \text{ (Adv.)} = 2,800 \text{ (Adv.)} + 800 \text{ (Adv.)}$$

Illustration 4.2

In a brass foundry, the standard mixture consists of 60% Copper and 40% Zinc. The standard loss of production is 10% on input. From the actual production in a month calculate the Material Cost Variance and analyse it:

Copper 50kg @ ` 30 per kg (standard 60kg)

Zinc 50 kg @ ` 20 per kg (Standard 40 kg)

Actual Output: 86 kg

SP and AP are the same

Solution:

	Standard Mix			Actual Mix		
	SQ(kg)	SP(`)	Std. Cost(`)	AQ(kg)	AP(`)	Actual Cost(`)
Copper	60	30	1800	50	30	1,500
Zinc	40	20	800	50	20	1,000
	100		<u>2,600</u>	100		<u>2,500</u>
Less (10%) (Loss)	10			14		
	<u>90</u>			<u>86</u>		

Material Cost Variance (MCV) = (Std. Cost – Actual Cost)

Std. Cost – (SQ for Actual Output \times SP)

SQ for Actual Output will be computed as follows:

$$\text{Copper} = \frac{60}{90} \times 86 = 57.33$$

$$\text{Zinc} = \frac{40}{90} \times 86 = 38.22$$

$$\text{Now, MCV for Copper} = (57.33 \times 30) - (50 \times 30) = ` 220 \text{ (Fav.)}$$

$$\begin{aligned} \text{MCV for} &= (38.22 \times 20) - (50 \times 20) = ` 236 \text{ (Adv.)} \\ &= ` 16 \text{ (A|dv.)} \end{aligned}$$

This is explained by

(i)	Material Price Variance	= Nil
(ii)	Material Mix Variance	= (SQ-AQ) \times SP
	Copper = (60-50) \times 30	= ` 300 (Fav.)
	Zinc = (40-50) \times 20	= ` 200 (Fav.)
		= ` 100 (Fav.)
(iii)	Material Yield Variance	= (AY - SY) \times SC per unit
		= (86 - 90) \times 28.89*
		= ` 116 (Adv.)
		*SC = $\frac{2600}{90} = ` 28.89$

Verification

$$\text{MCV} = \text{MPV} + \text{MMV} + \text{MYV}$$

$$` 16 \text{ (Adv.)} = \text{Nil} + ` 100 \text{ (Fav.)} + ` 116 \text{ (Adv.)}$$

$$` 16 \text{ (Adv.)} = ` 16 \text{ (Adv.)}$$

Note: Since SPO and AP are the same and Standard Total Quantity and actual Total Quantity are the same, there will be no Material Price variance and Material Usage Variance.

Illustration 4.3

The standard material cost for a normal mix of one tonne of chemical Z is based on:

Chemical	Usage (Kg)	Price Per Kg. (`)
A	240	6
B	400	12
C	640	10

During a month, 12.5 tonnes of Z were produced from:

Chemical	Consumption (Tonnes)	Cost (`)
A	3.2	22,400
B	4.8	60,000
C	9.0	94,500

Analyse the Variances:

Solution:

(i) **SQ for Actual output:**

$$A = 240 \times 12.5 = 3,000 \text{ Kg}$$

$$B = 400 \times 12.5 = 5,000 \text{ Kg}$$

$$C = 640 \times 12.5 = 8,000 \text{ Kg}$$

$$\text{Total SQ} = 16,000 \text{ Kg}$$

(ii) **Total AQ = 3,200 + 4,800 + 9,000 = 17,000 Kg.**

(iii) **RSQ**

$$A = \frac{3,000}{16,000} \times 17,000 = 3,187.5 \text{ Kg.}$$

$$B = \frac{5,000}{16,000} \times 17,000 = 5,312.5 \text{ Kg.}$$

$$C = \frac{8,000}{16,000} \times 17,000 = 8,500 \text{ Kg.}$$

Computation of Material Cost Variances

Material	SQ for AQ	SP(`)	SQ + SP(`)	AQ	AP(`)	AQ × AP(`)	RSQ	RSQ × SP(`)
A	3,000	6	18,000	3,200	7.0	22,400	3,187.5	19,125
B	5,000	12	60,000	4,800	12.5	60,000	5,312.5	63,750
C	8,000	10	80,000	9,000	10.5	94,500	8,500.00	85,000
	16,000			17,000				
Loss	3,500			4,500				
	<u>12,500</u>		<u>1,58,000</u>	<u>12,500</u>		<u>1,76,900</u>		<u>1,67,875</u>

(1) **Material Cost Variance (MCV) = (SQ × SP) – (AQ × AP)**

$$= `1,58,000 - `1,76,900$$

$$= `18,000 \text{ (A)}$$

(2) **Material Price Variance (MPV) = AQ (SP – AP)**

$$A = 3,200(6-7) = `3,200 \text{ (A)}$$

$$B = 4,800(12-12.5) = `2,400 \text{ (A)}$$

$$C = 9,000(10-10.5) = `4,500 \text{ (A)}$$

$$\text{MPV} = `10,100 \text{ (A)}$$

(3) **Material Usage Variance (MUV) = SP (SQ - AQ)**

A	= 6 (3,000 – 3,200) = `1,200 (A)
B	= 12 (5,000 – 4,800) = `2,400(F)
C	= 10 (8,000 – 9,000) = `10,000(A)
MUV	= 8,800(A)

(4) Material Mix Variance (MMV) = SP (RSQ-AQ)

A	= 6(3,187.5 – 3,200) = `75(A)
B	= 12(5,312.5 – 4,800) = `6,150 (A)
C	= 10(8,500 – 9,000) = 5,000 (A)
MMV	= `1,075(F)

(5) Material Yield Variance (MYV)

$$MYV = (\text{Actual Yield} - \text{Std. Yield}) \times \text{SC per unit}$$

$$\text{Actual Yield} = 12,500$$

$$\text{Standard Yield} = (12,500/16,000) \times 17,000 = 13,281$$

$$\text{Standard Cost} = 1,58,000/12,500 = 12.64$$

$$MYV = (12,500 – 13,281) \times 12.64 = `9,875 (A)$$

$$\text{Alternatively, } MYV = SP(SQ - RSQ)$$

$$\begin{aligned} MYV &= (SQ \times SP) - (RSQ \times SP) \\ &= (1,58,000 - 1,67,875) \\ &= `9,875 (A) \end{aligned}$$

Verification:

1. $MCV = MPV + MUV$
 $18,900 (A) = 10,100(A) + 8,800 (A)$
 $18,900(A) = 18,900 (A)$
2. $MUV = MMV + MYV$
 $8,800(A) = 1,075(F) + 9,875 (A)$
 $8,800 (A) = 8,800 (A)$

Labour Variances

These may be two main reasons of the occurrence of deviations in cost of direct labour:

- (i) Difference in actual rates and standard rates of labour and
- (ii) The variation in the actual time taken by the workers and standard time allowed to them for performing a job or an operation.

The various labour variances may be arranged as follows:

(1) Labour Cost Variance (LCV): It is the difference between the *standard labour cost* and *actual labour cost* of the product.

$LCV = (\text{Standard Rate} \times \text{Standard Time for Actual Output}^*) - (\text{Actual Rate} \times \text{Actual Time})$

$^* \frac{\text{Standard Time}}{\text{Standard Output}} \times \text{Actual output}$

$$LCV = (SR \times ST) - (AR \times AT)$$

Labour cost variance may be analysed further as (i) Labour rate variance, and (ii) Labour efficiency variance.

(2) Labour Rate Variance (LRV): It is that portion of labour cost variance which is due to the difference between the standard rate specified and the actual rate paid. It would occur due to the following **reasons:**

- (i) Employment of one or more workers of different grade than the standard grade,
- (ii) Excessive overtime,
- (iii) Overtime work in excess of that provided in the standard,
- (iv) New workers not being allowed full wage rates, etc. The formula for calculating LRV is as under: Labour Rate Variance (LRV) = Actual Time x {Standard Rate - Actual Rate}

$$\text{or } LRV = AT(SR - AR)$$

(3) Total Labour Time/Efficiency Variance (TLEV): It is that portion of labour cost variance which arises due to the difference between the *Standard Labour hours specified* and the *actual labour hours spent*. It may arise due to the following **reasons:**

- (i) Wrong selection of workers,
- (ii) Higher labour turnover,
- (iii) Lack of supervision,
- (iv) Poor working conditions,
- (v) Defective machinery, tools and equipment,
- (vi) Use of non-standardised materials,
- (vii) Inefficiency of workers, etc.

TLEV = Standard Rate x {Standard Time for Actual Output* - Actual Time}

$$* \frac{\text{Standard Time}}{\text{Standard Output}} \times \text{Actual output}$$

TLEV = SR x (ST - AT) TLEV can be divided into three parts:

(i) Simple LEV = SR x (ST for Actual output - AT worked*)

* AT Allowed - Idle Time - Holiday Time

(ii) Idle Time Variance* = Idle Time x SR

Note: Idle time is always adverse,

(iii) Holiday/Calendar Variance - Holiday Time x SR

Note: Holiday/Calendar Variance is always adverse.

TLEV = SLEV + Idle Time Variance + Holiday Variance

Labour Idle Time Variance: It is that portion of labour efficiency variance which may arise due to abnormal wastage of time on account of strikes, power out, non-availability of raw-material, breakdown of machinery etc.

$$\text{Idle Time Variance} = \text{Idle Time (Hours)} \times \text{Standard Rate}$$

(4) Labour Mix Variance (LMV): Where workers of two or more than two types are engaged in the difference between the standard composition of workers and the actual gang (or group) of workers is known as 'Labour Mix Variance'. It is calculated as under:

$$LMV = \text{Labour Mix Variance (LMV)} = SR(RST - AT)$$

$$\text{Revised Standard Time (RST)} = \frac{\text{Standard Time}}{\text{Total Standard Time}} \times \text{Total Actual Time}$$

(5) Labour Yield Variance (LYV): It is that portion of labour efficiency variance which arises due to the difference between actual output of worker and standard output of worker specified. It is calculated as follows:

$$(LYV) = SC \times (\text{Actual Yield} - \text{Revised Standard Yield}^*)$$

SC stands for standard cost of Labour per unit of standard output

SC is calculated as follows:

$$SC = \frac{\text{Standard Cost of Labour}}{\text{Standard Output}}$$

$$* \text{Revised Standard Yield} = \frac{\text{Standard Yield}}{\text{Standard Mix of Labour before Idle and Holiday Time}} \times \frac{\text{Actual mix of Labour before Idle and Holiday Time}}{\text{before Idle and Holiday Time}}$$

Illustration 4.4

From the following information, compute labour cost variance, labour efficiency variance and labour rate variance.

Standard			
Workers	Hours	Rate per hour (`)	Total Amount (`)
A	10	3.00	30.00
B	15	4.00	60.00
Actual			
A	20	3.00	60.00
B	5	4.50	22.50

Solution:

(a) Labour Cost Variance (LCV):

$$LCV = (ST \times SR) - (AT \times AR)$$

$$\text{Worker A} = (10 \times 3) - (20 \times 3) = `30 \text{ (Adv.)}$$

$$\begin{aligned} \text{Worker B} &= (15 \times 4) - (5 \times 4.50) = `37.50 \text{ (Fav.)} \\ &= `7.50 \text{ (Fav.)} \end{aligned}$$

(b) Labour Efficiency Variance (LEV):

$$LEV = (ST - AT) \times SR$$

$$A = (10 - 20) \times 3 = `30 \text{ (Adv.)}$$

$$\begin{aligned} B &= (15 - 5) \times 4 = `40 \text{ (Fav.)} \\ &= `10 \text{ (Fav.)} \end{aligned}$$

(c) Labour Rate Variance (LRV):

$$LRV = (SR - AR) \times AT$$

$$A = (3 - 3) \times 20 = 0$$

$$\begin{aligned} B &= (4 - 4.50) \times 5 = `2.50 \text{ (Av.)} \\ &= `2.50 \text{ (Adv.)} \end{aligned}$$

Verification:

$$LRV = LEV + LRV$$

$$7.50 \text{ (Fav.)} = 10 \text{ (Fav.)} + 2.50 \text{ (Adv.)}$$

$$`7.50 \text{ (Fav.)} = `7.50 \text{ (Fav.)}$$

Illustration 4.5

Calculate Labour Variance from the following information:

$$\text{Labour Rate} = `1 \text{ per hour}$$

$$\text{Hours as Standard per unit} = 12 \text{ Hours}$$

Actual Data:

$$\text{Units Produced} = 1,000$$

$$\text{Actual Labour Cost} = `10,000$$

$$\text{Hours Worked actually} = 12,500 \text{ Hours}$$

Solution:

$$\text{Standard Time (ST)} = 1000 \times 12 = 12,000 \text{ Hours}$$

$$\text{Standard Cost} = 12,000 \times 1 = `12,000$$

$$\text{Labour Cost Variance (LCV)} = (\text{Standard Cost} - \text{Actual Cost})$$

$$= (12,000 - 10,000) \\ = `2,000 (Fav.)$$

Labour Rate Variance (LRV) = (SR - AR) × AT

$$(1.00 - 0.80) \times 12,500 = `2,500 (\text{Fav})$$

$$\text{Actual Rate} = \frac{10,000}{12,500} = `0.80 \text{ per hour}$$

Labour Efficiency Variance (LEV): (ST - AT) × AT

$$\begin{aligned} \text{LEV} &= (12,000 - 12,500) \times 1 \\ &= `500 (\text{Adv.}) \end{aligned}$$

Verification:

$$\text{LCV} = \text{LRV} + \text{LEV}$$

$$\begin{aligned} `2,000 (\text{Fav.}) &= `2,500 (\text{Fav.}) + `500 (\text{adv.}) \\ `2,000 (\text{Fav.}) &= `2,000 (\text{Fav.}) \end{aligned}$$

Illustration 4.6

From the following information, calculate labour variance

Standard wages:

$$\begin{aligned} \text{Grade X} : 90 \text{ Labourers at `2 per hour} \\ \text{Grade Y} : 60 \text{ Labourers at `3 per hour} \end{aligned}$$

Actual Wages:

$$\begin{aligned} \text{X: 80 Labourers at `2.50 per hour} \\ \text{Y: 70 Labourers at `2.00 per hour} \end{aligned}$$

$$\begin{aligned} \text{Budgeted Hours} &= 1,000 \\ \text{Actual Hours} &= 900 \\ \text{Budgeted Gross Production} &= 5,000 \text{ units} \\ \text{Standard Loss} &= 20\% \\ \text{Actual loss} &= 900 \text{ units} \end{aligned}$$

Solution:

	Standard			Actual		
Grade	Time (Hours)	Rate (`)	Amount(`)	Time (Hours)	Rate (`)	Amount (`)
X(90×1000)	90,000	2	1,80,000	(80×900)	2.50	1,80,000
Y(60×1,000)	60,000	3	1,80,000	63,000	2.00	1,26,000
	<u>1,50,000</u>		<u>3,60,000</u>	<u>(70×900)</u>		<u>3,06,000</u>
				<u>1,35,000</u>		

(i) Labour Cost Variance (LCV):

Standard Cost for actual production – actual Cost

Here actual production = 5,000 – 900 = 4,100 units

So, Standard cost for actual Production:

$$\frac{3,60,000}{4,000} \times 4,100 = `3,69,000$$

Standard Production (SP) = 5,000 – 1,000 = 4,000 units

$$\text{LCV} = `3,69,000 - `3,06,000$$

$$= `63,000 (\text{Fav.})$$

(ii) Labour Rate Variance (LRV): AT (SR – AR)

$$\text{Grade X} = 72,000 (2 - 2.50) = `36,000 (\text{Adv.})$$

$$\text{Grade Y} = 63,000 (3 - 2.00) = `63,000 (\text{Fav.})$$

$$= 27,000 (\text{Fav.})$$

(iii) Labour Efficiency Variance (LEV):

SR (ST for actual Output – Actual Time)

$$ST \text{ for Grade X} = \frac{90,000}{4,000} \times 4,100 = 92,250 \text{ hrs}$$

$$ST \text{ for Grade Y} = \frac{60,000}{4,000} \times 4,100 = 61,500 \text{ hrs}$$

LEV:

$$\text{Grade X} = 2(92,250 - 72,000) = `40,500 (\text{Fav.})$$

$$\begin{aligned} \text{Grade Y} &= 3(61,500 - 63,000) = `4,500 (\text{Adv.}) \\ &= 36,000 (\text{Fav.}) \end{aligned}$$

Labour efficiency Variance can be further analysed as follows:

(iv) Labour Mix Variance (LMV): SR (RST – Actual Time)

$$RST = \frac{\text{Standard Time}}{\text{Total Standard Time}} \times \text{Total Actual Time}$$

$$\text{Grade X} = \frac{90,000}{1,50,000} \times 1,35,000 = 81,000 \text{ hrs}$$

$$\text{Grade Y} = \frac{60,000}{1,50,000} \times 1,35,000 = 54,000 \text{ hrs}$$

LMV:

$$\text{Grade X} = 2(81,000 - 72,000) = `18,000 (\text{Fav.})$$

$$\begin{aligned} \text{Grade Y} &= 3(54,000 - 63,000) = `27,000 (\text{Adv.}) \\ &= `9,000 (\text{Adv.}) \end{aligned}$$

(v) Revised Efficiency Variance (REV):

SR (ST for actual Output – RST)

$$\text{Grade X} = 2(92,250 - 81,000) = `22,500 (\text{Fav.})$$

$$\begin{aligned} \text{Grade Y} &= 3(61,500 - 54,000) = `22,500 (\text{Fav.}) \\ &= `45,000 (\text{Fav.}) \end{aligned}$$

Verification:

$$\begin{aligned} 1. \text{ LEV} &= LMV + REV \\ `36,000 (\text{Fav.}) &= `9,000 (\text{Adv.}) + `45,000 (\text{Fav.}) \\ `36,000 (\text{Fav.}) &= `36,000 (\text{Fav.}) \\ 2. \text{ LCV} &= LRV + LEV \\ `63,000 (\text{Fav.}) &= `27,000 (\text{Fav.}) + `36,000 (\text{Fav.}) \\ `63,000 (\text{Fav.}) &= `63,000 (\text{Fav.}) \end{aligned}$$

Note: Revised Efficiency Variance (REV) is equal to Labour Yield variance:

Labour Yield Variance = Standard Cost per unit \times (Standard Output for Actual Mix – Actual Output)

$$\text{Here, Standard Cost per unit} = \frac{3,60,000}{4,000} = `90$$

$$\begin{aligned} \text{Standard Output for Actual Mix} &= \frac{\text{standard Output}}{\text{Standard Mix}} \times \text{Actual Mix} \\ &= \frac{4,000}{1,50,000} \times 1,35,000 = 3,600 \end{aligned}$$

$$\text{Labour Yield Variance} = 90 (4,100 - 3,600) = `45,000 (\text{Fav.})$$

Overhead Variances

Overhead variance is the difference between the standard overhead specified and actual overhead incurred.

Overhead variance is divided into:

(A) Variable Overhead variance.

(B) Fixed Overhead Variance

(A) Variable Overhead Variance

Variable cost varies in proportion to the level of output, while cost is fixed per unit. As such the standard cost per unit of these overheads remains the same irrespective of the level of output attend.

(1) Variable Overhead Cost Variances. The variable overhead cost variance represents the difference between the standard cost of variable overhead for actual output and the actual variable overhead incurred during the period.

Variable Overhead Cost Variance

$$= (\text{Actual Output} \times \text{St. Variable Overhead Rate per unit}) - \text{Actual Variable Overhead Cost}$$

Or

$$= (\text{St. Hours for Actual Output} \times \text{St. Variable Overhead Rate per Hour})$$

- Actual Variable Overhead Cost

(2) Variable Overhead Expenditure Variance. It is the difference between the actual variable overhead rate per hour and standard variable overhead rate per hour multiplied by the actual hours worked. It is also known as 'Budget Variance'.

Variable Overhead Expenditure Variance

$$= (\text{St. Variable Overhead Rate} \times \text{Actual Hours}) - \text{Actual Variable Overheads}$$

Or

$$= \text{Recovered Variable Overheads} - \text{Actual Variable Overheads}$$

(3) Variable Overhead Efficiency Variance. The variable overhead efficiency variance is calculated by taking the difference in standard output and actual output multiplied by the standard variable overhead rate.

Variable Overhead Efficiency Variable = St. Variable Overhead Rate \times (St. Quantity - Actual Quantity)

Or

$$= \text{SVOR} \times (\text{SHAO} - \text{AH})$$

Where SVOR = Standard Variable Overhead Rate per hour; SHAO = Standard Hours for Actual Output;

AH = Actual Hours. **Confirmation:**

$$\text{Variable Overhead Variance} = \text{V.O. Expenditure Variance} + \text{V.O. Efficiency Variance}$$

Illustration 4.7

From the following information, calculate: (a) Variable Overhead Variance, (b) Variable Overhead Expenditure Variance, and (c) Variable Overhead Efficiency Variance.

1. Standard hours per unit: 3; Variable Overhead per hour: `5
2. Actual Variable Overhead incurred: `4,20,000
3. Actual Output: 30,000 units
4. Actual Hours worked: 1,00,000 hours.

Solution:

(a) Variable Overhead Variance = Standard Variable Overhead - Actual Variable Overhead
$$= (3 \times `5 \times 30,000 \text{ units}) - `4,20,000$$
$$= `4,50,000 - `4,20,000 = `30,000 (\text{F})$$

(b) Variable Overhead Expenditure Variance
$$= \text{Standard Variable Overhead for Actual Time} - \text{Actual Variable Overhead} = (\text{Standard Overhead Rate} \times \text{Actual Hours}) - \text{A.V.O.}$$
$$= (`5 \times 1,00,000 \text{ hours}) - `4,20,000$$
$$= `5,00,000 - `4,20,000 = `80,000 (\text{F})$$

(c) Variable Overhead Efficiency Variance = Standard Variable Overhead on Actual Production

- Standard Variable Overhead for Actual Time

$$= (3 \times `5 \times 30,000 \text{ units}) - (`5 \times 1,00,000 \text{ hours})$$

$$= `4,50,000 - `5,00,000 = `50,000 (\text{A})$$

Confirmation:

$$\text{Variable Overhead Variance} = \text{V.O. Expenditure Variance} + \text{V.O. Efficiency Variance.}$$

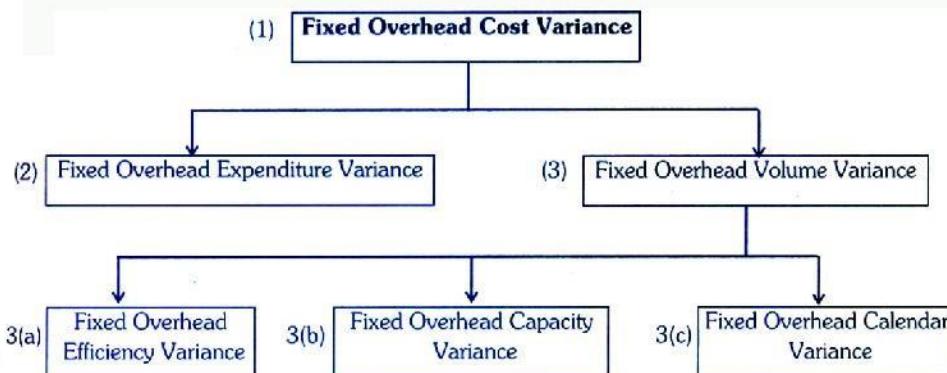
$$` 30,000 (\text{F}) = ` 80,000 (\text{F}) + ` 50,000 (\text{A})$$

$$` 30,000 (\text{F}) = ` 30,000 (\text{F}).$$

(B) Fixed Overhead Variance

Fixed overhead variance reveals all items of expenditure which are more or less remain constant irrespective of level of output or number of hours worked. Fixed overhead variance depends upon two factors, which are: (i) fixed expenses incurred and (ii) volume of production obtained.

The volume of production depends upon (a) capacity at which the factory works, (b) number of days factory works, and (c) efficiency at which factory works.



Classification of Fixed Overhead Variances

(1) **Fixed Overhead Cost Variance.** It shows the difference between the standard cost of fixed overheads recovered for actual output and actual cost of fixed overheads incurred.

$$\text{Fixed Overhead Cost Variance} = \text{Standard Fixed Overheads} - \text{Actual Fixed Overheads}$$

Or

$$= (\text{Actual Output} \times \text{Standard Fixed Overhead Rate}) - \text{Actual Fixed Overheads}$$

Fixed Overhead Cost Variance may be classified as:

- (a) Fixed Overhead Expenditure Variance;
- (b) Fixed Overhead Volume Variance.

(2) **Fixed Overhead Expenditure Variance.** It is that part of fixed overhead cost variance which arises due to the difference between budgeted fixed overhead expenditure and the actual fixed overhead expenditure relating to a specified period.

$$\text{Fixed Overhead Expenditure Variance} = \text{Budgeted Fixed Overheads} - \text{Actual Fixed Overheads}$$

Or

$$= (\text{Standard Overhead Rate} \times \text{Budgeted Output}) - (\text{Actual Overhead Rate} \times \text{Actual Output})$$

(3) **Fixed Overhead Volume Variance.** This variance reveals the difference between fixed overhead recovered on actual output and fixed overheads on budgeted output. It is the result of difference in volume of production multiplied by the standard rate. $\text{Fixed Overhead Volume Variance} = \text{Recovered Fixed Overheads} - \text{Budgeted Fixed Overheads}$

Or

$$= (\text{Actual Output} \times \text{Standard Overhead Rate}) - (\text{Budgeted Output} \times \text{Standard Overhead Rate})$$

Fixed overhead volume variance can further be analysed as (a) Fixed Overhead Efficiency Variance, (b) Fixed Overhead Capacity Variance and (c) Fixed Overhead Calendar Variance

3 (a) **Fixed Overhead Efficiency Variance.** It is that part of fixed overhead volume variance which is due to the difference between the budgeted efficiency of production and the actual efficiency attained. The actual quantity produced and standard quantity fixed might be different because of

higher or lower efficiency of workers employed in manufacturing of goods. Fixed Overhead Efficiency Variance = Recovered Fixed Overheads - Standard Overheads

Or

= Standard Overhead Rate (Actual Quantity - Standard Quantity)

3 (b) **Fixed Overhead Capacity Variance.** The variance which is related to the over or under utilisation of plant capacity is known as fixed overhead capacity variance. Strikes, lock-out, idle time, etc., lead to under-utilisation and overtime, extra shift, etc., lead to over-utilisation. Fixed Overhead Capacity Variance = Standard Overhead Rate per unit (Revised Budgeted Output - Budgeted Output)

Or

Hours = Standard Rate per hour (Revised Budgeted Hours - Budgeted Hours) Whereas, Revised Budgeted Nos. = Actual Working days x Budgeted Hrs. per Day.

3 (c) **Fixed Overhead Calendar Variance.** It is that part of volume variance which arises due to the difference between the number of working days anticipated in the budget period and the actual working days in the budget period. The number of working days in the budget are arrived at by dividing the number of annual days by twelve. But the actual days of a month may be more or less than the standard days and with the result there may be calendar variance. Fixed Overhead Calendar Variance = possible Fixed Overheads - Budgeted Fixed Overheads

Or

$$= (\text{Standard Rate of Overhead per hour} \times \text{Possible Hours}) - (\text{Standard Overhead Rate per hour} \times \text{Budgeted Hours})$$

Possible Hours = Standard Working hours per day x Actual Number of Working days.

Or Fixed Overhead Calendar Revised Variance = (Standard Rate per hour/day) \times (Excess or Deficit Hours/Days Worked)

Fixed Overhead Capacity Revised Variance = Standard Overhead - Possible Overhead

Illustration 4.8

From the following data calculate Fixed Overhead Variances

	Budgeted	Actual
Output	20,000 units	18,000 units
Number of Working Days	25	28
Fixed Overheads	₹ 40,000	₹ 41,000

There was an increase of 10% in capacity

Solution:

$$\begin{aligned} \text{Standard Overhead Rate} &= \frac{\text{Standard Fixed Overheads}}{\text{Standard Output}} \\ &= \frac{40,000}{20,000 \text{ Units}} = ₹ 2.00 \end{aligned}$$

(a) Fixed Overhead Cost Variance

$$\begin{aligned} &= \text{Standard Fixed Overheads} - \text{Actual Fixed Overheads} \\ &= (\text{Actual Output} \times \text{Standard Fixed Overhead Rate}) \\ &\quad - \text{Actual Fixed Overheads} \end{aligned}$$

$$\begin{aligned} \text{FOCV} &= (18,000 \text{ units} - ₹ 2.00) - ₹ 41,000 = ₹ 36,000 - ₹ 41,000 \\ &= ₹ 5,000 (\text{A}) \end{aligned}$$

(b) Fixed Overhead Expenditure Variance

$$\begin{aligned} &= \text{Budgeted Fixed Overheads} - \text{Actual Fixed Overheads} \\ \text{FOE} \times V &= ₹ 40,000 - ₹ 41,000 = ₹ 1,000 (\text{A}) \end{aligned}$$

(c) Fixed Overhead Volume Variance

$$= \text{Recovered Fixed Overheads} - \text{Budgeted Fixed Overheads}$$

St. Hrs. for Actual Output	$= \left(22,000 \times \frac{30,000}{20,000} \right) = 33,000 \text{ hrs}$
Budgeted Overheads	= `30,000
Budgeted Overhead Rate per hour	= `1.00
Budgeted Hours	$= \frac{30,000}{1.00} = 30,000$
Budgeted Output	= 20,000 units
St. Time per unit of Output	$= \frac{30,000}{20,000} = 1.5 \text{ hrs}$
St. Rate per unit of Output	$= \frac{1.5 \text{ Hours}}{1.0} = `1.50$
Budgeted Days	= 25
Budgeted Hrs. Worked per day	$= \frac{30,000}{25} = 1200 \text{ Hrs}$

Calculation of First Overhead Variances:

- (1) Efficiency Variance $= \text{St. Rate per hour} (\text{St. Hours} - \text{Actual Hours})$
EV $= `1.00 (33,000 - 31,500) = `1,500 (\text{F})$
- (2) Capacity Variance $= \text{St. Rate per hour} (\text{Actual Hours} - \text{Revised Budgeted Hours})$
CV $= `1.00 (31,500 - 27 \times 1.200) = `900 (\text{A})$
- (3) Calendar Variance $= \frac{\text{Budgeted Overheads}}{\text{Budgeted Working Days}} \times (\text{actual No. of Working Days} - \text{Budgeted No. of Working Days})$
 $\therefore \text{CIV} = \frac{30,000}{25} (27 - 25) = `2,400 (\text{F})$
- (4) Volume variance = Standard Rate per unit (Actual Output - Budgeted Output)
VV $= `1.50 (22,000 - 20,000) = `3,000$
- (5) Expenditure Variance = Budgeted Overheads - Actual Overheads
Exp. V $= `30,000 - `31,000 = `1,000 (\text{A})$
- (6) Total Overhead Variance = (Actual Output x Standard Rate per unit) - Actual Overheads
TOV $= (22,000 \text{ units} \times `1.50) - `31,000$
 $= `33,000 - `31,000 = `2,000 (\text{F})$

Confirmation:

$$\begin{aligned} \text{Total Overhead Variance} &= \text{Expenditure Variance} + \text{Volume Variance} \\ `2,000 (\text{F}) &= `1,000 (\text{A}) + `3,000 (\text{F}) \\ `2,000 (\text{F}) &= `2,000 (\text{F}) \end{aligned}$$

$$\begin{aligned} \text{Volume Variance} &= \text{Efficiency Variance} + \text{Capacity Variance} + \text{Calendar Variance} \\ `3,000 (\text{F}) - `1,500 (\text{F}) + `900 (\text{A}) + `2,400 (\text{F}) & \\ `3,000 (\text{F}) &= `3,000 (\text{F}) \end{aligned}$$

Illustration 4.10

The following information is available from the cost records of a company for January, 2014:

Materials Purchased: 20,000 pieces	88,000
Materials Consumed: 19,000 pieces	
Actual Wages Paid: 4,950 Hours	24,750
Factory Overheads Incurred	44,000
Factory Overheads Budgeted	40,000
Units Produced:	1,800

Standard Rates and Prices are:

Direct Material Rate	‘ 4 per piece
Standard Input	10 pieces per unit
Direct Labour Rate	‘ 4 per hour
Standard Requirement	2.5 hours per unit
Overhead	‘ 8 per labour hour

Required:

(a) Show the Standard Cost Card.

(b) Compute all Material, Labour and Overhead Variances for January, 2014.

Solution:

(a) **Standard Cost Card**

	Per Unit m
Direct Material	— 10 pieces @ ‘ 4 per piece
	— 2.5 hrs @ ‘ 4 per hour
Direct Labour	— 2.5 hrs @ ‘ 8 per hour
	Total Standard Cost
	40
	10
	20
	70

(b) **Computation of Variances:**

I. Material Variances

(1) Total Material Cost Variance = Standard Cost of Material for Actual Output

$$= (1,800 \times 10 \text{ pieces} \times 4) - \left(\frac{88,000 \times \frac{19,000}{20,000}}{} \right)$$

$$TMCV = 72,000 - 83,600 = 11,600 \text{ (A)}$$

(2) Material Price variance = Actual Qty. (St. Price - Actual Price)

$$MPV = 19,000 \text{ pieces} \left(\frac{4 - \frac{20,000}{19,000}}{} \right)$$

$$= 19,000 \text{ pieces} (4 - 4.40) = 7,600 \text{ (A)}$$

(3) Material Usage Variance = St. Price (St. Qty. - A. Qty.)

$$MUV = 4.00 (18,000 - 19,000) = 4,000 \text{ (A)}$$

Confirmation:

$$\begin{aligned} TMCV &= MPV + MUV \\ 11,600 \text{ (A)} &= 7,600 \text{ (A)} + 4,000 \text{ (A)} \\ 11,600 \text{ (A)} &= 11,600 \text{ (A)} \end{aligned}$$

II. Labour Variances

(1) Total Labour Cost Variance — St. Cost of Labour for Actual Output

$$- \text{Actual Labour Cost} \\ = (1,800 \times 2.5 \text{ hrs} \times 4) - 24,750$$

$$LTV = 18,000 - 24,750 = 6,750 \text{ (A)}$$

(2) Labour Rate Variance = Actual hrs. (St. Rate per hour - Actual Rate per hour)

$$= 4,950 \text{ hrs.} \left(\frac{4 - \frac{24,750}{4,950}}{} \right)$$

$$= 4,950 \text{ hrs.} (4 - 5)$$

$$LRV = 4,950 \text{ (A)}$$

(3) Labour Efficiency Variance = St. Rate per hour (St. hrs. - A. hrs.)

$$= 4 [(1800 \times 2.5 \text{ hrs}) - 4,950 \text{ hrs.}]$$

$$\begin{aligned} &= `4 (4,500 \text{ hrs.} - 4,950 \text{ hrs.}) \\ \text{LEV} &= `1,800 (\text{A}) \end{aligned}$$

Confirmation:

$$\begin{aligned} \text{TLCV} &= \text{LRV} + \text{LEV} \\ `6,750 (\text{A}) &= `4,950 (\text{A}) + `1,800 (\text{A}) \\ `6,750 (\text{A}) &= `6,750 (\text{A}) \end{aligned}$$

III. Fixed Overhead Variances

$$\begin{aligned} (1) \quad \text{Total fixed Overhead Cost variance} &= \text{Overhead Recovered on Actual Output} \\ &\quad - \text{Actual Factory Overheads} \\ &= (1,800 \text{ units} \times 2.5 \text{ hrs} \times 8) - 44,000 \end{aligned}$$

$$\therefore \text{TFOC} = `36,000 - `44,000 = `8,000 (\text{A})$$

$$\begin{aligned} (2) \quad \text{Fixed Overhead Expenditure Variance} &= \text{- Budgeted Fixed Overheads} - \text{Actual Fixed Overheads} \\ \therefore \text{F.O. Exp. V.} &= `40,000 - `44,000 = `4,000 (\text{A}) \end{aligned}$$

$$\begin{aligned} (3) \quad \text{Fixed Overhead Efficiency Variance} &= \text{St. F.O. Rate per hour} \\ (\text{St. hrs, for Actual Output} - \text{Actual hrs.}) &= `8 [(2.5 \text{ hrs.} \times 1,800) - 4,950 \text{ hrs.}] \\ \text{F.O. Eff. V.} &= `8 (4,500 \text{ hrs.} - 4,950 \text{ hrs.}) \\ &= `3,600 (\text{A}) \end{aligned}$$

$$\begin{aligned} (4) \quad \text{Fixed Overhead Capacity Variance} &= \text{St. F.O. Rate per hour} (\text{Actual Capacity hrs.} \\ &\quad - \text{Budgeted Capacity hrs.}) \\ &= \text{Rs.} 8 \left(4,950 \text{ hrs.} - \frac{\text{Rs.} 40,000}{8} \right) \\ &= `8(4,950 \text{ hrs.} - 5,000 \text{ hrs.}) \\ \text{F.O.C.V.} &= `400 (\text{A}) \end{aligned}$$

Confirmation:

$$\begin{aligned} \text{TFOCV} &= \text{F.O. Exp. V.} + \text{F.O. Capacity V} \\ `8,000 &= `4,000 (\text{A}) + `3,600 (\text{A}) + `400 (\text{A}) \\ `8,000 (\text{A}) &= `8,000 (\text{A}) \end{aligned}$$

4.3.1 Evaluation of cost and sales variances

Sales Variances

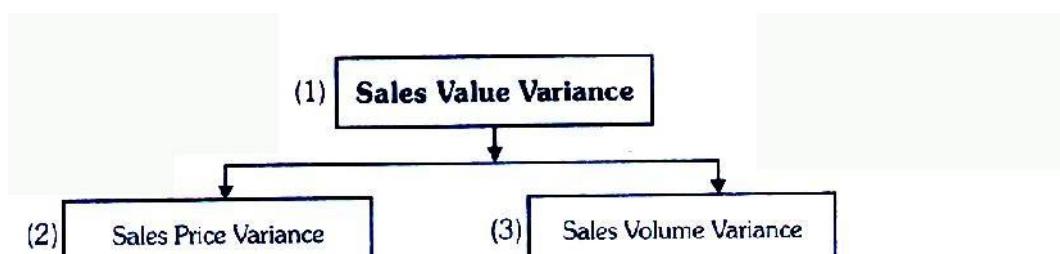
Some companies are interested in calculating only cost variances relating to materials, labour and overheads. These variances are of great significance to the business enterprises. But in order to obtain the full advantages of standard costing system, many companies also calculate sales variances. Sales variances affect a business in terms of changes in revenue.

Sales variances can be calculated by two methods:

(A) The Value or the Turnover Method, (B) The Profit or the Margin Method.

• (A) The Value or the Turnover Method

Under this method, variances are calculated with reference to their effect on sales or sales value.



Classification of Sales Variances Based on Turnover

(1) **Sales Value Variance (SVV):** It shows the difference between the actual sales and the budgeted sales. If the actual sales exceed the budgeted sales the variance is treated as favourable and vice-versa.

Sales Value Variance (SVV) = Actual Value of Sales - Budgeted Value of Sales

or

$$SVV = (Actual \text{ Quantity} \times Actual \text{ Selling Price}) - (St. \text{ Quantity} \times St. \text{ Selling Price})$$

(2) **Sales Price Variance (SPV):** It is the that part of Sales Value Variance which arises due to the difference between actual price and standard price of sales. If the actual price attained is more than the standard price, the variance shall be favourable and vice-versa.

Sales Price Variance (SPV) = Actual Quantity (Actual Selling Price - St. Selling Price)

(3) **Sales Volume Variance (S.Vlm. V):** It is that part of Sales Value Variance which arises due to the difference between the actual quantity sold and the standard quantity of sales.

Sales Volume Variance (S. Vim. V) = St. Selling Price (Actual Quantity of Sales - St. Quantity of Sales)

Sales Volume Variance can be further divided into:

3 (a) **Sales Mix Variance (SMV):** It is that part of Sales Volume Variance which arises due to the difference between standard and actual composition of the sales mix. This variance arises only when the business firm deals in more than one product. Sales Mix Variance (SMV) = St. Value of Actual Mix - St. Value of Revised St. Mix

or

$$SMV = St. \text{ Selling Price} (Actual \text{ Qty.} - Revised \text{ St. Qty.})$$

3 (b) **Sales Quantity Variance (SQV):** It is that part of Sales Volume Variance which is due to the difference between standard value of a actual sales at standard mix and the budgeted sales.

Sales Quantity Variance (SQV) = Revised Standard Sales Value - Budgeted Sales Value
or
SQV = Standard Selling Price per unit (Standard Proportion for

$$Actual \text{ Sales} \text{ Quantity} - Budgeted \text{ Quantity} \text{ of Sales})$$

or
SQV = St. Selling Price per unit (Revised St. Mix - St. Mix)

Illustration 4.11

The budgeted sales for one month and the actual results achieved are as under:

Product	Budget			Actual		
	Quantity (units)	Rate(`)	Amount(`)	Quantity (units)	Rate(`)	Amount(`)
M	1,000	10.00	10,000	1,200	12.50	15,000
N	700	20.00	14,000	800	15.00	12,000
O	500	30.00	15,000	600	30.00	18,000
P	300	50.00	15,000	400	60.00	24,000
Total	2,500		54,000			69,000

You are required to calculate in respect of each product, the Sales Variances.

Solution:

(1) Sales Value Variance = Actual Value of Sales - Budgeted Value of Sales

$$\therefore \text{SVV} = `69,000 - `54,000 = `15,000 (\text{F})$$

(2) Sales Price Variance = Actual Qty. (Actual Selling Price - St. Selling Price)

$$M = 1200 (`12.50 - `10.00) = `3,000 (\text{F})$$

$$N = 800 (`15.00 - `20.00) = `4,000 (\text{A})$$

$$O = 600 (`30.00 - `30.00) = \text{Nil}$$

$$P = 400 (`60.00 - `50.00) = `4,000 (\text{F})$$

$$\therefore \text{Total Sales Price Variance} = `3,000 (\text{F})$$

(3) Sales Volume Variance = St. Selling Price (Actual Qty. - St. Qty.)

$$M = `10.00 (1200 - 1000) = `2,000 (\text{F})$$

$$N = `20.00 (800 - 700) = `2,000 (\text{F})$$

$$O = `30.00 (600 - 500) = `3,000 (\text{F})$$

$$P = `50.00 (400 - 300) = `5,000 (\text{F})$$

$$\therefore \text{Total Sales Volume Variance} = `12,000 (\text{F})$$

3 (a) Sales Mix Variance = (St. Value of Actual Mix - St. Value of Revised St. Mix)

or SMV = St. Selling Price (Actual Qty. - Revised St. Qty.)

$$\text{Whereas, Revised St. Qty.} = \frac{\text{Total Actual Mix of Sales}}{\text{Total St. Mix of Sales}} \times \text{St.Qty.}$$

$$\text{Revised St. Qty. for product M} = \frac{3,000}{2,500} \times 1000 = 1,200 \text{ units}$$

$$\text{Revised St. Qty. for product N} = \frac{3,000}{2,500} \times 700 = 840 \text{ units}$$

$$\text{Revised St. Qty. for product O} = \frac{3,000}{2,500} \times 500 = 600 \text{ units}$$

$$\text{Revised St. Qty. for product P} = \frac{3,000}{2,500} \times 300 = 360 \text{ units}$$

$$\text{Sales Quantity Variance M} = `10.00 (1200 - 1200) = \text{Nil}$$

$$N = `20.00 (800 - 840) = `800 (\text{A})$$

$$O = `30.00 (600 - 600) = \text{Nil}$$

$$P = `50.00 (400 - 360) = `2,000 (\text{F})$$

$$\text{Total Sales Mix Variance} = `1,200 (\text{F})$$

3 (b) Sales Quantity Variance - St. Selling Price (Revised St. Qty. - St. Qty.)

$$M = ` 10.00 (1200 - 1000) = ` 2,000 (F)$$

$$N = ` 20.00 (840 - 700) = ` 2,800 (F)$$

$$O = ` 30.00 (600 - 500) = ` 3,000 (F)$$

$$P = ` 50.00 (360 - 300) = ` 3,000 (F)$$

$$\therefore \text{Total Sales Quantity Variance} = ` \underline{10,800} (F)$$

Confirmation:

$$\text{Sales Value Variance} = \text{Sales Price Variance} + \text{Sales Volume Variance}$$

$$` 15,000 (F) = ` 3,000 (F) + ` 12,000 (F)$$

$$` 15,000 (F) = ` 15,000 (F)$$

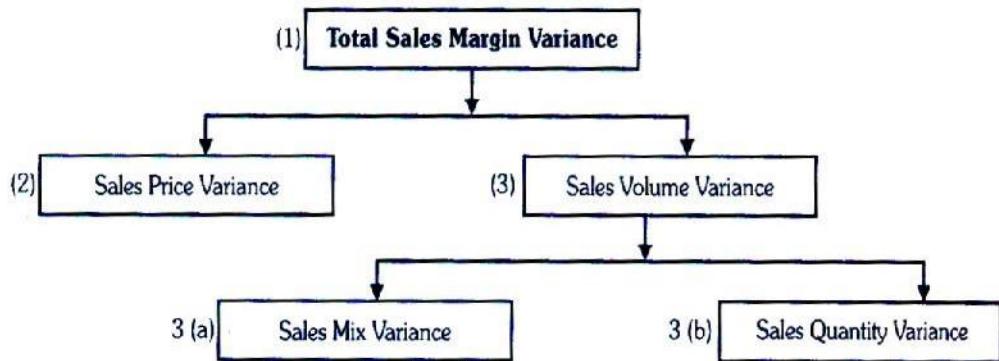
$$\text{Sales Volume Variance} = \text{Sales Mix Variance} + \text{Sales Quantity Variance}$$

$$` 12,000 (F) = ` 1200 (F) + ` 10,800 (F)$$

$$` 12,000(F) = ` 12,000(F)$$

• (B) The Profit or Margin Method

The sales variances based on profit are also known as Sales Margin Variances which indicates the deviation or difference between actual profit and standard or budgeted profit.



Classification of Sales Variances based on Margin

(1) **Total Sales Margin Variance:** This sales variance reveals the difference between actual profit and standard or budgeted profit.

$$\text{Total Sales Margin Variance} = \text{Actual Profit} - \text{Budgeted Profit}$$

$$\text{or} \quad = (\text{Actual Qty. of Sales} \times \text{Actual Profit per unit})$$

$$- (\text{Budgeted Qty. of Sales} \times \text{Budgeted Profit per unit})$$

(2) **Sales Price Variance:** It is that part of Total Sales Margin Variance per unit which shows the difference between the standard price of the quantity of sales effected and the actual price of those sales.

$$\text{Sales Price Variance} = \text{Actual Qty. of Sales} (\text{Actual Profit per unit} - \text{Budgeted Profit per unit})$$

or = (Actual Qty. of Sales \times St. Price) - (Actual Qty. of Sales \times Actual Price)

(3) **Sales Volume Variance:** It shows the difference between the actual units sold and the budgeted quantity multiplied by either the standard profit per unit or the standard contribution per unit.

Note: In Absorption Costing, standard profit per unit is used, but in Marginal Costing, standard contribution per unit must be used,

Sales Volume Variance = St. Profit per unit (Actual Qty. of Sales - St. Qty. of Sales)

or = (St. Profit on Actual Qty. of Sales) - (St. Profit on St. Qty. of Sales)

Sales Volume Variance can be further divided into:

3 (a) **Sales Mix Variance:** This variance arises only when the firm manufactures and sells more than one type of product. This variance will be due to variation of actual mix and budgeted mix of sales.

Sales Mix Variance = St. Profit per unit (Actual Qty. of Sales - Revised St. Qty. of Sales)

or = Standard Profit - Revised Standard Profit

3 (b) **Sales Quantity Variance:** It is that part of Sales Volume Variance which arises due to the difference between the standard profit and revised standard profit. Sales Quantity Variance = St. Profit per unit (St. Proportion for Actual Sales - Budgeted Qty. of Sales)

or = Revised St. Profit - Budgeted Profit

or = Budgeted Margin per unit on budgeted Mix \times (Total Actual Qty. - Total Budgeted Qty.)

Illustration 4.12

Rama Ltd. is manufacturing and selling three products X, Y and Z. The company has a standard costing system and analysis the variances between the budget and the actuals periodically. The summarised working results for 2013-14 were as follows:

Product	Budget			Actual		
	Selling Price p. u.(`)	Cost per unit (`)	No. of Units Sold	Selling Price p. u.(`)	Cost per unit (`)	No. of Units Sold
X	50.00	16.00	20,000	48.00	15.00	24,000
Y	40.00	12.00	28,000	42.00	12.50	24,000
Z	30.00	9.00	32,000	31.00	10.00	30,000

(a) Calculate variances in profit during the period.

(b). Analyse the variance in profit into: (1) Sales Price Variance; (2) Sales Volume Variance; (3) Total Sales Margin Variance; (4) Sales in Quantity Variance; and (5) Sales Margin Mix Variance.

Solution:

Working Notes:

1 (a). Actual Margin per unit = Actual Sales Price per unit - St. Cost per unit

$$X = ` (48-16) = ` 32$$

$$Y = ` (42-12) = ` 30$$

$$Z = ` \{31-9\} = ` 22$$

1 (b). Budgeted Margin per unit = Budgeted Selling Price per unit - St. Cost per unit

$$X = ` (50-16) = ` 34$$

$$Y = ` (40-12) = ` 28$$

$$Z = ` (30-9) = ` 21$$

2 (a). Actual Profit = Actual Quantity of Units Sold \times Actual Margin per unit

$$X = 24,000 \text{ units} \times ` 32 = ` 7,68,000$$

$$Y = 24,000 \text{ units} \times ` 30 = ` 7,20,000$$

$$Z = 30,000 \text{ units} \times ` 22 = ` 6,60,000$$

$$\text{Total} = `21,48,000$$

2 (b). Budgeted Profit = Budgeted Quantity of Units Sold x Budgeted Profit per unit

$$X = 20,000 \text{ units} \times `34 = `6,80,000$$

$$Y = 28,000 \text{ units} \times `28 = `7,84,000$$

$$Z = 32,000 \text{ units} \times `21 = `6,72,000$$

$$\text{Total} = `21,36,000$$

3 (a). Budgeted Margin per unit on Actual Mix

$$\begin{aligned} &= \frac{(34 \times 24,000) + (28 \times 24,000) + (21 \times 30,000)}{(24,000 + 24,000 + 30,000) \text{ units}} \\ &= \frac{(8,16,000) + (6,72,000) + (6,30,000)}{78,000 \text{ units}} \\ &= \frac{21,18,000}{78,000 \text{ units}} = `27.154 \end{aligned}$$

3 (b). Budgeted Margin per unit on Budgeted Mix

$$\begin{aligned} &= \frac{(34 \times 20,000) + (28 \times 28,000) + (21 \times 32,000)}{(20,000 + 28,000 + 32,000) \text{ units}} \\ &= \frac{(6,80,000) + (7,84,000) + (6,72,000)}{80,000 \text{ units}} \\ &= \frac{21,36,000}{80,000 \text{ units}} = `26.70 \end{aligned}$$

Calculation of Sales Margin Variances:

(1) Sales Margin Price Variance = Actual Qty. {Actual Margin per unit

– Budgeted Margin per unit)

$$X = 24,000 \text{ units} (`32 - `34) = `48,000 (\text{A})$$

$$Y = 24,000 \text{ units} (`30 - `28) = `48,000 (\text{F})$$

$$Z = 30,000 \text{ units} (`22 - `21) = `30,000 (\text{F})$$

$$\text{Total Sales Margin Price Variance} = `30,000 (\text{F})$$

(2) Sales Margin Volume Variance = Budgeted Margin per unit (Actual Qty. - Budgeted Qty.)

$$X = `34 \{24,000 \text{ units} - 20,000 \text{ units}\} = `1,36,000 (\text{F})$$

$$Y = `28 \{24,000 \text{ units} - 28,000 \text{ units}\} = `1,12,000 (\text{A})$$

$$Z = `21 \{30,000 \text{ units} - 32,000 \text{ units}\} = `42,000 (\text{A})$$

$$\therefore \text{Total Sales Margin Volume Variance} \equiv `18,000 (\text{A})$$

(3) Total Sales Margin Variance = Actual Profit - Budgeted Profit

$$= `21,48,000 - `21,36,000 = `12,000 (\text{F})$$

(4) Sales Margin Quantity Variance = Budgeted Margin per unit on Budgeted Mix

(Total Actual Qty. – Total Budgeted Qty.)

$$= `26.70 (78,000 \text{ units} - 80,000 \text{ units})$$

$$\text{Total Sales Margin Qty. Variance} = `53,400 (\text{A})$$

(5) Sales Margin Mix Variance = Total Actual Qty. (Budgeted Margin per unit on Actual Mix

– Budgeted Margin per unit on Budgeted Mix)

$$= 78,000 \text{ units} (`27.154 - `26.70)$$

$$\therefore \text{Total Sales Margin Mix Variance} = `35,412 \text{ or } `35,400$$

Confirmation:

Total Sales Margin Variance = Sales Margin Price Variance + Sales Margin Volume Variance

$$\begin{aligned}`12,000(F) &= `30,000(F) + `18,000(A) \\`12,000(F) &= `12,000(F)\end{aligned}$$

Sales Margin Volume Variance = Sales Margin Qty. Variance + Sales Margin Mix Variance

$$\begin{aligned}`18,000(A) &= `53,400(A) + `35,400(F) \\`18,000(A) &= `18,000(A)\end{aligned}$$

• Disposition of Variances

When standard costs are used by a business enterprise only as a statistical data and are not entered in the books of account, the disposition of variances is not needed since no adjustments are required for variances in such a case. But when standard costs are incorporated into accounting system through work-in-progress, finished goods and cost of goods sold accounts, the adjustment and disposition of variances is required. There is no hard and fast rule regarding the disposition of variances nor there is any single way of dealing with them. Hence, the method which will be adopted depends on the accountants attitude and the practice that is followed by the business enterprise. However, the following methods may be usually applied:

- (1) **Transfer to Costing Profit and Loss Account:** According to this method, the unfavourable variances are debited to Costing Profit and Loss Account whereas favourable variances are credited to Costing Profit and Loss Account, at the end of accounting period. Thus, work-in-progress, finished goods, and cost of goods sold accounts are maintained at standard cost. This method has the significance of quick and uniform valuation of stocks and shows the different variances separately to enable the management to pay dual attention quickly and correctly.
- (2) **Allocation of Variances to Stocks and Cost of Sales:** According to this method, cost variances are allocated among finished goods, work-in-progress and cost of sales on the basis of units or value. As a result, the stocks and cost of sales will appear in the books of actual cost.
- (3) **Transfer of Variances to Reserve Account:** The variances, whether favourable or unfavourable are transferred to a Reserve Account to be carried forward to the next accounting period as deferred 'debits' or 'credits'. If variances are favourable, they are shown on liability side of Balance Sheet. On the other hand, if variances are unfavourable, they are shown on asset side of Balance Sheet.

4.4 SUMMARY

- Variances may be classified into two categories, "Favourable and unfavourable, Controllable and uncontrollable variances.
- Variance is the Difference between standard and Actual is known as variance.
- Favourable variance will be designated by (F) and Adverse variance by (A).
- Revision variance represents the difference between the original standard cost nad the revised standard cost.
- Direct material mix variance is that portion of the material usage variance which is due to the difference between standard and actual composition of materials.

4.5 KEY TERMS

- Actual production: is mean actual quantity produced during the actual hours worked.
- Standard Production: It means the quantity which have been produced during actual hours worked.
- Budgeted cost: it means the budgeted quantity to be produced at the standard cost per unit.
- Standard cost: It means the actual quantity produced at the standard cost per unit.
- Material cost variance: Material cost variance is the difference between the standard cost of materials specified for the actual output and actual cost of materials used.
- Material price variance: Material price variance is the portion of the material cost variance which arises due to the difference between the standard price specified and actual price paid.
- Material usage variance: Material usage variance is the difference between the standard quantity specified and the actual quantity used.

- Material mix variance: Material mix variance is that portion of material usage variance which is due to the difference between the standard and actual composition of as mixture.
- Material yield variance: Material yield variance represents the portion of material usage variance which is due to the difference between the standard yield specified and the actual yield obtained.
- Labour cost variance: it is the difference between the standard labour cost and actual labour cost of the product.

4.6 QUESTIONS AND EXERCISES

1. What is standard costing? Explain its advantages and disadvantages.
2. What is standard costing? Explain the requisites of standard costing method.
3. Explain the procedure for determining standards.
4. Distinguish between the following:
5. Standard Cost and Estimated Cost, (b) Standard Costing and Budgetary Control.
6. What do you mean by variances? What are its different kinds and explain it?
7. What do you mean by 'Analysis of Variances'? Explain briefly the various types of variances.
8. "Standard Costing is always accompanied by a system of budgeting, but budgetary control may be operated in business where standard costing would be impracticable." Comment.

Practical Problems:

1. Find out the material variances

Material	Std. Qty. (units)	Std. Price (`)	Actual Qty. (`)	Actual Price (`)
A	50	2	60	3
B	25	5	30	4
	75		90	

[Ans: (i) MVC: A = ` 80 (Adv.); B = ` 5 (Fav.); (ii) MPV: A = ` 60 (Adv.); B = ` 30 (Fav.)
 (iii) MUV: A = ` 20 (Adv.); B = ` 25 (Adv.); (iv) MMV = Nil; (v) MSUV = ` 45 (Adv.)]

2. Calculate material variances from the following data:

Material	Standard			Actual		
	Std. Qty. (kg)	Rate (`)	Amount (`)	Qty.	Rate (`)	Amount (`)
A	10	2	20	5	3	15
B	20	3	60	10	6	60
C	20	6	120	15	5	75
	50		200	30		150

[Ans: MCV = ` 50 (Fav.); MPV = ` 20 (Adv.); MUV = ` 70 (Fav.); MMV = ` 10 (Adv.); MSUV = ` 80 (Fav.)]

3. The standard mix of product is as under:

Material A - 60 units @ ` 0.15 per unit.

Material B - 80 units @ ` 0.20 per unit

Material C = 100 units @ ` 0.25 per unit.

10 units of finished product should be obtained from the above mix.

During the month January 2010, 10 such mixes were completed and consumption was as follows:

Material A - 640 units @ ` 0.20 per unit

Material B - 960 units @ ` 0.15 per unit

Material C - 840 units @ ` 0.30 per unit

Actual output was 90 units.

Calculate the various material variances.

[Ans: MCV = ` 74 (Adv.); MPV = ` 26 (Adv.); MUV = ` 48 (Adv.); MMV = ` 10.35 (Fav.)
MYV = ` 58.35 (Adv.)]

4. The standard mix to produce one unit of product is as follows:

Material A = 60 units @ ` 15 per unit = ` 900
Material B = 80 units @ ` 20 per unit = ` 1,600
Material C = 100 units @ ` 25 per unit = ` 2,500
240 units = ` 5,000

During the month of February, 10 units were produced and the actual consumption was as follows:

Material A - 640 units @ ` 17.50 per unit = ` 11,200
Material B - 950 units @ ` 18 per unit = 17,100
Material C - 870 units @ ` 27.50 per unit = ` 23,925
460 units = ` 52,225

Calculate:

- (i) Material Cost Variance
- (ii) Material Price Variance
- (iii) Material Usage Variance
- (iv) Material Mix Variance
- (v) Material Yield Variance.

[Ans: (i) MCV = ` 2225 (Adv.); (ii) MPV = ` 1.875 (Adv.); (iii) MUV = ` 350 (Adv.); (iv) MMV = ` 900 (Fav.); (v) MYV = ` 1,250 (Adv.)]

5. The standard cost of a chemical mixture is as under:

4 ton of material X at ` 20 per ton.

6 ton of material Y at ` 30 per ton.

The actual cost for a period is as under:

4.5 tons of material X at ` 15 per ton

5.5 tons of material Y at ` 34 per ton.

The standard yield is 90% of input, whereas the actual yield is 9.1 tons.

Calculate: (a) Material Cost Variance

- (b) Material Price Variance
- (c) Material Usage Variance
- (d) Material Mix Variance
- (e) Material Yield Variance.

[Ans: (a) MCV = ` 8.38 (Fav.); (b) MPV = ` 0.50 (Fav.)] (c) MUV = ` 7.88 (Fav.); (d) MMV = ` 5 (Fav.); (e) MYV = ` 2.88 (Fav.)

6. A company manufactures a single product. The standard mix is as under:

Material A - 60% at ` 20 per kg

Material B - 40% at ` 10 per kg

Normal loss in production is 20% of input. Due to shortage of material A, the standard mix was changed.

The actual results of February 2001 were:

Material A - 105 kg at ` 20 per kg

Material B - 95 kg at ` 9 per kg

Actual Output - 165 kg

Calculate the various material variances.

[Ans: MCV = ` 345 (Fav.); MPV = ` 95 (Fav.) MUV = ` 250 (Fav.); MMV = ` 150 (Fav.)
MYV = ` 100 (Fav.)]

7. From the following calculate the material variances; Actual production during the period 192 units.

	Material A	Material B
Actual Price per ton	` 277.50	` 308
Standard Price per ton	` 240.00	` 320
Actual Weight	16 tons	13 tons

Budgeted Production during the period 400 units for which the standard quantity of materials are 30 tons of A and 25 tons of B.

[Ans: MCV = ` 1,148 (Adv.); MPV = ` 444 (Adv.) MUV = ` 704 (Adv.)]

8. A company is engaged in producing a standard mix using 60 kg of Material X and 40 kg of Material Y. The standard loss of production is 30%. The standard price of X is ` 5 per kg and of Y is ` 10 per kg. During the period, the actual results were:

X - 80 kg @ ` 4.50 per kg and Y - 70 kg @ ` 8.00 per kg Actual Yield 115 kg

Calculate the various material variances.

[Ans: MCV = ` 230 (Fav.); MPV = ` 180 (Fav.); MUV = ` 50 (Fav.); MMV = ` 50 (Adv.)]

MYV = ` 100 (Fav.)]

Labour Variances

9. From the following information, calculate labour variances:

Actual wage paid - ` 6000; Standard hours - 3,200;

Standard hourly rate - ` 1.50; Actual hours paid - 3,000 hrs;

Idle Time - 100 hours (included in actual hours paid)

[Ans: LCV = ` 1200 (Adv.); LRV = ` 1500 (Adv.); LEV = ` 450 (Fav.); Idle Time Var. = ` 150 (Adv.)]

10. From the following information, calculate the different labour variances:

Standard

Workers	No. of Workers	Rate per hour	Hrs. Worked	Amount (`)
Men	100	3	100	30,000
Women	50	5	100	25,000
Boys	40	10	100	40,000

Actual

Workers	No. of Workers	Rate per hour	Mrs. Worked	Amount (`)
Men	80	2.50	120	24,000
Women	60	5	120	36,000
Boys	50	8	120	48,000

Actual Production = 190 units

Standard Production = 200 units

[Ans: LCV = ` 17,750 (Adv.); LRV = ` 16,800 (Fav.); LEV = ` 34,550 (Adv.); LMV = ` 10,800 (Adv.); LYV = ` 23,750 (Adv.)]

11. The standard labour and the actual labour engaged during the month are given below:

	Skilled	Semi-skilled	Unskilled
(a) Standard no. of workers in a group	30	10	10
(b) Standard Rate (in `) per hour	5	3	2
(c) Actual number of workers employed in the group	24	15	12
(d) Actual Rate (in `) per hour	6	2.5	2

During the month the group produced 200 hrs of work.

[Ans: LCV = ` 1,100 (Adv.); LRV = ` 3,300 (Adv.); LEV = ` 2,200 (Fav.); LMV = ` 3,000 (Fav.); Idle Time Var. = ` 800 (Adv.)]

12. Calculate the Material Variances and Labour Variances from the following information:

Materials	Standard			Actual		
	Qty. (kg)	Price (`)	Amount (`)	Qty. (kg)	Price (`)	Amount (`)
A B	450	20 10	9,000	450	19 11	8,550
	360		3,600	360		3,960
	810		12,600	810		12,510
	90		Loss	50		
Loss	720		Yield	760		
Labour	Standard			Actual		
	Hours	Rate(`)	Amount(`)	Hours	Rate(`)	Amount(`)
Skilled Unskilled	2,400	2 1	4,800	2,400	2.25 1.25	5,400
	1,200		1,200	1,200		1,500
	3,600		6,000	3,600		6,900

[Ans: MCV = ` 790 (Fav); LCV = ` 566.67(Adv.); MPV = ` 90 (Fav.); LYV = ` 900 (Adv.); MYV = ` 700 (Fav.); LYV = ` 333.33 (Fav.); MUV = ` 700 (Fav.)]

13. Find out the different labour variances from the following information:

Standard	Actual
Output: 1,000 units Rate of Payment: ` 6 per unit Time Taken: 50 hrs	Output: 1,200 units Wages Paid : ` 8,000 Time Taken: 40 hrs

[Ans: LCV = ` 800 (Adv.); LRV = ` 3,200 (Adv.); LEV = ` 2,400 (Fav.); LW = ` 2,400 (Fav.)]

14. A gang of workers normally consists of 30 men, 15 women and 10 boys. They are paid at standard rate as under;

Men	` 0.80
Women	` 0.60
Boys	` 0.40

In a normal working week of 40 hours, the gang is expected to produce 2,000 units of output.

During the week ended on 31st March 2014, the gang consisted of 40 men, 10 women and 5 boys. The actual wages paid were at the rate of ` 0.70, ` 0.65 and ` 0.30 respectively. 4 Hours were lost due to abnormal idle time and 1600 units were produced.

Calculate:

(i) Labour Cost Variance, (ii) Labour Rate Variance.
 (iii) Labour Efficiency Variance, (iv) Labour Mix Variance,
 (v) Labour Idle Time Variance, (vi) Labour Yield Variance.

[Ans: LCV = ` 256 (Adv.); LRV = ` 160(Fav.); LEV = ` 416 (Adv.); LMV = ` 120 (Adv.); LITV = ` 148 (Adv.); LYV = ` 148 (Adv.)]

15. A gang of workers usually consists of 10 men, 5 women and 5 boys in a factory. They are paid at a standard hourly rates of ` 1.25, ` 0.80, and ` 0.70 respectively. In a normal working week of 40 hours, the gang is expected to produce 1,000 units of output.

In a certain week, the gang consists of 13 men, 4 women and 3 boys. The Actual wages were paid at the rates of ` 1.20, ` 0.85 and ` 0.65 respectively. Two hours were lost due to abnormal idle time and 960 units of output were produced. Calculate various labour variances.

[Ans: LCV = ` 70 (Adv.); LRV = ` 24 (Fav.); LEV = ` 94 (Adv.) LMV = ` 62 (Adv.); LITV = ` 40 (Adv.); LYV = ` 8 (Fav.)]

16. The standard cost of material and labour for making of 5 units of a certain product are estimated as under:

Material: 80 kg at ` 1.50 per kg

Labour: 18 hrs at ` 1.25 per hour

On completion of the production, it was found that 75 kg of material costing ` 1.75 per kg has been consumed and the time taken was 16 hours at the rate of ` 1.50 per hour,

You are required to analyse material and labour variances.

[Ans: MCV = ` 11.25 (Adv.); MPV = ` 18.75 (Adv.); MUV = ` 7.5 (Fav.) LCV = ` 1.50 (Adv.); LRV = ` 4.00 (Adv.); LEV = ` 2.50 (Fav.); Total Cost Variance = H2.75 (Adv.)]

17. The standard cost for one unit of a product shows the following costs for material and labour:

Material - 4 pieces @ ` 5 Labour- 10 hours @ ` 1.25

11,400 units of the product were manufactured during the month of March 2014 with the following material and labour costs:

Material - 46,000 pieces @ ` 4.95

Labour-113,600 hours @ ` 1.52. Calculate Material and Labour variances.

[Ans: MCV=300 (F); MPV =2,300 (F); MVV - 2,000 (A); LCV - 30,172 (A); LRV = 30,672 (A); LEV = 500 {F}]

Overhead Variances

18. You are given below the following data for the month of April, 2014:

	Budgeted	Actual
Fixed Overheads	` 20,000	` 20,400
Units of Production	10,000	10,400
Standard Time for One unit	4 hours	
Actual Hours Worked		40,200 hours

Calculate: (i) Fixed Overhead Expenditure Variance; (ii) Fixed Overhead Volume Variance; (iii) Fixed Overhead Cost Variance; (iv) Fixed Overhead Efficiency Variance; and (v) Fixed Overhead Capacity Variance.

[Ans: (i) F.O. Exp. V.= ` 400 (A); (ii) F.O.V.V.= `800 (F); (iii) F.O. Cost V = ` 400 (F); (iv) F.O. Eff. V. = ` 700 (F); (v) F.O. Capacity V = ` 100 (F)]

19. A company has normal capacity of 100 machines working 8 hours per day of 25 days in a month. The budgeted fixed overheads are ` 1,50,000. The standard time to manufacture one unit of product is 4 hours.

In a particular month, the company worked for 24 days of 750 machines hours per day and produced 4,500 units of the product. The Actual Fixed Overheads incurred amounted to ` 1,45,000.

Compute: (a) Total Fixed Overhead Variance; (b) Expenditure Variance; (c) Volume Variance; (d) Efficiency Variance; (e) Capacity Variance; and (f) Calendar Variance.

[Ans: (a) TFOV = ` 10,000 (A); (b) Exp. V = ` 5,000 (F); (c) Vol. V = ` 15,000 (A); (d) Eff. V. = ` Nil; (e) Capacity V = ` 9,000 (A); (f) Calendar V. = ` 6,000 (A)]

Hints:

- (i) Budgeted Hrs. in a month = $8 \times 25 \times 100$ machines - 20,000
- (ii) Budgeted Hrs. per day = $8 \text{ hrs} \times 100 \text{ machines} = 800$
- (iii) Budgeted Output in a month = $8 \text{ hrs} - 4 \text{ hrs} \times 25 \times 100 = 5,000$ units
- (iv) Budgeted Overhead per hour = ` $1,50,000 + 20,000 \text{ hrs} = ` 7.50$
- (v) Budgeted Rate per unit = ` $7.50 \times 4 \text{ hrs} = ` 30$
- (vi) Budgeted F.O. per day = ` $1,50,000 + 25 \text{ days} = ` 6,000$

20. Following information is available from the cost records of a manufacturing unit for May, 2014:

	Standard	Actual
Production	10,000 tons	11,500 tons
Working days	25	24
Fixed Overheads	` 5,00,000	` 6,00,000
Variable Overheads	` 2,50,000	` 3,00,000

Calculate the following variances:

- Total Variable Overheads Variance;
- Variable Overheads Expenditure Variance;
- Variable Overheads Efficiency Variance;
- Total Fixed Overheads Variance;
- Fixed Overheads Expenditure Variance;
- Fixed Overheads Volume Variance;
- Fixed Overheads Efficiency Variance; and
- Fixed Overheads Calendar Variance.

[Ans: (a) TVOV = ` 12,500 (A); (b) V.O. Exp. V = ` 50,000 (A); (c) V.O. Eff. V. = ` 37,500 (F); (d) TFOV = ` 25,000 (A); (e) F.O. Exp. V = ` 1,00,000 (A); (f) F.O.V.V. = ` 75,000 (F);

(g) F.O. Eff. V. = ` 95,000 (F); (h) F.O.C1.V. = ` 20,000 (A)]

$$\text{Hint: (i) St. F.O. per day} = \frac{\text{St.F.O.}}{\text{St.W.Days}} = \frac{5,00,000}{25 \text{ days}} = ` 20,000$$

$$(11) \text{ St. Production per day} = \frac{\text{St.Output}}{\text{St.W.Days}} = \frac{10,000 \text{ tons}}{25 \text{ days}} = 400 \text{ tons}]$$

21. V. Ltd. has furnished you the following information for the month of September, 2014:

	Budgeted	Actual
Production	30,000 units	32,500 units
Man Hours	30,000 Mrs.	33,000 hrs.
Fixed Overheads	` 45,000	` 50,000
Variable Overheads	` 60,000	` 68,000
Working Days	25	26

Calculate Overheads Variance.

[Ans: (I) Variable Overhead Variance = ` 3,000 (A); (II) Fixed Overheads Variance = ` 1,250 (A);

(i) Expenditure Variance = ` 5,000 (A); (H) Volume Variance = ` 3,750 (F); (iii) Capacity Variance = ` 2,700 (F); (iv) Calendar Variance = ` 1,800 (F) and (v) Efficiency Variance = ` 750 (A)]

22. The following data has been collected from the cost records of a unit for computing the various Fixed Overhead Variances for the month of June, 2014:

Number of budgeted working days	25
Budgeted man-hours per day	6,000
Budgeted Output per man hour (in units)	1
Budgeted Fixed Overheads (`)	1,50,000
Actual no. of Working days	27
Actual man-hours per day	6,300
Actual Output per man hour (in units)	0,9
Actual Fixed Overheads incurred	` 1.56.000

Calculate:

- Fixed Overhead Expenditure Variance;
- Calendar Variance;
- Capacity Variance;
- Efficiency Variance;

(5) Volume Variance; and (6) Fixed Overhead Cost Variance.

[Ans: (1) F.O. Exp. V = ` 6,000 (A); (2) Calendar V = ` 12,000 (F); (3) Capacity V. = ` 8,100 (F); (4) Eff. V = ` 17,010 (A); (5) Vol. V = ` 3,090 (F); (6) F.O. C.V= ` 2,910 (A)]

23. The following information is received from the books of Mehta Manufacturing Company:

Normal Overhead Rate	3
Actual Hours Operated	20,000
Allowed Hours for Actual Production	21,000
Allowed Overheads for Budgeted Hours	70,000
Actual Overheads	72,000

Calculate:

(i) Overhead Budget Variance; (ii) Volume Variance; (iii) Efficiency Variance; (iv) Capacity Variance; and (v) Total Overhead Cost Variance.

[Ans: (i) OBV = ` 2,000 (A); (ii) Vol. V = ` 7,000 (A); (iii) Eft. V = ` 3,000 (F); (iv) Capacity V = ` 10,000 (A); (v) TOCV = ` 9,000 (A)]

24. The following data are available with respect to particular department for weekly operations-.

(a) Standard Output for 40 Hours a week	= 2,000 units
(b) Standard Fixed Overheads	= ` 2,000
(c) Actual Output	= 1,800 units
(d) Actual Hours Worked	= 32 hours
(e) Actual Fixed Overheads	= ` 2,250

Compute Overhead Variances.

(f) [Ans: (i) O.C.V. = ` 450 (A); (ii) O. Exp. V. = ` 250 (A); (iii) O. VO1. V. = ` 200(A) (iv) O. Eff. V. = ` 200 (F); (v) O. Capacity V. = ` 200(F); (v) O. Capacity V. = ` 400 (A)]

Sales Variances

25. Green Star Ltd. has budgeted the following sales for the month of December, 2014:

Product	Quantity (Units)	Price per unit
A	7,000	8
B	9,000	10
C	5,000	6

As against this, Actual Sales were:

Product	Quantity (units)	Price per unit (`)
A	6,000	9
B	10,000	8
C	5,500	7

You are required to calculate:

(i) Sales Value Variance; (ii) Sales Price Variance;
 (iii) Sales Volume Variance; (iv) Sales Mix Variance; and
 (v) Sales Quantity Variance.

[Ans: (i) SVV = ` 3,500 (A); (ii) SPV = ` 8,500 (A); (iii) SVV = ` 5,000 (F); (iv) SMV = ` 810 (F); (v) SQV = ` 4,190 (F)]

26. Calculate Sales Margin Variances from the following data:

	Budgeted Sales	Actual Sales
--	----------------	--------------

Product	Quantity	Price per unit (`)	Quantity	Price per unit (`)
Alfa	1,800	200	2,000	210
Beta	1,200	180	1,000	160
Gamma	1,000	210	1,200	200

The cost per unit of product Alfa, Beta and Gamma was ` 170; ` 150 and ` 175 respectively.

[Ans: (i) Sales Margin Variance = ` 5,000 (A); (ii) Sales Margin Price Variance = ` 12,000 (A); (iii) Sales Margin Volume Variance = ` 7,000 (F); (iv) Sales Margin Mix Variance = ` 750 (F); and (v) Sales Margin Qty. Variance = ` 6,250 (F)]

27. Compute the missing data indicated by the question marks from the following:

Particulars	Products	
	R	S
Sales Quantity:		
Standard (in units)	?	400
Actual (in units)	500	?
Price per unit:		
Standard (in `)	12	15
Actual (in units)	15	20
Sales Price Variance	?	?
Sales Volume Variance (in `)	1200	?
Sales Volume Variance	?	?

Sales Mix Variance for both the products together was ? 450 (F).

[Ans: (i) Sales Price Variance for 'R' = ` 1,500 (F); (ii) Sales Value Variance for 'R' = ` 2,700 (F); (iii) Sales Volume Variance for 'S' = ` 6,000 (F); (iv) Sales Price Variance for 'S' = ` 4,000 (F); (v) Sales Value Variance for 'S' = ` 10,000 (F); (vi) Actual Qty. Sold for 'S' = 800 units; (vii) Standard Qty. Sold for 'R' = 400 units]

UNIT- 5: BUDGETARY CONTROL

Chapter Outlines

- 5.0 Learning Objectives
- 5.1 Introduction
- 5.2 Meaning of Budget
 - 5.2.1 Meaning of Budgetary Control
 - 5.2.2 Budgetary Control as a Management Tool
 - 5.2.3 Limitations of Budgetary Control
 - 5.2.4 Forecasts and Budgets.
- 5.3. Budgetary Control System
 - 5.3.1 Installation of Budgetary Control System.
 - 5.3.2 Kinds of Budgets.
 - 5.3.3 Functional Budgets.
 - 5.3.4 Flexibility Budgets
 - 5.3.5 Period Budgets
 - 5.3.6 Condition Budgets
- 5.4 Zero-Base Budgeting Strategy
- 5.5 Balanced Scorecard
- 5.6 Summary
- 5.7 Key Terms
- 5.8 Questions and Exercises

5.0. LEARNING OBJECTIVES

After studying this chapter, you should be able to understand:

- Explain Budget, Budgeting.
- Explain Budgetary control and distinguish between Budget and forecast.
- Explain precautions in Budgeting.
- Explain the advantages of Budgetary control.
- Explain kinds of Budgets.
- Explain the advantages and disadvantages of zero-Base Budgeting.

5.1 INTRODUCTION

Budgetary Control is an important tool for the management to make optimum use of limited business resources and to maximize the profits of business. In order to maximize the profits of business effective control on cost is must. In budgetary control, plans are made in advance for various business activities like purchases, sales and productions, etc. These plans are termed as budget and the actual results are compared with the budgets and the variance are discussed and analyzed.

5.2 MEANING OF BUDGET

“ Budget is a financial and/or quantitative statement, prepared prior to defined period of time , of the policy to be pursued during that period for the propose of attaining a given objective . It may include income, expenditure and the employment of capital.”

-I.C.M.A London

5.2.1 Meaning of Budgetary Control:-

- (i) “Budgetary control is the establishment of budgets relating to the responsibilities of executives to the requirement of a policy and continuous comparison of actual with budget results, either to secure by individual action of objectives of that policy to provide a solid basis for its revision.”
- (ii) “Budgetary control is the planning in advance of the various functions of a business so that the business as a whole can be controlled.”

-Wheldon

5.2.2 Budgetary Control as a Management Tool

• Advantages of Budgetary Control

- (i) **Definite Objectives:** Under budgetary control, every department is given a target to be achieved. The efforts are made to achieve the specific aims.
- (ii) **Reduction in Cost of Production:** In budgetary control, the various departments prepare the budgets and this results in reduction in cost of production. Moreover, every businessman tries to reduce the cost of production and opts for more profitable combinations of products.
- (iii) **Coordination:** The working of different departments is properly coordinated and a 'Master Budget' is prepared for effective coordination and cooperation among various departments of the organisation.
- (iv) **Maximum Profits:** Under budgetary control, the resources are utilised efficiently in an organisation as each person is aware of his task and the best way by which it is to be performed.
- (v) **Reduces Uncertainty:** Under budgetary control, the managers are forced to map out future courses of action clearly. Thus, uncertainty is reduced to minimum.
- (vi) **Determining Weaknesses:** The deviations in budgeted and actual performance will enable the determination of weak spots. By pin-pointing responsibility for inefficient performance, budgetary control helps managers trace weak spots early and take remedial steps.
- (vii) **Economy:** The planning of expenditure will be systematic and there will be economy in spending. The resources are used to the best advantage. The benefits derived for the enterprise will ultimately extend to industry and then to national economy.
- (viii) **Adoption of Standard Costing:** The use of performance standards in financial matters and operational activities help the adoption of standard costing.
- (ix) **Optimum use of Resources:** The resources of the organisation are used to the best advantage as the objectives are clear and each level of management is aware of its task. It directs enterprise activity towards maximisation of efficiency, productivity and profitability.
- (x) **Effective Control:** It is a very important tool for effective control because under it the actual performance is compared with the budgets and remedial steps are taken in case of deviation, if any.
- (xi) **Successful Planning:** Budgets are based on plans and all the departmental managers are informed about the expectations from them. The extent of expenditure that they can incur is laid down in the budget alongwith the expected profits of their department. The departmental managers make their utmost effort to achieve the target and thus much help is obtained in the success of the plans.
- (xii) **Inculcates the feeling cost consciousness:** Budgetary control inculcates the feeling of cost consciousness among workers. Thus, it increases productivity and operating economy.
- (xiii) **Introduction of Incentive schemes:** Budgetary control system also enables the introduction of incentives schemes of remuneration. The comparison of budgeted and actual performance will enable the use of such schemes. Thus, efficient workers become more efficient and inefficient workers start becoming efficient.

Thus it can be said that "Budgetary control improves planning, aids in coordination and helps in having comprehensive control.

5.2.3 Limitations of Budgetary Control

To maximise the profit of the business and industry budgeting control is an important managerial technique but the technique of the budgetary control has following limitations:

- (i) **Based on Estimates:** Budgets are based on estimates regarding an event the success of budget depends upon experience and estimates. Thus, these estimates cause the failure of budgetary control system.
- (ii) **Co-operation:** The success of the budgetary control system depends upon the co-operation and co-ordination among the various levels of the management. The lack of co-ordination and co-operation at the operating level results into failure of budgetary control.
- (iii) **Time Effect:** The world is changing everyday like change in price, change in demand, change in government policies, create problems in achieving the budgetary targets. So, budget needs revision for their success but this revision is a very costly affair.

- (iv) **Excessive Cost of Budgetary System:** To apply and implement budgetary control system successfully needs heavy expenditure, which may not be possible for small scale organisations.
- (v) **Internal Disputes:** Each and every departmental head wants more and more financial outlay for their respective departments which becomes a cause of contention (dispute) among the various departments of the organisation.
- (vi) **Opposition of Budgets:** Employees and Managerial personnel are of the view that budgetary control will reveal their efficiency and inefficiency at the various levels and hence because of fear of inefficiency they oppose the implementation of budgetary control system.
- (vii) **Pressure Devices:** Budgets are perceived by the work force as pressure devices imposed by top management. This can have an adverse effect on labour relations.
- (viii) **Success Depends Upon the Support of Top Management:** If the top management is dynamic and enthusiastic then it will bring success to the budgetary control. On the other hand, if the top management is dull and lethargic then the system will collapse.

5.2.4 Difference between Budget and Forecast

Basis	Budget	Forecast
Concept	It relates to planned events and is the quantitative expression of business plans and policies for the future.	It is the estimate or inference about the future probable events which may or may not be accurate.
Control device	It is an important control device for the management.	It represents a probable event over which no control can be exercised.
Provision for correction	The difference between actual performance and budgeted performance can be found out under budgetary control and necessary steps taken to rectify the deficiencies, if any.	Here, there is no such provision-
Period	It is prepared separately for each accounting period.	It may covers a long period.
Sequence	Budgeting begins where forecasting ends.	Forecasting provides a logical basis for preparing budgets.
Scope	Budgets have limited scope. It can be made of phenomenon capable of being expressed quantitatively.	Forecasts are wider in scope and it can be made in those spheres also where budgets cannot interfere

5.3 BUDGETARY CONTROL SYSTEM

5.3.1 Precautions in Budgeting/Budget Administration/Essentials/Installation of Budgetary Control system

For the successful implementation of the budgetary control system, the following steps should be considered:

- (i) **Objectives and Policy of Business:** The budget is prepared for the achievement of the business objectives. Therefore, the objectives of the business should be clear. Business policy is made to attain the business objectives.
- (ii) **Budget Period:** Budget period refers to the period of time for which the budget is prepared. The budget period depends on the various factors such as nature of business, timing of availability of finance, period required for manufacturing the products, etc. Generally there are two types of budget - short term and long term budgets, cash budget, sales budget, income and expenditure budget are short term budgets whereas capital expenditure budget, research and development budget are long term budget.
- (iii) **Budget Committee:** Budget committee will have the managers of various departments like production, marketing, sales, finance, etc. The managers of each department prepare budgets for their own department and submit it to the committee. The main functions of this committee are as follows:
 - (a) To provide previous years data to departmental managers for making budgets,
 - (b) To determine business policy regarding budgets.
 - (c) To prepare master budget.
 - (d) To review the departmental budgets and to establish coordination among them, etc.

(iv) **Budget Centres:** It is that part of the organisation which is selected for budgetary control such as sales department, purchase department, production department, etc. Each budget centre prepares a separate budget. A budget centre must be clearly demarcated to facilitate the formulation of various budgets with the help of concerned departmental heads.

(v) **Budget Manual:** A budget manual helps in knowing the role of every employees and the ways of undertaking various tasks. It helps in avoiding ambiguity in time. Any problem arising from the operation of a budgetary controls system can be settled through the budget manual. Thus, Budget manual is a written document or booklets which covers the following matters:

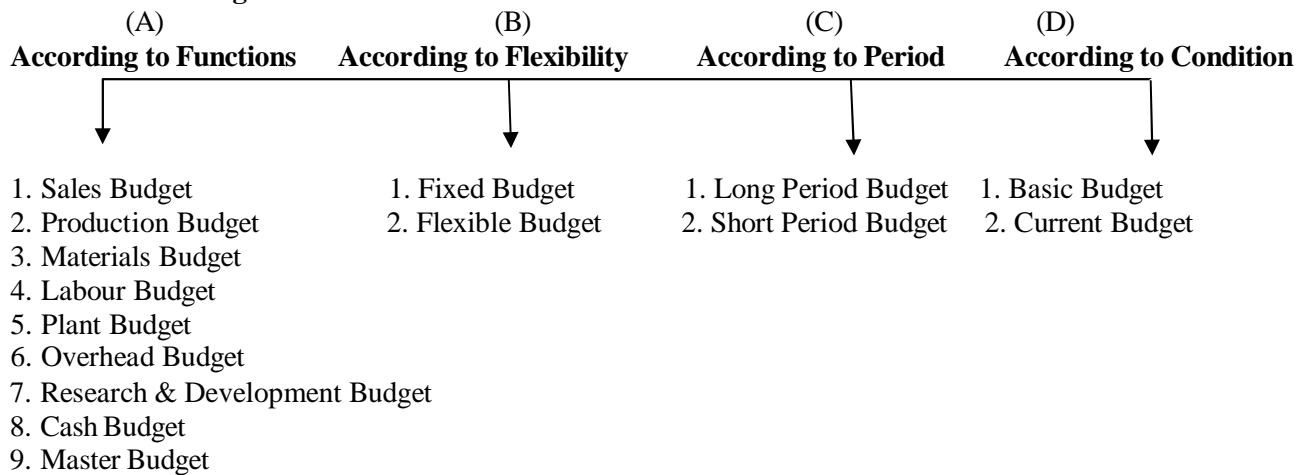
- (a) It states the functions of various officials connected with the formulation of budgets.
- (b) Duties, responsibilities' of various officials connected with the preparation of budgets.
- (c) Objectives and benefits of budgetary control system.
- (d) Length of various budget periods.
- (e) Specimen forms and number of copies for preparing budget report.

(vi) **Budget Key Factor:** A factor which sets a limit to the total activity is known as budget factor / key factor / limiting factor. There may be a limitation on the quantity of goods a concern may sell. In this case, sales will be a key factor and all other budgets will be prepared by keeping in view the amount of goods the concern will be able to sell. The raw material supply may be limited; so, production, sales and cash budgets will be decided according to raw materials budget. Similarly, plant capacity may be a key factor if the supply of other factors is easily available. The key factors may not necessarily remain the same. The sales may be increased by adding more salesmen and advertisement. The raw material supply may be limited at one time and it may be easily available at another time.

(vii) **Organisation for Budgetary Control:** For the successful preparation of budgets, a proper organisation is a must. There must be cooperation among all the departments. Therefore, keeping in mind the cooperation and coordination, an organisation chart is prepared

(viii) **Budget Officer:** The chief executive appoints some person as budget officer. The budget officer works as a coordinator among different departments. He determines the deviations between actual performance and budgeted and takes necessary step to rectify the deficiencies. He also informs the top management about the performance of different departments.

5.3.2 Kinds of Budgets



5.3.3 Functional Budgets According to Functions

(1) Sales Budget: A sales budget is an estimate of expected sales during a budget period. It is the most important budget and it is called the backbone of the enterprise. A sales budget is the starting point on which other budgets are based.

In sales, budget expected sales are expressed in quantity as well as in value. A sales manager is made responsible for preparing sales budget. The following factors should be taken into account while preparing a sales budget:

(i) Past sales figures and facts; (ii) Availability of raw materials; (iii) Seasonal fluctuations; (iv) Plant capacity; (v) State of competition in the market; (vi) Availability of finance; (vii) Government policy; (viii) Selling price and quality of the products of competitors; (ix) Development of market.

The following informations can be obtained with the help of sales budget:

(i) Sales target; (ii) Possibility of sales in different areas; (iii) What efforts should be made for increasing sales in new areas? (iv) How much amount is required to increase the sales?

Illustration 5.1

A company manufactures two types of products A and B and sells them in the markets of Ambala and Panchkula. The following information is made available for the current year:

Market	Budgeted Sales		Actual Sales
Ambala	: A	400 units at ` 9 each	500 units at ` 9 each
	: B	300 units at ` 21 each	200 units at ` 21 each
Panchkula	: A	600 units at ` 9 each	700 units at ` 9 each
	: B	500 units at ` 21 each	400 units at ` 21 each

Market studies reveal that product A is popular as it is under priced. It is observed that if its price is increased by 11 it will get a ready market. On the other hand, product B is overpriced and market could absorb more sales if its selling price is reduced to `20. The management has agreed to give effect to the above price changes.

On the above basis, the following estimates have been prepared by sales manager:

Percentage increase in Sales over Current Budget

Product	Ambala	Panchkula
A	+ 10%	+ 5%
B	+ 20%	+ 10%

With the help of an intensive advertisement campaign, the following additional sales above the estimated sales:

Product	Ambala	Panchkula
A	60 units	70 units
B	40 units	50 units

You are required to prepare a budget for sales incorporating the above estimates.

Solution:

Sales Budget

Market	Product	Budget for Current Period			Actual Sales			Budget for Future		
		Qn.	Price(`)	Value(`)	Qn.	Price(`)	Value(`)	Qn.	Price(`)	Value(`)
Ambala	A	400	9	3,600	500	9	4,500	50	10	5,000
	B	300	21	6,300	200	21	4,200	0	20	8,000
		700	—	9,900	700	—	8,700	900	—	13,000
Panchkula	A	600	9	5,400	700	9	6,300	70	10	7,000
	B	500	21	10,500	400	21	8,400	0	20	12,000
	Total	1,100		15,900			—	14,700	1,300	19,000

Budgeted Sales for the future has been calculated as under:

Ambala	Panchkula
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Product A	Product B	Product A	Product B
400		600	500
(10% of 400) 40	(20% of 300) 60	(5% of 600) 30	(10% of 500) 50
<u>440</u>	<u>360</u>	<u>630</u>	<u>550</u>
60	40	70	50
<u>500</u>	<u>400</u>	<u>700</u>	<u>600</u>

(2) Production Budget: Production budget is a forecast of production and cost of production for a budget period. A production manager is made responsible for preparing production budget. A production budget is prepared on the basis of sales budget. The sales budget presents demand while the production budget makes adequate arrangements for the fulfilment of this demand. The object of this budget is to manufacture the product at the minimum cost. A proper production planning is essential for preparing the production budget.

The following factors should be taken into account while preparing production budget:

- (i) The optimum plant capacity utilization
- (ii) Avoidance of bottlenecks due to shortage of materials and labour
- (iii) Key factors
- (iv) Quantity of different products
- (v) Opening stock, closing stock and estimated sales
- (vi) Availability of physical resources

Example of Production Budget is as follows:

Production Budget

Stock on 31st Dec. 2014	Products		
	A Units	B Units	C Units
Add: Budgeted Sales	5,000	10,000	15,000
	50,000	60,000	70,000
Estimated Stock on 1st Jan.,	55,000	70,000	85,000
2014 Production requirement	4,000	6,000	8,000
	51,000	64,000	77,000

Illustration 5.2

From the following data, prepare a Production Budget for a company: Stocks for the budget period:

Product as on 1st January 2014 as on 30th June 2014

A	8000	10,000
B	9000	8,000
C	10,000	14,000

Requirement to fulfill sales programme:

A	60,000 units
B	50,000 units
C	80,000 units

Solution:

Production Budget

	Products		
	A Units	B Units	C Units
Sales	60,000	50,000	80,000
Add: Stock on 30th June, 2014	10,000	8,000	14,000
Less: Stock on 1st January, 2014	70,000	58,000	94,000
Production requirement	8,000	9,000	10,000
	62,000	49,000	84,000

(3) **Materials Budget:** Material budget is prepared for determining the requirement of raw material for production. This budget depends upon sales and production budget. The materials are purchased as per the requirements of production department. The number of units to be produced multiplied by the rate of consumption of raw materials will give the figure of materials required. The units of materials required multiplied by the rate per unit of raw material will give a figure of material cost.

Total material required = (Quantity of material required per unit) × (Budgeted output)

Material cost = (Units of material required) × (Rate per unit of Raw material)

The raw materials budget will enable the fixation of minimum stock level, maximum level and re-ordering level.

(4) **Labour Budget:** The labour required for manufacturing the product is known as direct labour and the labour which cannot be specified with production is called indirect labour. Labour budget is prepared for making possible the continuous availability of labour for attaining the production targets. This budget is useful for anticipating labour time required for production.

Labour Cost is determined as under:

Labour Cost = Labour hours × Rate of pay per hour

Labour budget provides the following information:

- (i) Number and types of workers required,
- (ii) Rate of remuneration payable to the workers of different categories and availability of them.
- (iii) Time and cost of training to be provided to the labourers.
- (iv) The number of workers to be required more in the year.

(5) **Plant Budget:** In big enterprises where plants are valuable and most of the production is carried out with the help of machinery, preparation of plant budget becomes essential. Plant budget provides the following informations:

- (i) Department wise the number of machines.
- (ii) Original cost, depreciation and current value of machineries.
- (iii) Work for which each machine is to be used.
- (iv) Need to purchase new machines and amount required thereof.
- (v) Production capacity of machines.
- (vi) Remaining life of machines, etc.

(6) **Overheads Budget:** Overheads budget is prepared for the estimation of indirect expenses related to production, i.e., indirect material, indirect labour and other indirect expenses. This budget is classified into following parts:

- (i) Factory overheads Budget
- (ii) Financial overheads Budget
- (iii) Sales overheads Budget
- (iv) Administrative Overheads Budget

(7) **Research and Development Budget:** It is a long term budget. It is prepared for the expansion of business and to adopt new techniques of production. In this budget, the estimates are made for expenses on current research programmes. Development starts where research ends and development ends where actual production commences. Thus, development is the stage between research and actual production.

(8) Cash Budget: Cash budget is a statement of estimates of cash position for the budget period.

It is a plan of estimated receipts and payments of cash for the budget period. It can be prepared for any time period. Normal time period of cash budget is half year which is further sub-divided into the months. It helps in planning and control of the financial requirements of the organisation. Cash budget ensures that cash is available in time for carrying out business activities and meeting financial obligations. If there is any shortage of cash, then time by arrangements can be profitability used in temporary investments. In cash budget, estimate regarding each item of cash receipt and payment is made at the time of its preparation.

Cash-receipts items: Cash sales, credit sales having regard to credit collection policy, interest, dividend, the amount received on shares and debentures, bank loan, the amount of tax refund, rent receivable, etc.

Cash-payments items: Cash purchase of raw materials, payment made to suppliers of credit purchases of raw materials, wages, salaries, manufacturing expenses, administrative expenses, selling and distribution expenses, research and development expenses, repayment of bank loans and public deposits, redemption of preference shares and debentures, payment of taxes, interest and dividends.

Importance of Cash Budget

The importance of preparing a cash-budget are as follows:

1. It serves as a device for planning and controlling of receipts and payments of cash to ensure availability of cash in an adequate amount.
2. It enables the management to prepare borrowing and repayment schedule will in advance.
3. It enables the management to take advantages of cash discount.
4. It enables the management to plan for financing a new project and expansion modernization of an existing project.
5. It enables the management to plan for dividend payment.

Methods of Preparation of Cash Budget

- (I) Receipt and Payment Method
- (II) Adjusted Profit and Loss Account Method
- (III) Projected Balance Sheet Method

(I) Receipt and Payment Method: In this method, estimated cash receipts and payments are taken into consideration. Cash receipts and cash-payment items we have discussed earlier.

Illustration 5.3

Prepare a cash budget for the month of May, June and July 2014 on the basis of the following information:

- (1) Income and Expenditure Forecasts:

Months	Credit Sales (`)	Credit Purchases (`)	Wages (`)	Manufacturing Expenses (`)	Office Expenses (`)	Selling Expenses (`)
March	60,000	36,000	9,000	4,000	2,000	4,000
April	62,000	38,000	8,000	3,000	1,500	5,000
May	64,000	33,000	10,000	4,500	2,500	4,500
June	58,000	35,000	8,500	3,500	2,000	3,500
July	56,000	39,000	9,500	4,000	1,000	4,500
August	60,000	34,000	8,000	3,000	1,500	4,500

(2) Cash balance on 1st May, 2014 `8,000.

(3) Plant costing `16,000 is due for delivery in July and payable 10% on delivery and the balance after 3 months.

(4) Advance tax `8,000 each is payable in March and June.

(5) Period of credit allowed (i) by supplier - two months and (ii) to customers-one month.

(6) Lag in payment of manufacturing expenses - $\frac{1}{2}$ month.

(7) Lag in payment of office and selling expenses - one month.

Solution:

Cash Budget

Particulars	May 2014 (`)	June 2014 (`)	July 2014 (`)
Opening Balance	8,000	13,750	12,250
Add: Receipts			
Credit Sales	62,000	64,000	58,000
	70,000	77,750	70,250
Less: Payment			
Credit Purchase	36,000	38,000	33,000
Wages	10,000	8,500	9,500
Manufacturing Expenses	3,750	4,000	3,750
Office Expenses	1,500	2,500	2,000
Selling Expenses	5,000	4,500	3,500
Plant - Payment on delivery	—	—	1,600
Advance Tax	—	8,000	
	56,250	65,500	53,350
Closing Balance	13,750	12,250	16,900

Working Notes:

- (i) Since the period of credit allowed by suppliers is two months, the payment for credit purchases in March will be made in May and so on.
- (ii) Since the period of credit allowed to customers is one month, the receipt for credit sales in April will be in May and so on.
- (iii) One half of the manufacturing expenses of April and one half of May will be paid in May, i.e., $(1/2 \text{ of } `3,000) + (1/2 \text{ of } `4,500) = `3,750$ and so on.
- (iv) Office and selling expenses of April shall be paid in May and so on.
- (v) Opening balance of cash for the month of June has been ascertained after finding out closing balance of May and for July after closing balance of June.
- (ii) **Adjusted Profit and Loss Method:** In this method, the cash balance and net profit disclosed by Profit and Loss Account and Balance Sheet does not represent the fair amount of cash, since some such items take place in Profit and Loss Account which do not affect the outflow and inflow of the cash. Therefore, all such non-cash items are to be adjusted just to get the correct estimate of real cash. The formula for calculating closing cash balance is given below:

$$\text{Opening Cash Balance} + \text{Net Profit} + \text{Non - Cash expenses} + \text{Decrease in Current Assets} + \text{Increase in Current Liabilities} + \text{Sales of Fixed Assets of Issue of Shares and Debentures} - \text{Increase in Current Assets} - \text{Decrease in Current Liabilities} - \text{Payment of Tax and Dividend} - \text{Purchase of Fixed assets} - \text{Redemption of Shares and debentures etc.} = \text{Closing Cash Balance.}$$
- (iii) **Balance Sheet Method:** Under this method, a forecasted or budgeted balance sheet is prepared at the end of the budget period. In this method, all assets and liabilities (except Cash and Bank Balance) are shown. If the amount of budgeted liabilities exceeds the budgeted assets, the difference will be cash or bank balance at the end of budget period. If the amount of budgeted assets are in excess of liabilities, the difference will be bank overdraft.

Illustration 5.4

From the following information prepare a Cash Budget by the Adjusted Profit and Loss Method, for ABC Limited:

BALANCE SHEET

(as on 31st December, 2013)

Liabilities	Amount (`)	Assets	Amount (`)
Equity Share Capital	50,000	Cash	7,360
Debentures	29,400	Stock	24,760
Creditors	26,920	Debtors	19,600
ACC Depreciation	20,000	Investments	40,000
Profit & Loss A/c	53,400	Plant	88,000
	1,79,720		1,79,720

Forecasted Profit and Loss Account

Particulars	Amount (`)	Particulars	Amount (`)
To ACC Depreciation A/c	8,800	By Gross Profit b/d	80,000
To Income Tax	2,000	By Profit on sale of Investment	800
To Interest	1,200	By Interest	4,000
To Admn. & Selling Exp.	4,000		
To Loss on Sale of Plant	3,200		
To Net Profit c/d	65,600		
	84,800		84,800
To Dividend	4,000	By Net Profit b/d	65,600
To Balance c/d	61,600		
	65,600		65,600

Additional Information:

- (i) Investment Costing ` 4,000 were sold for ` 4,800.
- (ii) New Plant Costing ` 32,000 was purchased during the year.
- (iii) An old plant costing ` 24,000 and accumulated depreciation of ` 16,800 was sold for ` 4,000.

Balance on 31st December, 2014:

Stock ` 37,000; Debtors ` 33,280;

Creditors ` 40,000; Debentures ` 20,000;

Equity shares issued during the year ` 20,000

Solution:

CASH BUDGET
(Adjusted Profit and Loss Method)

Particulars	Amount(`)	Amount (`)
Opening Cash Balance		7,360
Add: Budgeted Net Profit	65,600	
Depreciation written off	8,800	
Increase in Creditors	13,080	
Loss on sale of Plant	3,200	
Sale of Investment	4,800	
Issue of Shares	20,000	
Sale of old Plant	4,000	1,19,480
		1,26,840
Less: Purchase of Plant	32,000	
Redemption of Debentures	9,400	
Payment of Dividend	4,000	
Profit on sale of Investment	800	
Increase in Debtors	13,680	
Increase in Stock	12,240	72,120
Closing Balance of Cash		54,720

Illustration 5.5

By using the data of Illustration 5.4, prepare a Cash Budget showing Cash at Bank on 31st December, 2014, under 'Balance Sheet Method'.

Solution:

Budgeted Balance Sheet (On 31st December, 2014)

Liabilities	Amount (`)	Assets	Amount (`)
Equity Share Capital	70,000	Plant Investment Stock	96,000
Profit and Loss A/c (53,400 + 61,600) Debentures Ace.	1,15,000	Debtors Cash at Bank (Bal. Figure)	36,000
Depreciation (20,000 + 8,800 - 16,800)	20,000		37,000
Creditors	12,000		33,280
	40,000		54,720
	2,57,000		2,57,000

9. **Master Budget:** A master budget is prepared for the business as a whole, combining all the budgets for a period into this budget. It is the summary of all subsidiary functional budgets, prepared by the concern. Before preparing a master budget, it is necessary to prepare sales budget, purchase budget, cash budget, production budget, overheads budget, etc. Thus, the master budget is a summary budget which incorporates all functional budgets in a capsule form. It shows budgeted income statement for the budget period and budgeted balance sheet at the end of the budget period. The master budget requires the approval of the budget committee before it is put into action. The master budget co-ordinates the budgets of all the departments.

5.3.4 Flexibility Budgets

On the basis of flexibility, budgets can be classified as follows:

(1) **Fixed Budget:** According to **I.C.M.A., London**, "Fixed budget is a budget which is designed to remain unchanged irrespective of the level of activity attained."

It does not change with the change in level of activity actually attained. It is prepared for a given level of activity and does not take note of changes in the circumstances. Therefore, it becomes useless for comparison with actual performance when level of activity changes.

(2) **Flexible Budget;** According to **I.C.M.A., London**, "A *flexible budget is a budget designed to change in accordance with the level of activity actually attained.*"

A flexible budget provides budgeted costs at different levels of activity. It varies with the level of activity attained. Flexible budget is desirable in the following cases:-

- (i) Where the business is new or estimation of demand is not possible.
- (ii) Where the business is subject to the vagaries of nature such as soft drinks, etc.
- (iii) Where sales are unpredictable.
- (iv) Where the demands for the product keep changing due to change in fashion and tastes of customers.
- (v) Where production cannot be estimated due to irregular supply of necessary material and labour.

Illustration 5.6

Prepare a Flexible Budget for the production at 80% and 100% activity on the basis of following information:

Production at 50% capacity	5,000 units
Raw Material	80 per unit
Direct labour	50 per unit
Direct Expenses	15 per unit
Factory Overhead	50,000 (50% fixed)
Administration Overhead	60,000(60% variable)

Solution:

Flexible Budget

Particulars	50% Capacity 5,000 units (`)		80% Capacity 8,000 units (`)		100% Capacity 10,000 units (`)	
	Per unit	Total	Per unit	Total	Per unit	Total
Raw Material	80	4,00,000	80	6,40,000	80	8,00,000
Direct Labour	50	2,50,000	50	4,00,000	50	5,00,000
Direct Expenses	15	75,000	15	1,20,000	15	1,50,000
Prime Cost	145	7,25,000	145	11,60,000	145	14,50,000
Factory Expenses: (Fixed 50%) (Variable 50%)	5	25,000	3.125	25,000	2.50	25,000
Works Cost	5	25,000	5	40,000	5	50,000
Administration Exps.	155	7,75,000	153.125	12,25,000	152.50	15,25,000
Fixed (40%)	4.80	24,000	3.00	24,000	2.40	24,000
Variable (60%)	7.20	36,000	7.20	57,600	7.20	72,000
Total Cost	167	8,35,000	163.325	13,06,600	162.10	16,21,000

Note: 1. Variable cost per unit and total fixed costs remain constant irrespective of changes on activity levels.

2. Total variable cost and fixed cost per **unit vary with the changes in the activity levels.**

5.3.5 Period Budgets

(i) **Long Period Budgets:** Long period budgets are those budgets which incorporate planning for five to ten years and even more. Research and development budget is an example of long period budget.

(ii) **Short Period Budgets:** Short period budgets are prepared for the period less than one year. Material budget, Cash budget, etc. are the examples of short period budgets.

5.3.6 Condition Budgets

(i) **Basic Budget:** A basic budget is one which is established for use unaltered over a long period of time. Current circumstances are not considered while preparing this budget.

(ii) **Current Budget:** A current budget is one which is established for use over a short period of time and it is related to current conditions. This budget is more useful than basic budget.

Illustration 5.7

ABC Ltd. prepared the budget for the production of one lakh unit of the one type of commodity manufactured by them for a costing period as under:-

Raw Material	Z 2.52 per unit
Direct Labour	? 0.75 per unit
Direct Expenses	? 0.10 per unit
Works overheads (60% Fixed)	? 2.50 per unit
Admn. overheads (80% Fixed)	? 0.40 per unit
Selling overheads (50% Fixed)	? 0.20 per unit

Actual production during the period was only 60,000 units. Calculate the budget cost per unit.

Solution:

Flexible Budget

Particulars	1,00,000 Units		60,000 Units	
	Per unit	Amount (`)	Per unit	Amount (`)
Raw Material	2.52	2,52,000	2.52	1,51,200
Direct Labour	0.75	75,000	0.75	45,000
Direct expenses	0.10	10,000	0.10	6,000
Prime Cost	3.37	3,37,000	3.37	2,02,200
Works Cost: (60% Fixed) (40% Variable)	1.50	1,50,000	2.50	1,50,000
Admn. Overheads: (80% Fixed) (20% Variable)	1.00	1,00,000	1.00	60,000
	0.32	32,000	0.53	32,000
	0.08	8,000	0.08	4,800
Cost of Production	6.27	6,27,000	7.48	4,49,000
Selling Overheads:				
50% Fixed	0.10	10,000	0.17	10,000
50% Variable	0.10	10,000	0.10	6,000
Total Cost	6.47	6,47,000	7.75	4,65,000

- Programme Budgeting

Programme budgeting was firstly used by Department of Defence in U.S.A. in 1961. It focuses on process of allocating funds.

5.4 ZERO-BASE BUDGETING STRATEGY (ZBB)

Zero-base budgeting is also known as "De nova budgeting", i.e., budgeting from beginning. In other words, it is beginning from zero base, assuming that nothing is happened in the past. The concept of zero base budgeting can be applied from a home budget to the national budget. In a home budget, a housewife prepares the budget of next month after ignoring the current and past budget (expenditures) altogether.

1. According to **Certified Institute of Management Accountants, London**, "Zero base budgeting is a method of budgeting whereby all activities are re-evaluated each time a budget is set. Discrete levels of each activity are valued and a combination chosen to match funds available."
2. According to **Peter A Pyher**, "A planning and budgeting process which requires each manager to justify his entire budget request in detail from scratch (hence zero base) and

shifts the burden of proof to each manager to justify why he should spend money at all. The approach requires that all activities be analysed in decision packages which are evaluated by systematic analysis and ranked in order of importance." Peter Pyher is known as the father of Zero Base Budgeting as he introduced ZBB at Texas Instruments in USA in 1969.

Thus we can say that in zero base budgeting, every year is taken as a new year and previous year is not taken as a base. It starts from a "Zero base" and every function within an organization is analysed for its needs and costs. Budgets are then built around what is needed for the upcoming period, regardless of whether the budget is higher or lower than the previous one.

Steps Involved in the Process of Zero Base Budgeting

For implementing zero base budgeting, following necessary steps are taken

1. Determining the objectives of zero base budgeting.
2. Developing decision unit i.e., a department of an organization where decisions are taken. Decision units are developed for cost benefit analysis.
3. Development decision packages: Decision package summaries the scope of work requirement, anticipated benefits, time schedule etc.
4. Ranking of decision packages on the basis of benefits to the organization.
5. Allocation of resources on the basis of ranking of decision packages.

Advantages of Zero-Base Budgeting

1. Efficient allocation of resources, as it is based on needs and benefits rather than history.
2. It helps in identifying and eliminating wasteful and obsolete operations.
3. It helps in detecting inflated budgets.
4. It increases communication and coordination within the organization.
5. It enables the management to find cost effective ways to improve operations.
6. Responsibility and accountability are more specifically fixed under zero based budgeting as compared to traditional budgeting.
7. It increases staff motivation by providing greater initiative and responsibility in decision making.
8. It is useful in Government department where all expenditure are incurred on the basis of budgets.
9. It focuses on cost benefit analysis to reach on maximization of profit of the company.
10. It can be used for implementation of "Management by objective" (MBO). Thus it can be used not only for fulfillment of the objective, but also for variety of the purpose.
11. It identifies activities involving wasteful expenditure.
12. It involves rational decision making.
13. It promotes operating efficiency.

Limitations of zero-Base Budgeting

1. It is more time consuming than traditional budgeting as every single item is paid attention to afresh.
2. It requires specific training due to increased complexity as compared to traditional budgeting.
3. It increases paper work.
4. Cost of preparing the decision package may be very high.
5. There is a problem in defining decision units and decision packages.
6. Wrong cost-benefit analysis may hamper the future growth of the organization. For example, cutting present advertisement cost may effect future sales. Similarly, cutting research and development cost may effect the future growth and cost effectiveness of the organization.
7. The concept ZBB needs clarity at top management level otherwise conflict among departments may affect the overall profitability of the organizations.

ZBB is highly relevant in 'continuous improvement' environment because of its nature of continuous evaluation of costs and benefits. This technique is relevant for effective utilization of

resources and increasing the profitability of the organizations. So ZBB can be implemented as a planning device in the overall corporate strategy.

STRATEGIC MEASUREMENT MODEL

In performance measurement, what is difficult is measuring the right things and learning to ignore other interesting data that do not help us become more successful. As one can see in the model in Exhibit 5.1, we begin by defining what an organisation does and what is the vision for the future. Next, an organisation should identify the strategies and the key success factors it needs to concentrate on to differentiate itself from competitors. During this phase, the organization also identifies important business fundamentals on which it must focus to maintain its success. Business fundamentals tend to be issues that all organizations in the industry need to concentrate on, such as profitability, growth, or regulation. Selecting the key success factors for an

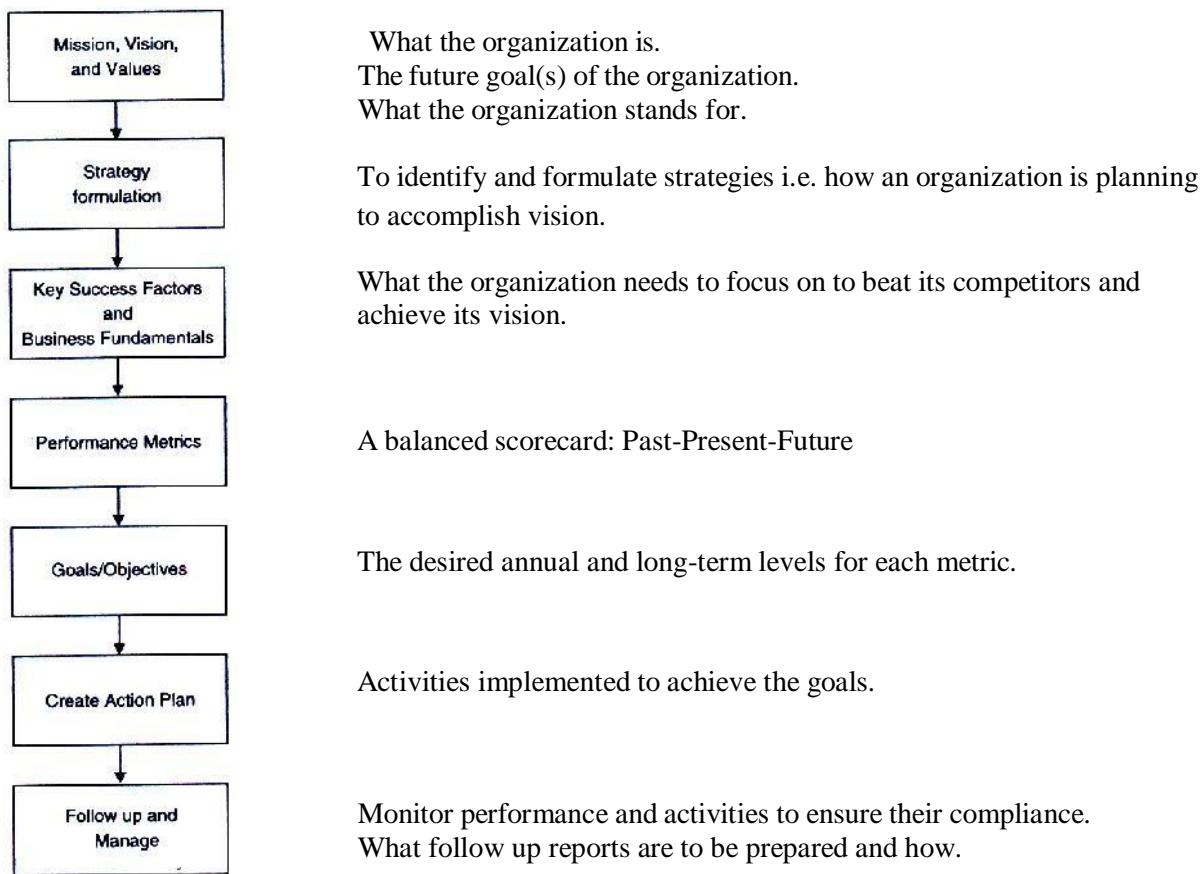


Exhibit 5.1. Strategic Measurement Model

organization is a major part of a business strategy, because then the organizations can concentrate on the selected areas of performance. These could be strengths they will continue to exploit or weaknesses that need to be corrected. From the key success factors and business fundamentals come the measures, or metrics. Once the organization has defined all of the important measures on its scorecard, specific goals or objectives need to be set for each metric. Goals are based upon research and should help the organization to achieve its overall vision. Care must be taken to make sure that all the goals link up well with each other, so that improved performance on one measure does not cause deterioration of performance on another measure. Once the goals or objectives have been identified, action plans need to

be identified that will allow to achieve them. Finally, performance and activities are to be monitored and supervised to ensure their compliance with the goals and objectives. Performance reports and follow up reports are also required to be prepared with relevant and useful contents.

5.5 BALANCED SCORECARD

Balanced Scorecard is a technique of performance measurement developed by Robert Kaplan, a Harvard Professor and David Norton, a consultant.

Kaplan and Norton comment on balanced scorecard (BSC) as follows:

"The Balanced Scorecard (BSC) provides managers with the instrumentation they need to navigate to future competitive success. The Balanced Scorecard translates an organisation's mission and strategy into a comprehensive set of performance measures that provides the framework for a strategic measurement and management system. The balanced scorecard retains an emphasis on achieving financial objectives, but also includes the performance drivers of these financial objectives. The scorecard measures organisational performance across four balanced perspectives: financial, customers, internal business processes and learning and growth. The BSC enables companies to track financial results while simultaneously monitoring progress in building the capabilities and acquiring the intangible assets they need for future growth."

Strategy: BALANCED SCORECARD EXAMPLE To be the leading organisation in our industry through constant innovation and adaptation to our environment. We will measure success in terms of value creation for our shareholders and customers, by the learning and growth of our employees, and by our good corporate citizenship.

Objectives	Initiatives	Performance Measure	Target
Financial Perspective			
Increase share holder wealth	Develop new products	Return on assets	25%
Provide growth	Increase online sales	Percentage growth in sales	30%
Customer Perspective			
Increase market share	Increase advertising	Percentage market share	10%
Increase customer satisfaction	Increase postsales service	Percentage satisfied through survey.	99%
Internal Business			
Process Perspective			
Reduce through- put time	Reduce non-value- added activities	Average throughput time	4 hours
Provide on-time delivery	Streamline delivery process	Percentage on-time delivery	90%
Reduce defects	Develop employee quality teams	Percentage defects	0.01%
Learning and Growth Perspective			
Develop a multi skilled workforce	Provide employee training	Percentage of employees with multiple skills	80%
Improve information systems	Hire new employees in computing	Number of employees in computing	20

Reduce employee turnover	Pay higher salaries	Percentage annual turnover	10%
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CHARACTERISTICS OF GOOD BALANCED SCORECARDS

Balanced scorecards to be effective and useful should have the following characteristics:

1. Balanced scorecards should highlight a company's strategy by focusing on cause-and-effect relationship. Assume, Hindustan Unilever Ltd. aims to be a low-cost manufacturer and accelerate growth. The balanced scorecards should pinpoint specific objectives and measures in 'learning and growth perspective' which could improve internal business processes. These, in turn, would result into greater customer satisfaction, larger market share, higher operating income and shareholder wealth.
2. Balanced scorecards should help in communicating the strategy formulated to all members of an organisation by translating the strategy into a coherent and linked set of understandable and measurable operational targets. Subsequently, managers and employees take actions, based on scorecard, to achieve the firm's strategy. To facilitate decisions and actions in accordance with scorecards, it is preferable to develop scorecards at the division and department levels.
3. In profit-seeking companies, the balanced scorecard gives strong emphasis on financial objectives and measures. Sometimes managers give too much importance to innovation, quality and customer satisfaction though they may not produce tangible benefits. A good balanced scorecard considers non-financial measures as a part of a strategy or programme to achieve and improve future financial performance. When financial and non-financial performance measures are properly linked in balanced scorecards, many non-financial measures serve as leading indicators of future financial performance.
4. The balanced scorecard limits the number of measures used by identifying only the most critical ones. Avoiding a proliferation of measures focuses management's attention on those that are key to the implementation of strategy.
5. The scorecard highlights suboptimal tradeoffs that managers may make when they fail to consider operational and financial measures together. For example, a company for which innovation is key, could achieve superior short-run financial performance by reducing spending on R&D. A good balanced scorecard would signal that the short-run financial performance may have been achieved by taking actions that hurt future financial performance because a leading indicator of that performance, R&D spending and R&D output, has declined.

REQUISITES OF BALANCE SCORECARDS

Balance scorecard requires an adequate planning system and understanding of organization processes to fit the organization's primary objectives. However, developing and using balance score-cards for performance measurements are difficult tasks. The following are the requirements which should be satisfied by organizations before adopting balanced scorecard.

1. *Management must define the organization's primary objectives.* This is usually well done because most profit-seeking organizations have a narrow primary objective, namely, to increase shareholder wealth. In profit-seeking organizations that have primary objectives that include both social and owner wealth objectives, management must stipulate how decision-makers should weigh each of these objectives. In not-for-profit organizations like governments, management must state its objectives precisely.
2. *The organization must understand how stakeholders and processes contribute to its primary objectives.* Many managers admit that this is problematic. For example, the organization behaviour literature is unclear about whether increased employee motivation necessarily translates into improved employee and profit performance. Many organizations, despite implementing massive quality programs, really do not understand the effect of quality on

performance and prefer to speak in platitudes when they say, for example, "quality is not an issue, you have to have quality just to be in the game."

3. *The organization must develop a set of secondary objectives that are the drivers of performance on primary objectives.* This step is perhaps the most challenging and important in implementing the balanced scorecard. Accomplishing this task requires that processes and results come together. The organization must invest resources to back the strategies that it feels will produce results. This task seeks answers to questions like how much should be invested in employee training, a customer satisfaction system, a quality improvement system, or an improved logistical system? Such decisions should be based on an understanding of how increased spending improves process results, such as improved customer satisfaction, which in turn results in improved performance on the organization's primary objectives.
4. *The organization must develop a set of measures to monitor performance on both primary and secondary objectives.* This is the conventional role for management accounting. This step raises issues about how to measure the variable of interest. For example, how does the organization measure employee motivation or commitment to the organization? These performance measures are important because they translate strategy into focus, since the measures that people are told to manage will drive their performance. If the organization chooses the wrong set of measures, it will motivate inappropriate performance. Suppose, for example, that the organization, lacking an ability to measure motivation, equates motivation with lavish incentive compensation and measures motivation by the amount of incentive compensation that it distributes to employees. However, incentive compensation actually may have little incremental effect on motivation.
5. *The organization must develop a set of processes with their attendant implicit and explicit contracts with stakeholders to achieve those primary objectives.* Although this management requirement is well understood, the implied level of complexity required by the balanced scorecard is much deeper than what is done in normal practice. For example, based on 1980s experience, many managers developed the motto of "quality at any cost." Under the balanced scorecard, managers would assess the costs and benefits of schemes to improve quality.
6. *The organization must make specific and therefore public statements about its beliefs concerning how processes create results.* Public statements and specific commitments to courses of action and expected results provide a basis for accountability. Therefore, they represent an element of management risk since management can be questioned more accurately about its failures. Many senior managers may find this level of risk distasteful. However, owners may find such public statements illuminating.

PRECAUTIONS IN USING BALANCED SCORECARDS

Balanced scorecards are strategic, comprehensive and integral techniques of measuring the performance and managing a firm to achieve its vision and objectives. However, while implementing a balanced scorecard, managers should exercise utmost precautions and avoid certain evils or pitfalls while executing balanced scorecards. Such precautions are as follows :

1. The cause-and-effect relationship assumed in balanced scorecard may not be as precise in reality as it has been claimed before implementing balanced scorecard. It is preferable for the organizations together evidence of these linkages overtime. Attempts should be made to evolve balanced scorecards over the time rather than design or impose balanced scorecards at the outset.
2. Improvements in all measures simultaneously or all of the time should not be targeted. There is a need for balance or tradeoff across various strategic goals. For example, emphasizing quality and on-time performance beyond a point may not be worthwhile-further improvement in these objectives may be inconsistent with profit maximization.

3. Non-financial measures should not be ignored. Managers generally tend to give more focus on financial performance and measures. If non-financial measures and performance are not considered when evaluating performance, it will minimize the importance of balanced scorecard as a strategic measurement and management tool.
4. Don't use only objective measures in the scorecard. A scorecard may include both objective measures (such as operating income from cost leadership, market share and manufacturing yield), as well as subjective measures (such as customer and employee satisfaction ratings). When using subjective measures, though, management must be careful to trade off the benefits of the richer information these measure provide against the imprecision and potential for manipulation.
5. Don't fail to consider both costs and benefits of initiatives such as spending on information technology and research and development before including these objectives in the scorecard. Otherwise, management may focus the organization on measures that will not result in overall long-run financial benefits.

5.6 SUMMARY

- A budget is a quantitative expression of the plan of action.
- Budgetary control is the planning in advance of the various functions of a business so that the business as a whole can be controlled.
- Budgets can be classified according to Functions flexibility, period and condition.
- Production budget is a forecast of production on and cost of production for a budget period.
- Material budget is prepared for determining the requirement of raw material for production.
- Cash budget is a statement of estimates of cash position for the budget period.
- Material budget is prepared for the business as a whole, combining all budgets for a period into this budget.

5.7 KEY TERMS

- **Budget:** A Budget is a blueprint of plan expressed in quantitative or monetary terms.
- **Budgetary Control:** Budgetary control is an important tool for the management to make optimum use of limited business resources and to maximize the profits of business.
- **Budgeting:** Budgeting is a technique for formulating budgets.
- **Budget period:** Budget period refers to the period of time for which the budget is prepared.
- **Budget centres:** It is that of the organization which is selected for budgetary control.
- **Budget manual:** A budget manual helps in knowing in writing the role of every employers and the ways of undertaking various tasks.
- **Sales budget:** A sales budget is an estimate of expected sales during a budget period.

5.8 QUESTIONS AND EXERCISES

1. What do you understand by “Budgeting” ? Mention the type of budget that the Management of a big industrial concern would normally prepare.
2. What is budget ? What is sought to be achieved by Budgetary Control.
3. Has ‘Budgetary Control’ any significance with management accounting ?
4. Outline a plan for sales budget and purchases budget. What considerations are necessary in the preparation of such budgets ?
5. Mr. Managing Director is surprised that his profit every year is quite different from what he wants or expects to achieve. Someone advised him to install a formal system of budgeting. He employs a fresh accountant to do this. For two years, the accountant faithfully makes all budgets based on previous year's accounts. The problem remains unsolved. Advise Mr. Managing Director and the Accountant on what steps they should take. Make assumption about what is lacking.

6. (a) What do you mean by budgetary control with reference to manufacturing-cum-selling enterprise.
- (b) What factors would influence the selection of budget period between two firms carrying on diverse activities ?
- (c) What do you mean by flexible budget allowance ? How is it ascertained ? Explain with a cogent example.
7. (a) What do you mean by budgetary control ? Explain the objectives of budgetary control with special reference to a large manufacturing concern.
- (b) Explain what is meant by flexible budget and its utility. Prepare a proforma of flexible budget of a manufacturing concern for their imaginary activity, levels in a suitable form.
8. (a) What do you understand by budget and budgetary control ? Give example of five budgets that may be prepared and employed by a manufacturing concern.
- (b) What is the principal budget factor ? Give a list of such factors and explain how you would proceed to prepare budgets in the case of a manufacturing company.
9. Are you in agreement with the view that Budgeting should better be called profit planning and control.
10. 'Why do responsible people in an organization agree to accept budgetary control in theory but resist in practice' ? Explain.
11. 'If the sales forecast is subject to error then there is no basis of budgeting'. Do you agree ? Also explain how flexible budget can be used to help control cost.
12. Explain the procedure you would follow to prepare a projected Profit and Loss Account and Projected Balance Sheet. Explain also use of these statements.
13. 'Budgetary control improves planning, aids in coordination and helps in having comprehensive control'. Elucidate this statement.
14. Describe in brief the modus operandi for the purpose of preparation of a production budget. What are the principal considerations involved in budgeting production ?
15. What do you understand by budget and budgetary control ? How far is a budgetary control a tool in the hands of management ?
16. What is 'zero-base budgeting' ?
17. What do you understand by the terms 'Budget' and 'Budgetary Control' ? What are the advantages of 'budgetary control' ?
18. What is the mechanism of master budget ?
Discuss the difficulties which arise and how are they overcome in forecasting sales and preparing sales budget in a jobbing concern.
19. (a) What is master budget ? How is it prepared ?
(b) Explain zero-based budgeting.
20. Write an essay on zero-based budgeting and highlight its procedure, norms and superiority over functional budgeting.
21. What are different types of functional budgets which are prepared by a large scale manufacturing concern ?

PRATICAL PROBLEMS

Functional Budgets

1. Prepare a Materials Budget of PQ Co. Ltd., based on the following information. The production orders of the product show the following consumption.

(i) Consumption for a batch of 1,000 units of

Materials No.	Rate per kg	Product P	Product Q
	Kg	Kg	
11	60	50	80
13	60	10	5
16	10		30
17	50	6	10
18	25	4	4
Total	70	129	
(ii) Production (units)		Product P	12,000 units
Product Q		11,000 units	

[Ans : Material No. 11 13 16 17 18
Qty. (kg) 1,480 175 330 182 92
Amt. (`) 88,800 10,500 3,300 9,100 2,300]

2. Draw a Material Procurement Budget (Quantitative) from the following information : Estimated sales of a product 40,000 units. Each unit of the product requires 3 units of materials *P* and 5 units of material *Q*.

Estimated opening balances at the commencement of the next year :

Finished product	5,000 Units
Material <i>P</i>	12,000 Units
Material <i>Q</i>	20,000 Units

Materials on order :

Material <i>P</i>	7,000 Units
Material <i>Q</i>	11,000 Units

The desirable closing balance at the end of next year :

Finished product	7,000 Units
Material <i>P</i>	15,000 Units
Material <i>Q</i>	25,000 Units

Materials on order :

Material <i>P</i>	8,000 Units
Material <i>Q</i>	10,000 Units

[Ans Units to be procured *P* : 1,30,000, *Q* : 2,14,000]

3. Production cost of a factory for a year is as follows :

Direct Wages	` 80,000
Direct Materials	1,20,000
Production Overheads, Fixed	40,000
Production Overheads Variable	60,000

During the forthcoming year it is anticipated :

- (a) that average rate for direct labour remuneration will fall from ` 3 per hour to ` 2.50 per hour.
- (b) production efficiency will remain unchanged;
- (c) direct labour hours will increase by 33½%.

The purchase price per unit of direct materials and of other materials and services which comprise overheads will remain unchanged. Draw up a budget and compute a factory overhead rate, the overhead being absorbed on a direct wage basis.

[Ans. Cost of production ` 3,08,889, Production overhead rate 112.5%]

4. A Company is manufacturing two Products *X* and *Y*. A Forecast about the number of units to be sold in the first seven month is given below :

Month	Product X	Product Y
January	10,000	28,000
February	12,000	28,000
March	16,000	24,000
April	20,000	20,000
May	24,000	16,000
June	24,000	16,000
July	20,000	18,000

It is anticipated that :

- (i) there will be no work-in-progress at the end of any month;
- (ii) finished units equal to half the sales for the next month will be in stock at the end of each month (including December, of previous year).

Budgeted production and production costs for the year ending 31st December are as follows :

	Product X	Product Y
Production (units)	2,20,000	2,40,000
Direct material per unit	12.5	19
Direct wages per unit	4.5	7
Total factory overheads for each type of products (variable)	6,60,000	9,60,000

Prepare for 6 months ending 30th June a production budget and summarized cost production budget.

[Ans.]	Jan	Feb.	March	April	May	June
<i>X</i>	11,000	14,000	18,000	22,000	24,000	22,000 units
<i>Y</i>	28,000	26,000	22,000	18,000	16,000	17,000 units

Cost of production : Product *X* ` 22,20,000 and Product *Y* ` 38,10,000]

[Hint. Units to be manufactured for each month have been calculated as follows : Estimated Sales + Desired Closing Stock – Opening Stock.]

5. A Company manufactures Product *A* and Product *B*. During the year ending 31st December, 1992, it is expected to sell 15,000 kg. of product *A* and 75,000 kg. of Product *B* at 30 and 16 per kg respectively. The direct materials *P*, *Q* and *R* are mixed in the proportion of 3 : 5 : 2 in the manufacture of Product *A*. Materials *Q* and *R* are mixed in the proportion of 1 : 2 in the manufacture of product *B*. The actual and budget inventories of the year are given below :

<i>Opening Stock</i>	<i>Expected</i>	<i>Anticipated</i>
<i>Closing Stock</i>		<i>Cost per kg.</i>

	<i>Kgs.</i>	<i>kgs.</i>	
Material P	4,500	3,000	12
Material Q	3,000	6,000	10
Material R	30,000	9,000	8
Product A	3,000	1,500	—
Product B	4,000	4,500	—

Prepare the Production Budget and the Materials Budget showing the expenditure on purchase of materials for the year ending 31st December, 1992.

[Ans. Qty. to be produced : A: 13,500 kg. B: 75,500 kg]

Materials to purchased :	<i>P</i>	<i>Q</i>	<i>R</i>
Quantity (kg)	2,550	34,916.7	32,033.3
Value	30,600	3,49,167	2,56,266

6. A limited company is engaged in the business of manufacturing standard toys. It has prepared a six-monthly budget, which shows the following particulars :

Sales 80,000 units @ ` 20 per unit

Variable Costs :

Manufacturing	` 6 per unit
Selling	` 1 per unit
Distribution	` 0.25 per unit

Semi-variable Costs :

Manufacturing	60,000
Selling	30,000
Administration	16,000

Fixed Cost :

Manufacturing	60,000
Selling	40,000
Administration	80,000

It is decided to provide a plastic tray along with sale of toys. It is estimated that this gesture on the part of the company would boost up the sales from 80,000 units to 1,00,000 units.

The above proposal would involve an additional expenditure estimated as under :

[Ans. Comparative Cost ` 8,66,000 and ` 10,31,000; Comparative Profitability ` 7,34,000 and ` 9,69,000]

7. ABC Co. wishes to arrange overdraft facilities with its bankers during the period April to June when it will be manufacturing mostly for stock. Prepare a Cash Budget for the above period from the following data including the extent of bank facilities the company will require at the end of each month :

(a)	Sales	Purchases	Wages
-----	-------	-----------	-------

February	1,80,000	1,24,800	12,000
March	1,92,000	1,44,000	14,000
April	1,08,000	2,43,000	11,000
May	1,74,000	2,46,000	10,000
June	1,26,000	2,68,000	15,000

(b) 50 per cent of credit sales is realized in the month, following the sale and the remaining 50 percent in the second month, following. Creditors are paid in the month following.
 (c) Cash at bank on 1st April (estimated), `25,000.

[Ans. Closing balance (Overdraft) April May June
 `56,000 (`47,000) (`1,67,000)]

8. Texas Manufacturing Company Ltd. is to start production on 1st January, 1998. The Prime cost of a unit is expected to be `40 out of which `16 is for materials and `24 for labour. In addition variable expenses per unit are expected to be `8, and fixed expenses per month `30,000. Payment for materials is to be made in the month following the purchase. One-third of sales will be for cash and the rest on credit for settlement in the following month. Expenses are payable in the month in which they are incurred.

The selling price is fixed at `80 per unit. The number of units manufactured and sold are expected to be as under :

January	900	April	2,100
February	1,200	May	2,100
March	1,800	June	2,400

Draw up a statement showing requirements of working capital from month to month, ignoring the question of stocks.

[Ans. Cumulative Jan. Feb. March April May June
 surplus
 (Cash required) (34,800) (37,600) (32,400) (6,400) 30,800 66,400

Hint: Prepare a Cash Budget.]

9. ABC Ltd. a newly started company, wishes to prepare cash budget from January. Prepare a cash budget for the first six months from the following estimated revenue and expenses :

Months	Total Sales	Materials	Wages	Production	Overheads	
					Selling	& Distribution
January	20,000	20,000	4,000	3,200	800	
February	22,000	14,000	4,400	3,300	900	
March	28,000	14,000	4,600	3,400	900	
April	36,000	22,000	4,600	3,500	1,000	
May	30,000	20,000	4,000	3,200	900	
June	40,000	25,000	5,000	3,600	1,200	

Cash balance on 1st January was `10,000. A new machinery is to be installed at `20,000 on credit, to be paid by two equal instalments in March and April.

Sales commission 5% on total sales is to be paid within a month following actual sales: `10,000 being the amount on 2nd call may be received in March. Share premium amounting to `2,000 is also obtainable with the 2nd call.

Period of credit allowed by suppliers : 2 months
 Period of credit allowed to customers : 1 month
 Delay in payment of overheads : 1 month
 Delay in payment of wages : 1/2 month

Assume cash sales to be 50% of total sales.

[Ans. Closing cash balance January `18,000; Feb. `29,800; March `27,000; April `24,700, May `33,100 and June `36,000]

10. Prepare a cash budget for M/s. Alpha Manufacturing Company on the basis of the following information for the first six months of 1991 :

- (1) Costs and Price remain unchanged.
- (2) Cash sales are 25% and credit sales are 75% of total sales.
- (3) 60% of credit sales are collected in the month after sales, 30% in the second month and 10% in the third, no bad debts are anticipated.
- (4) Sales forecasts are as follows :

October	1990	12,00,000	March,	1991	8,00,000
November	1990	14,00,000	April,	1991	12,00,000
December	1990	16,00,000	May,	1991	10,00,000
January	1991	6,00,000	June,	1991	8,00,000
February	1991	8,00,000	July,	1991	12,00,000

(5) Gross profit margin 20%.

(6) Anticipated Purchases :

January	1991	6,40,000	April,	1991	8,00,000
February	1991	6,40,000	May,	1991	6,40,000
March,	1991	9,60,000	June,	1991	9,60,000

(7) Wages and Salaries to be paid for 1991 :

January	1,20,000	April,	2,00,000
February	1,60,000	May,	1,60,000
March	2,00,000	June,	1,40,000

(8) Interest on `20,00,000 6% on debentures is due by end of March and June.

(9) Excise deposit due in April `2,00,000.

(10) Capital Expenditure on plant and machinery planned for June `1,20,000.

(11) Company has a cash balance of `4,00,000 at 31.12.1990.

(12) Company can borrow on monthly basis.

(13) Rent is `8,000 per month.

[Ans. Cash balance at the close of the month : Jan. ` 9,07,000. Feb. ` 10,34,000, March ` 6,51,000, April ` 4,00,000, May ` 5,50,000, June ` 4,00,000.]

11. The Board of Directors of Punjab Cable Factory Ltd. have arranged for repayment of loan to a financial institution. You have been asked to prepare a projected profit and loss account for 1999 on the basis of figures available for 1997 and 1998 and to submit the net cash flow. If 75% of the net cash flow is estimated as the fair amount for repayment of loan, ascertain the sum that may be borrowed.

<i>Particular</i>	<i>1997</i>	<i>1998</i>	<i>Particular</i>	<i>1997</i>	<i>1998</i>
To Opening Stock	80,00,000	1,00,000	By Sales	8,00,000	10,00,000
To Raw Material			By closing		
		Stock	1,00,000	1,50,00,000	
To Stores	3,00,00,000	1,50,00,000	By Misc.	10,00,000	10,00,000
To Manufacturing					
Expenses	1,00,00,000	1,20,00,000			
To other Expenses	1,00,00,000	1,30,00,000			
To Depreciation	1,00,00,000	1,00,00,000			
To Net Profit	1,30,00,000	1,60,00,000			
	9,10,00,000	10,61,00,000			
			9,10,00,000	11,60,00,000	

Sales are expected to increase to ` 12,00,000 along with Raw materials, Stores and manufacturing expenses which are expected to rise by the same amount by which they rose between 1997 and 1998. Other expenses will increase by ` 50,00,000. Depreciation will remain constant. Assume sales and purchases in cash terms and the closing stock is expected to go up by the same amount as between 1997 and 1998. You may assume that no dividend is being paid.

[Ans. Projected profit for 1999 `140 lakhs. Cash inflow in 1999 from operations `190 lakhs; Available for servicing of loan `12,50 lakhs. In case loan has to be repaid in one year it should not exceed `142.50 lakhs]

[Hint. Increase in Raw materials, Manufacturing expenses and Closing stock is the same in 1999 over 1998 as in case of 1998 over 1997]

12. Jamuna Printing Co. Private Limited ended with the following Profit and Loss during the year 1998
;

(In lakhs of rupees)

Sales	35.58
Less : Expenses :	
Raw materials	7.42
Stores	4.88
Expenses	20.40
Interest	2.00
Depreciation	2.00
Loss for the year	1.12

The press had been working at 60% capacity during 1998. Of the expenses of, `20.40 lakhs, 25% is variable.

In 1999 production/sales volume at 80% of capacity is expected to be achieved. Fixed cost is however to increase by `1.20 lakhs.

Draw the 1998 Budget.

13. From the following data, prepare a forecast balance sheet as on 31.12.1998 :

(i) Position as on 1.1.1998 :

Description (` in lakhs)

Share capital	5.0
Reserves	10.0
Debentures	3.0
Public deposit	2.0
Debtors	5.0
Stocks and stores at cost	3.0
Net fixed assets	13.0
Cash and bank balance	1.0
Current liability	2.0

(ii) *Budget for 1998 :*

Sales	15.0
Production at sale value	20.0
Direct cost production	12.0
Fixed overheads	1.0
Variable selling and distribution costs	2.0
Collection of debtors and sales proceeds	17.0
Payment of dividends	0.5
Refund of public deposit	1.0
Net increases in current liability	0.5
Additional stock at closing at cost	3.0

[**Ans.** Net profit `3 lakhs Surplus `2.50 lakhs, Closing Cash Balance `3 lakhs. Projected Balance Sheet total `24 lakhs]

[**Hins.** (i) It has been presumed that the entire amount of fixed overheads is on account of depreciation on fixed assets. (ii) In the absence of any information about the rate of interest on debentures and public deposits, no adjustments have been made on the account]

