

UNIT – I

Objective:

- To access the demand for a particular product.
- To make optimal business decisions by integrating the concepts of economics, mathematics and statistics.
- To understand the economic goals of the firms and optimal decision making.

Syllabus:

Unit 1: Introduction to Managerial Economics

Definition, Nature and Scope of Managerial Economics– Relation of Managerial Economics with other disciplines.

Demand Analysis: Demand Determinants, Law of Demand and its exceptions, Significance & Types of Elasticity of Demand. Factors governing demand forecasting- Methods of Demand forecasting.

Learning Outcomes:

- Know the various factors that influence demand of particular product
- Forecast the future demand using various tools & Techniques
- Take the Further Decisions based on demand

Learning Material

Introduction

Managerial Economics as a subject gained popularity in USA after the publication of the book “Managerial Economics” by Joel Dean in 1951.

Managerial Economics refers to the firm’s decision making process. It could be also interpreted as “Economics of Management” or “Economics of Management”. Managerial Economics is also called as “Industrial Economics” or “Business Economics”.

As Joel Dean observes managerial economics shows how economic analysis can be used in formulating policies.

Meaning & Definition:

In the words of E. F. Brigham and J. L. Pappas Managerial Economics is “the applications of economics theory and methodology to business administration practice”.

Managerial Economics bridges the gap between traditional economics theory and real business practices in two ways. First it provides a number of tools and techniques to enable the manager to become more competent to take decisions in real and practical situations. Secondly it serves as an integrating course to show the interaction between various areas in which the firm operates.

M. H. Spencer and Louis Siegelman explain the “Managerial Economics is the integration of economic theory with business practice for the purpose of facilitating decision making and forward planning by management”.

Nature of Managerial Economics

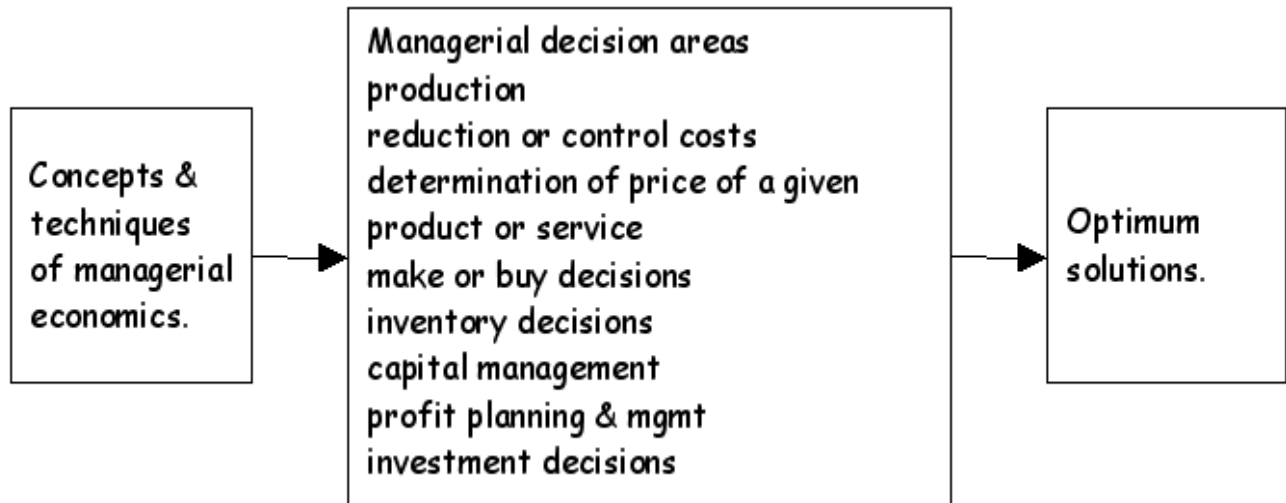
Managerial economics is, perhaps, the youngest of all the social sciences. Since it originates from Economics, it has the basis features of economics, such as assuming that other things remaining the same (or the Latin

equivalent *ceteris paribus*). This assumption is made to simplify the complexity of the managerial phenomenon under study in a dynamic business environment so many things are changing simultaneously. This set a limitation that we cannot really hold other things remaining the same. In such a case, the observations made out of such a study will have a limited purpose or value. Managerial economics also has inherited this problem from economics.

The other features of managerial economics are explained as below:

- (a) ***Close to microeconomics***: Managerial economics is concerned with finding the solutions for different managerial problems of a particular firm. Thus, it is more close to microeconomics.
- (b) ***Operates against the backdrop of macroeconomics***: The macroeconomics conditions of the economy are also seen as limiting factors for the firm to operate. In other words, the managerial economist has to be aware of the limits set by the macroeconomics conditions such as government industrial policy, inflation and so on.
- (c) ***Normative statements***: A normative statement usually includes or implies the words 'ought' or 'should'. They reflect people's moral attitudes and are expressions of what a team of people ought to do. For instance, it deals with statements such as 'Government of India should open up the economy. Such statement are based on value judgments and express views of what is 'good' or 'bad', 'right' or 'wrong'.
- (d) ***Prescriptive actions***: Prescriptive action is goal oriented. Given a problem and the objectives of the firm, it suggests the course of action from the available alternatives for optimal solution. If does not merely mention the concept, it also explains whether the concept can be applied in a given context on not.
- (e) ***Applied in nature***: 'Models' are built to reflect the real life complex business situations and these models are of immense help to managers for decision-making. The different areas where models are extensively used include inventory control, optimization, project management etc. In managerial economics, we also employ case study methods to conceptualize the problem, identify that alternative and determine the best course of action.
- (f) ***Offers scope to evaluate each alternative***: Managerial economics provides an opportunity to evaluate each alternative in terms of its costs and revenue. The managerial economist can decide which is the better alternative to maximize the profits for the firm.
- (g) ***Interdisciplinary***: The contents, tools and techniques of managerial economics are drawn from different subjects such as economics, management, mathematics, statistics, accountancy, psychology, organizational behavior, sociology and etc.
- (h) ***Assumptions and limitations***: Every concept and theory of managerial economics is based on certain assumption and as such their validity is not universal. Where there is change in assumptions, the theory may not hold good at all.

Scope of Managerial Economics:



THE MAIN AREAS OF MANAGERIAL ECONOMICS:

1. Demand decisions.

The analysis and forecasting of demand for a give product and service is the first task of the managerial economist. The behavioural implications such as needs of the customer's responses to a given chance in the price or supply are analysed in a scientific manner. The impact of changes in prices, income levels and prices of alternative products/services are assessed and accordingly the decisions are taken to maximise the profits. Demand at different price levels at different points of time is forecast to plan the supply accordingly and initiate changes in price, if necessary to enlarge the customers base and gain more profits.

2. Input-output decision

The costs of inputs in relation to output are studied to optimise the profits. Production function and cost function are estimated given certain parameters. The behaviour of cost at different levels of production is assessed here. Some costs are fixed, some are semi variable. The quantity of production increases remains constant or decreases with additional increase in the inputs. The decision deals with changes in the production following changes in inputs which could be substitutes or complementary. The entire focus of this decision is to optimise (maximise) the output at minimum cost.

3. Price-output decision

The production is ready and the task is to determine price these in different market situations such as perfect market and imperfect markets ranging from monopoly, monopolistic competition, duopoly and oligopoly.

The features of these markets and how price is determined in each of the competitive situation is studied here. The pricing policies, methods, strategies and practices constitue curcial part of the study of managerial economics.

4. Profit-related decision

We employ the techniques such as break even analysis, cost reduction and cost control and ratio analysis to ascertain the level of profits. In break even analysis, we are concerned with profit planning and control. We determine breakeven point beyond which the firm starts getting profits. In other words, if the firm produces less than breakeven point, it loses. We can also plan the production needed to attain a given level of profits in the short-run. Cost reduction and cost control deal with the strategies to reduce the wastage and thereby reduce the costs. These indirectly enhance the level of profits.

5. Investment decision

Investment decisions are also called capital budgeting decisions. These involve commitment of large funds, which determine the fate of the firm. These decisions are irreversible. Hence the manager needs to be more attentive while committing his scarce funds. Which have alternative uses. The allocation and utilisation of the investments is paramount importance. Capital has a cost. It is expensive. Hence, it is to be utilised in such a way as to maximise the return on the capital invested. It is necessary to study the cost of capital, choice of capital structure and investment projects before the funds are committed.

6. Economic forecasting and forward planning.

Economic forecasting leads to forward planning. The firm operates in an environment which is dominated by the external and internal factors. The external factors include major forces such as government policy, competition, employment, labour, price and income levels and so on. These influence its decisions relating to production, human resources, finance and marketing. The internal factors include its policies and procedures relating to finance, people, market and products. It is necessary to forecast the trends in the economy to plan for the future in terms of investments, profits, products and markets. This will minimise the risk and uncertainty about the future.

Managerial economics relationship with other disciplines:

Many new subjects have evolved in recent years due to the interaction among basic disciplines. While there are many such new subjects in natural and social sciences, managerial economics can be taken as the best example of such a phenomenon among social sciences. Hence it is necessary to trace its roots and relationship with other disciplines.

1. Relationship with economics

2. Management theory and accounting

3. Managerial Economics and mathematics

4. Managerial Economics and Statistics

5. Managerial Economics and Operations Research

6. Managerial Economics and the theory of Decision- making

7. Managerial Economics and Computer Science

DEMAND ANALYSIS

Introduction & Meaning:

Demand in common parlance means the desire for an object. But in economics demand is something more than this. According to Stonier and Hague, "Demand in economics means demand backed up by enough money to pay for the goods demanded". This means that the demand becomes effective only if it is backed by the purchasing power in addition to this there must be willingness to buy a commodity.

Law of Demand:

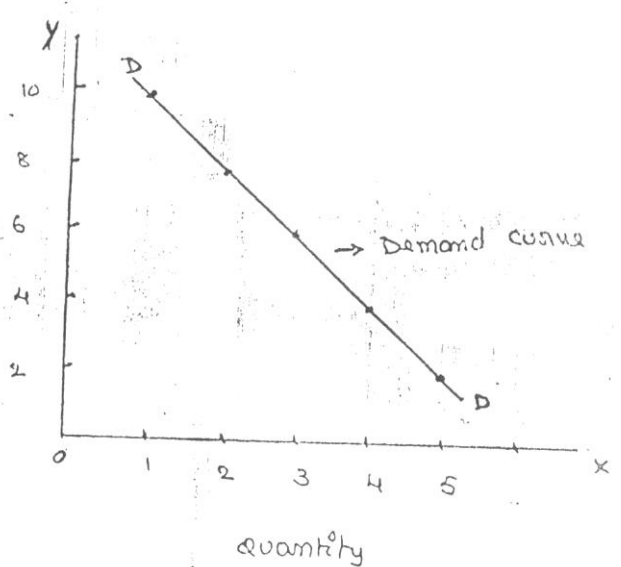
Law of demand shows the relation between price and quantity demanded of a commodity in the market. In the words of Marshall, "the amount demand increases with a fall in price and diminishes with a rise in price".

A rise in the price of a commodity is followed by a reduction in demand and a fall in price is followed by an increase in demand, if a condition of demand remains constant.

The law of demand may be explained with the help of the following demand schedule.

Demand Schedule.

| Price of Apple (In. Rs.) | Quantity Demanded |
|--------------------------|-------------------|
| 10 | 1 |
| 8 | 2 |
| 6 | 3 |
| 4 | 4 |
| 2 | 5 |



When the price falls from Rs. 10 to 8 quantity demand increases from 1 to 2. In the same way as price falls, quantity demand increases on the basis of the demand schedule we can draw the demand curve.

The demand curve DD shows the inverse relation between price and quantity demand of apple. It is downward sloping.

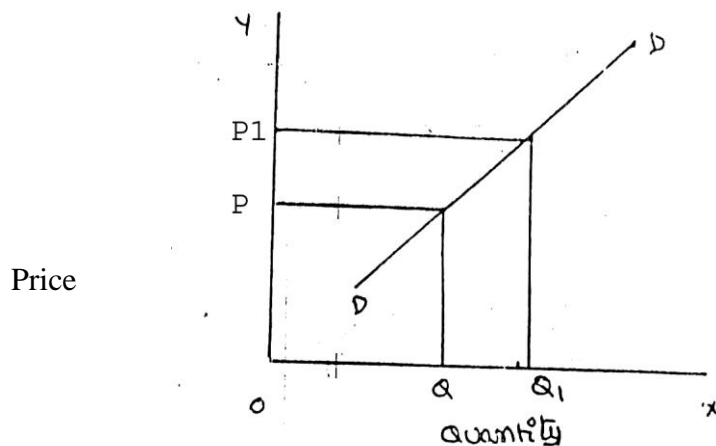
Assumptions:

Law of demand is based on certain assumptions:

1. There is no change in consumers taste and preferences.
2. Income should remain constant.
3. Prices of other goods should not change.
4. There should be no substitute for the commodity
5. The commodity should not confer any distinction
6. The demand for the commodity should be continuous
7. People should not expect any change in the price of the commodity

Exceptional demand curve:

Sometimes the demand curve slopes upwards from left to right. In this case the demand curve has a positive slope.



When price increases from OP to Op1 quantity demanded also increases from to OQ1 and vice versa. The reasons for exceptional demand curve are as follows.

1. *Giffen paradox*
2. *Veblen or Demonstration effect*
3. *Ignorance*
4. *Speculative effect*
5. *Fear of shortage*
6. *Necessaries*

Factors Affecting Demand:

There are factors on which the demand for a commodity depends. These factors are economic, social as well as political factors. The effect of all the factors on the amount demanded for the commodity is called Demand Function.

These factors are as follows:

1. *Price of the Commodity*
2. *Income of the Consumer*
3. *Prices of related goods*
4. *Tastes of the Consumers*
5. *Wealth*
6. *Population*
7. *Government Policy*
8. *Expectations regarding the future:*
9. *Climate and weather*
10. *State of business*

ELASTICITY OF DEMAND

Elasticity of demand explains the relationship between a change in price and consequent change in amount demanded. “Marshall” introduced the concept of elasticity of demand. Elasticity of demand shows the extent of change in quantity demanded to a change in price.

Elastic demand: A small change in price may lead to a great change in quantity demanded. In this case, demand is elastic.

In-elastic demand: If a big change in price is followed by a small change in demanded then the demand is “inelastic”.

Types of Elasticity of Demand:

There are three types of elasticity of demand:

1. Price elasticity of demand
2. Income elasticity of demand
3. Cross elasticity of demand

1. Price elasticity of demand:

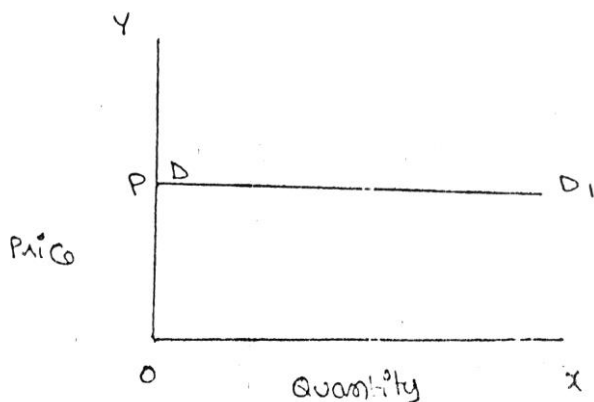
Marshall was the first economist to define price elasticity of demand. Price elasticity of demand measures changes in quantity demand to a change in Price. It is the ratio of percentage change in quantity demanded to a percentage change in price.

$$\text{Price elasticity} = \frac{\text{Proportionate change in the quantity demand of commodity}}{\text{Proportionate change in the price of commodity}}$$

There are five cases of price elasticity of demand

A. Perfectly elastic demand:

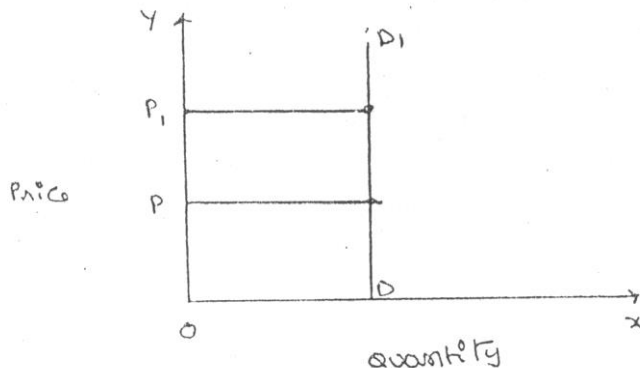
When small change in price leads to an infinitely large change in quantity demand, it is called perfectly or infinitely elastic demand. In this case $E = \infty$



The demand curve DD1 is horizontal straight line. It shows the at "OP" price any amount is demand and if price increases, the consumer will not purchase the commodity.

B. Perfectly Inelastic Demand

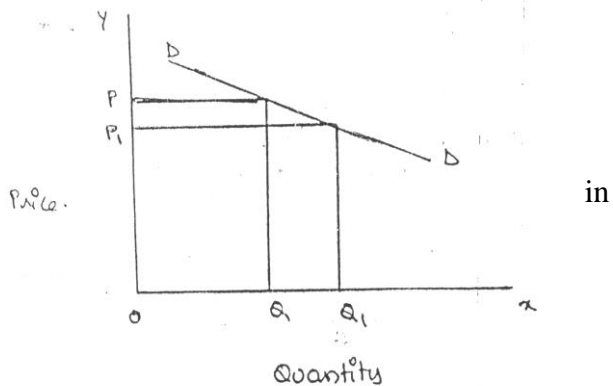
In this case, even a large change in price fails to bring about a change in quantity demanded.



C. Relatively elastic demand:

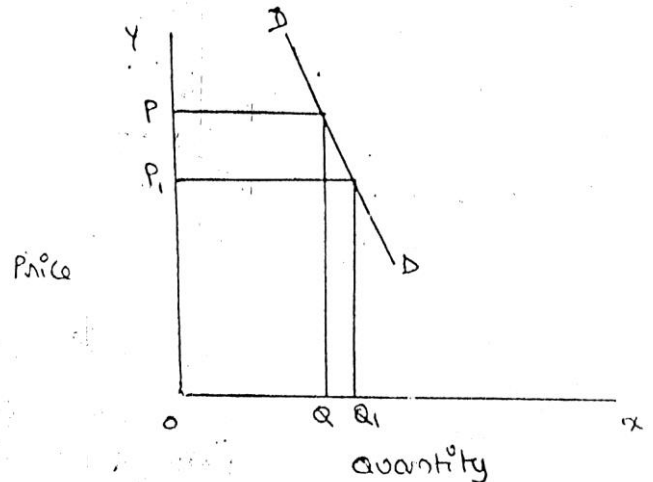
Demand changes more than proportionately to a change price. i.e. a small change in price leads to a very big change in the quantity demanded. In this case

$E > 1$. This demand curve will be flatter.



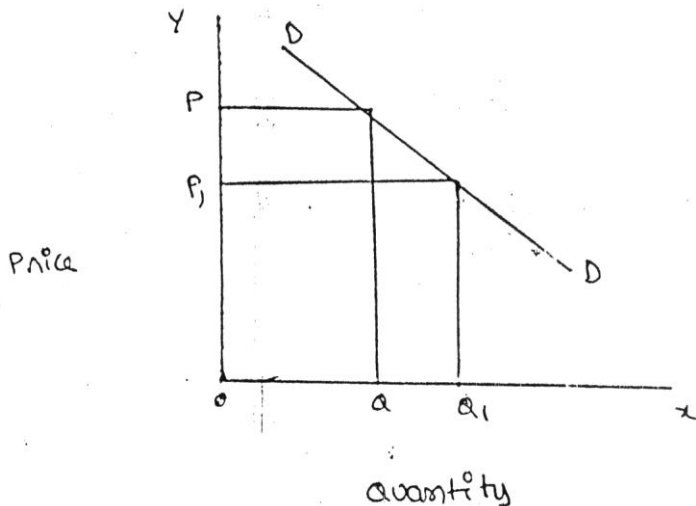
D. Relatively in-elastic demand.

Quantity demanded changes less than proportional to a change in price. A large change in price leads to small change in amount demanded. Here $E < 1$. Demanded curve will be steeper.



E. Unit elasticity of demand:

The change in demand is exactly equal to the change in price. When both are equal $E=1$ and elasticity is said to be unitary.



When price falls from 'OP' to 'OP1' quantity demanded increases from 'OQ' to 'OQ1'. Thus a change in price has resulted in an equal change in quantity demanded so price elasticity of demand is equal to unity.

2. Income elasticity of demand:

Income elasticity of demand shows the change in quantity demanded as a result of a change in income. Income elasticity of demand may be stated in the form of a formula.

Proportionate change in the quantity demand of commodity

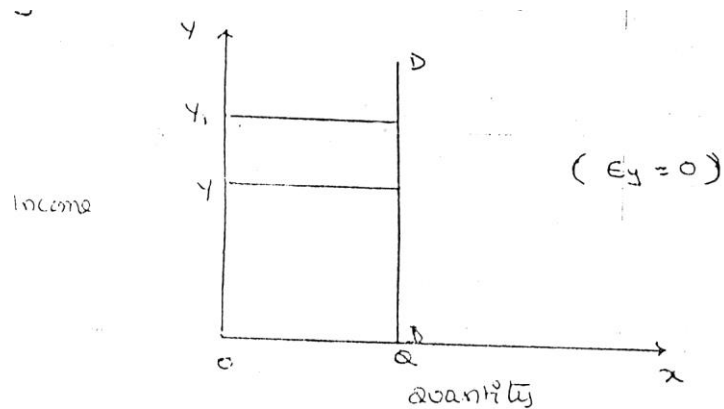
Income Elasticity = -----

Proportionate change in the income of the people

Income elasticity of demand can be classified in to five types.

A. Zero income elasticity:

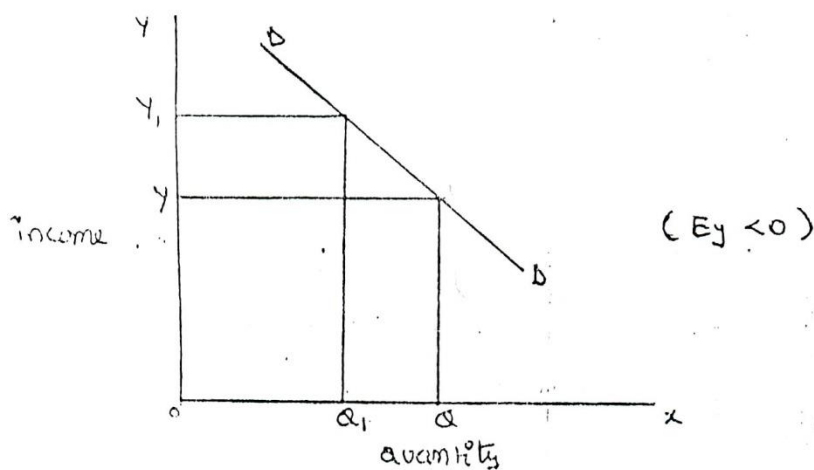
Quantity demanded remains the same, even though money income increases. Symbolically, it can be expressed as $E_y=0$. It can be depicted in the following way:



As income increases from OY to OY1, quantity demanded never changes.

B. Negative Income elasticity:

When income increases, quantity demanded falls. In this case, income elasticity of demand is negative. i.e., $E_y < 0$.

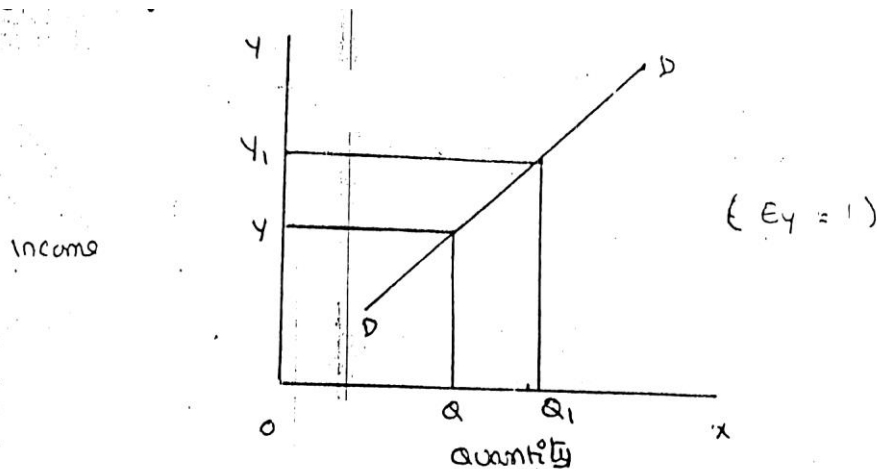


When income increases from OY to OY1, demand falls from OQ to OQ1.

income increases from OY to OY1, demand falls from OQ to OQ1.

c. Unit income elasticity:

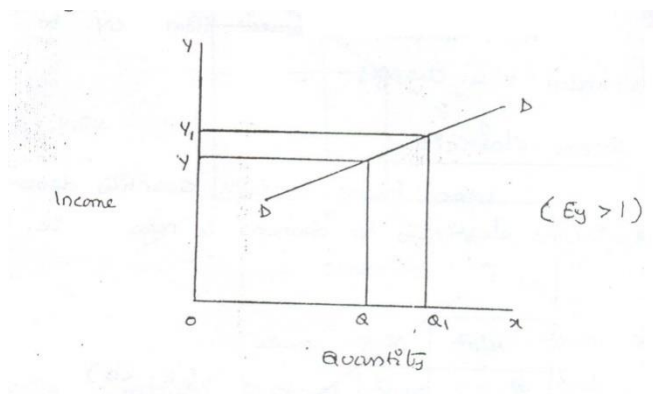
When an increase in income brings about a proportionate increase in quantity demanded, and then income elasticity of demand is equal to one. $E_y = 1$



When income increases from OY to OY1, Quantity demanded also increases from OQ to OQ1.

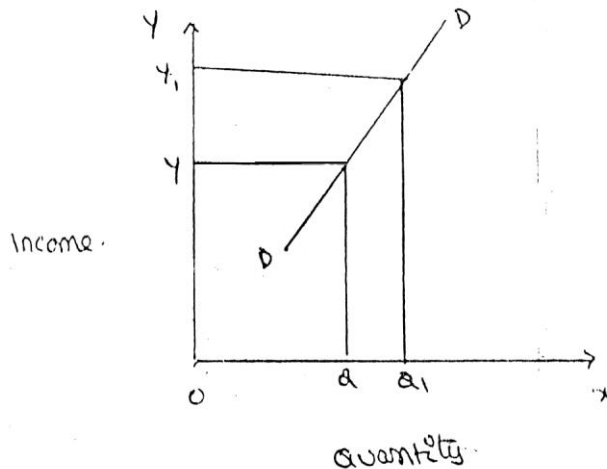
d. Income elasticity greater than unity:

In this case, an increase in come brings about a more than proportionate increase in quantity demanded. Symbolically it can be written as $E_y > 1$.



E. Income elasticity less than unity:

When income increases quantity demanded also increases but less than proportionately. In this case $E < 1$.



3. Cross elasticity of Demand:

A change in the price of one commodity leads to a change in the quantity demanded of another commodity. This is called a cross elasticity of demand. The formula for cross elasticity of demand is:

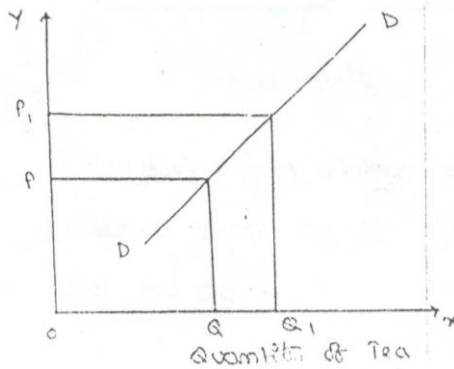
Proportionate change in the quantity demand of commodity "X"

Cross elasticity = -----

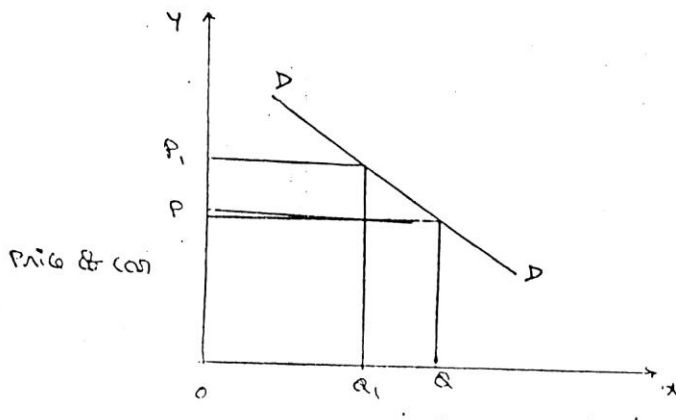
Proportionate change in the price of commodity "Y"

a. In case of substitutes, cross elasticity of demand is positive. Eg: Coffee and Tea

When the price of coffee increases, Quantity demanded of tea increases. Both are substitutes.



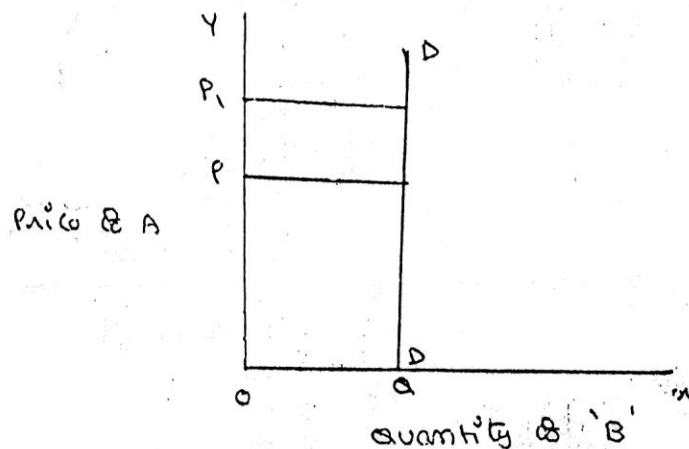
b. In case of compliments, cross elasticity is negative. If increase in the price of one commodity leads to a decrease in the quantity demanded of another and vice versa.



$$E_c = \frac{\% \Delta Q_1}{\% \Delta P_1} \text{ (Negative)}$$

c. In case of unrelated commodities, cross elasticity of demanded is zero. A change in the price of one commodity will not affect the

quantity



demanded of another.

Factors influencing the elasticity of demand

1. *Nature of commodity*
2. *Availability of substitutes*
3. *Variety of uses*
4. *Postponement of demand*
5. *Amount of money spent*
6. *Time*
7. *Range of Prices*

DEMAND FORECASTING

METHODS OF DEMAND FORECASTING:

I. Survey method.

- 1) Survey of buyer's intention.
 - A] Census method
 - B] Sample method.
- 2) Sales force opinion method.

II. Statistical methods

- 1) Trend projection method.
 - A] Trend line observation.
 - B] Least square method.
 - C] Time series analysis.
 - D] Moving average method.
 - E] Exponential smoothing.
 - 2) Barometric techniques.
 - 3) Simultaneous equations method.
 - 4) Correlation & regression method.
- #### **III. Other methods**
- 1) Expert opinion method
 - 2) Test marketing.
 - 3) Controlled experiments.
 - 4) Judgmental approach.

I. Survey methods:-

Survey of buyer's intention:-

To anticipate what buyers are likely to do under a given set of circumstances, a most useful source of information would be the buyers themselves. It is better to draw a list of all potential buyers, approach each buyer to ask how much does her plans to buy of the given product at a given point of time under particular conditions.

This is the most effective method because the buyer is the ultimate decision maker and we are collecting the information directly from him.

The survey of the buyers can be conducted either by covering the whole population or by selecting a sample group of buyers.

Advantages of the survey methods:-

1. Where the product is new in the market for which no data exists previously.
2. When the buyers are few and they are accessible.
3. When the cost of reaching them is not significant.
4. When consumers stick to their intentions.
5. When they are willing to disclose what they are willing to do.

Disadvantages:-

1. Survey may be expensive.
2. Sample size and timing of survey.
3. Methods of sampling.
4. In consisted buying behavior.

Sales Force Opinions:-

Another source of getting reliable information about possible level of sales or demand for a given product or services is the group of people who sell the same. Thus we can control the limitation of cost and delays in contacting the costumers. The sales people are those who are in constant touch with the main and large buyers of particular market. The sales force is capable of assessing the likely reaction of the costumers in their territories quickly; giving the company's marketing strategy. It is less costly and can be conducted through telephones, fax, video conferences and many more.

Here also there is a danger that salesmen may sometimes become biased with their views.

- The sales people are paid based on their results.
- Targets are set for the salesmen.
- The salary of the salesmen depends upon the targets.
- Incentives are paid to the salesmen who achieved the targets.
- Salespersons having more knowledge about the information of sources.
- Salesmen are cooperative.

II. Statistical Methods:-

For forecasting the demand for goods and services in the long-run, statistical and mathematical methods are used considering the past data.

(a)Trend projection methods:-

This is based on past sales patterns. The necessary information is already available in company files with different time periods.

There are five main techniques:

1. Trend line by observation.
2. Least square method.
3. Time series analysis.
4. Moving average method.
5. Exponential smoothing.

(1)Trend line by observation:-

It is easy and quick as it involves plotting the actual sales data on a chart and then estimating just by observation when the trend line lies.

(2) Least square method:-

In this statistical method is used. The trend line is the basis to extrapolate the line for future demand for the given product or service on graph. Here it is assumed that there is a proportional exchange in sales over a period of time. In such a case the trend line equation is in linear form.

The estimated linear trend equation of sales is written as:

$$S = x + y (T)$$

x & y have been calculated from past data.

S = sales;

T = year no. for which the forecast is made.

To find x & y values,

$$\Sigma \Sigma S = N x + y \Sigma \Sigma T$$

$$\Sigma \Sigma \Sigma ST = x \Sigma \Sigma T + y \Sigma (T * T)$$

S = sales;

T = year number

N = no. of years.

Example 1:

| Year | 1996 | 1998 | 2000 | 2002 | 2004 |
|---------------|------|------|------|------|------|
| Sales (lakhs) | 75 | 84 | 92 | 98 | 88 |

Estimate the sales for the years 2004 & 2006.

Sol:

$$\Sigma S = N x + y \Sigma T$$

$$\Sigma ST = x \Sigma T + y \Sigma (T * T)$$

| Year | Year no. (T) | Sales (s) | ST | T * T |
|------|-----------------|------------------|--------------------|----------------------|
| 1992 | 1 | 75 | 75 | 1 |
| 1994 | 3 | 84 | 252 | 9 |
| 1996 | 5 | 92 | 460 | 25 |
| 1998 | 7 | 98 | 686 | 49 |
| 2000 | 9 | 88 | 792 | 81 |
| | $\Sigma T = 25$ | $\Sigma S = 437$ | $\Sigma ST = 2265$ | $\Sigma (t*t) = 165$ |

Substituting the values in the formula,

$$437 = 5x + 25 y$$

$$2265 = 25x + 165 y$$

By solving these equations

$$x = 77.4 \text{ \& } y = 2;$$

Years 2004 & 2006 take on the year numbers 11 and 13 respectively.

By substituting the values in the trend equations $x + y (T)$

$S_{2002} = 77.4 + 2(11) = 99.4$ lakh units

$S_{2004} = 77.4 + 2(13) = 103.4$ lakh units.

Thus the forecast sales for year 2004 & 2006 are 99.4 and 103.4 lakh units.

3) Time Series Analysis:-

Where the surveys or market tests are costly and time consuming, statistical and mathematical analysis of past sales data offers another method to prepare the forecasts that is time series analysis.

The product should have actively been traded in the market for quite sometime in the past.

Considerable data on the performance of the product or service over significantly large period should be available for better results under this method.

Time series emerge from a data when arranged chronologically, given significantly large data.

The following 4 major components analyzed from time series while forecasting the demand.

Trend (T):

It also called as long term trend, is the result of basic developments in the population, capital formation & technology. These developments relate to over a period of long time say 5 to 10 years, not definitely overnight. The trend is considered statistically significant when it has reasonable degree of consistency. A significant trend is central and decisive factor considered while preparing a long range forecast.

Cycle Trend (C):

It is wave like movement of sales inflation, during the period of inflation prices go up and down.

Seasonal Trend (S):

More goods are sold in festivals seasons, weather factors, holidays.

Erratic Trend (E):

Results from the sporadic occurrence of strikes, riots etc.

4) MOVING AVERAGE METHOD:

This method considers that the average of past events determine the future events.

This method provides consistent results when the past events are consistent and unaffected by wide changes.

The average keeps on moving depending upon the no. of years selected. Selection of no. of years is the decisive factor in this method. Moving averages get updated as new information flow in.

This method is easy to compute. One major advantage with this method is that the old data can be dispensed with once the averages are calculated. These averages, not original data, are further used as the forecast for next period. It gives equal weightage to data both in the recent past and the earlier one.

Example: - Compute 3-day moving average from the following daily sales data.

| Date and month | Daily sales (lakhs) | 3-day moving average |
|----------------|---------------------|----------------------|
| Jan 1 | 40 | |
| Jan 2 | 44 | |
| Jan 3 | 48 | |
| Jan 4 | 45 | 44 |
| Jan 5 | 53 | 45.7 |

Sol:-

To calculate 3-days moving avg...

$$S_4 = (40 + 44 + 48) / 3 = 44$$

$$S_5 = (44 + 48 + 45) / 3 = 45.7$$

5) EXPONENTIAL SMOOTHING:

This is a more popular technique used for short-run forecasts. This method is an improvement over moving averages method.

All time periods (ranging from the immediate part to distant part) here are given varying weights , that is the value of the given variable in the recent times are given higher weights and the values of the given variable in the distant past are given relatively lower weights for further processing.

The formula used for exponential smoothing,

$$S_{t+1} = c S_t + (1 - C) S_{Mt}$$

S_{t+1} == exponentially smoothed average for New Year.

S_t == actual data in the most recent part.

S_{Mt} == most recent smoothed forecast.

C = smoothing constant.

If the smoothing constant `c` is higher, higher weight is given to the most recent information. The value of `c` varies between `0` and inclusive and the exact values of `c` is determined by the magnitude of random variation. If the magnitude of random variations is large, lower values of c are assigned and vice versa. However, it is considered that a value between 0.1 & 0.2 is more appropriate in most of cases.

BAROMETRIC TECHNIQUES:

Where forecasting based on time series analyses or extrapolation may not yield significant results, barometric techniques can be made use of . Under the barometric technique, one set of data is use to predict another set.

To forecast demand for a particular product or service, use some other relevant indicator which is known as a barometer of future demand.

To assess the demand for services in India and abroad. We can see the percentage of population in each occupation. In the US 78% of the labour force is employed in services 15% of them in manufacturing. In India, according to 1991 census, 21% of work force is engaged in services, 13% in manufacturing, and 67% in agriculture. The world over, an increase in prosperity has been accomplished by an increase in demand for services.

Simultaneous Equation Method

In this method all variables are simultaneously considered, with the conviction that every variable influences the other variable in an economic environment. Hence the set of eqns equal the no. of dependent variable which is also called endogenous variables.

This method is more practical in the sense that it requires to estimate the future values of only predetermined variables. it is difficult to compute where the no. of eqns is larger.

CORRELATION AND REGRESSION METHODS:

Correlation and regression methods are statistical techniques. Correlation describes the degree of association between 2 variables such as sales and advertisement expenditure, when the 2 variables tend to change together then they are said to be correlated. The extent to which they are correlated can be measured by correlation coefficient.

In regression analysis an equation is estimated which best fits in the sets of observations of dependent variables and independent variables. The main advantage of this method is that it provides the values of independent variables from within the model itself. Thus it frees the forecaster from the difficulty of estimating them exogenously.

III. OTHER METHODS

EXPERT OPINION:

Well informed persons are called experts. Experts constitute yet another source of information. These persons are generally the outside experts and they do not have any vested interests in the results of a particular survey.

Main advantages are:

1. Results of this method would be more reliable as the expert is unbiased, has no direct commercial involvement in its primary activities.
2. Independent demand forecast can be made relatively quick and cheap.
3. This method constitutes a valid strategy particularly in the case of new products.

The main disadvantage is that an expert can't be held accountable if his estimates are found incorrect.

TEST MARKETING:

It is likely that opinions given by buyers, sales men or other experts may be at times, misleading. This is the reason why most of the manufacturers favour to test their product or service in a limited market as test-run before they launch their products nation wide.

Advantages:

1. Acceptability of the product can be judged in a limited market.
2. Before it is too late, the corrections can be made to product design if necessary, thus major catastrophe, in terms of failure, can be avoided.
3. The customer psychology is more focused in this method and the product and services are aligned or redesigned accordingly to gain more customer acceptance.

Disadvantages:

1. It reveals the quality of product to the competitors before it is launched in his wider market. The competitors may bring about a similar product or often misuse the results of the test marketing against the given company.
2. It is not always easy to select a representative audience or market.
3. It may also be difficult to extrapolate the feedback received from such a test market, particularly where the chosen market is not fully representative.

CONTROLLED EXPERIMENTS:

Controlled experiments refer to such exercises where some of the major determinants of demand are manipulated to suit to the customers with different tastes and preferences, income groups and such others. This method can not provide better results, unless these markets are homogenous in terms of, tastes and preferences of customers, their income and soon.

This method is in infancy state and not much tried because of following reasons:

It is costly and time consuming. It involves elaborate process of studying different markets and different permutations and combinations that push the product aggressively. If it fails in one market, it may affect other markets also.

JUDGEMENT APPROACH:

When none of the above methods are directly related to the given product or service, the management has no other alternative than using its own judgment. Even when the above methods are used, the forecasting process is supplemented with the factor of judgment for the following reasons:

1. Historical data for significantly long period is not available.
2. Turning points in terms of policies or procedures or casual factors cannot be precisely demanded.
3. Sales fluctuations are wide and significant.

Assignment-Cum-Tutorial Questions

A. Questions testing the remembering / understanding level of students

I) Objective Questions (10 to 15)

1. Managerial Economics is close to _____ economics.
2. Managerial Economics is more of _____ in nature.
3. Any activity aimed at earning or spending money is called _____ activity”.
4. When a great change in price leads small change in the quantity demand, we call it _____.
5. The theory of firm is also called as _____.
6. When $PE = 1$ (Price Elasticity of Demand is one), we call it _____.
7. Estimation of future possible demand is called _____.
8. Demand for a commodity depends on the relative price of its _____
9. An upward sloping demand curve is called _____ .
10. The degree of responsiveness of quantity demanded to a change in price of the product is known as _____

II) Descriptive Questions(6 to 8)

1. “Managerial Economics is integration of economic theory and with business practice for the purpose of facilitating decision making and forward planning” explain.
2. Explain in law of demand. What do you mean by shifts in demand curve?
3. What is meant by elasticity of demand? How do you measure it?
4. Discuss the various techniques of demand forecasting?
5. What are the various factors that influence the demand for a mobile hand set?
6. Explain exceptional demand curve with suitable examples.
7. How do you forecast the demand for washing machines?

B. Question testing the ability of students in applying the concepts.

I) Multiple Choice Questions: (10 to 15)

1. The rise in price of two wheeler leads to fall in demand for fuel and vice-versa. These goods are _____ ()
(a) Substitutes (b) Complimentary goods (c) Giffen goods (d) Veblen goods.
2. When a great change in price leads to small change in the quantity demand, we call it _____.
(a) Elastic Demand (b) Positive Demand
(c) Inelastic Demand (d) None
3. In the short run, firms can adjust their production by changing their
(a) fixed factors (b) variable factors
(b) semi- fixed factors (d) both (a) and (b)
4. In case of Giffen goods the demand curve

- (a) Slopes downwards (c) slopes upwards
 (b) Intersects supply curve (d) meets cost curve.
5. Demand for a commodity depends on _____ ()
 (a) Price of that commodity (b) Price of related commodity
 (c) Income (d) All of the above
6. If the price elasticity of demand for a good is 0.75, the demand for the good can be described as:
 (a) Normal (c) elastic
 (b) Inferior (d) inelastic.
7. Economists typically assume that the owners of firms wish to
 (a) Produce efficiently. (c) Maximize sales revenues.
 (b) Maximize profits. (d) All of these.
8. Demand forecasting is important for _____ ()
 a. Price Control b. Business Planning c. Competitive Strategy d. All of Above
9. "Coffee and Tea are the _____ goods". ()
 (a) Relative (b) Complementary
 (c) Substitute (d) None
10. Consumers Survey method is one of the Survey Methods to forecast the ____. ()
 (a) Sales (b) Revenue
 (c) Demand (d) Production
11. When $PE = 1$ (Price Elasticity of Demand is one), we call it _____. ()
 (a) Perfectly Elastic demand (b) Perfectly inelastic demand
 (c) Unit elastic demand (d) Relatively Elastic demand
12. When Income Elasticity of demand is Zero ($IE = 0$), It is termed as _____. ()
 (a) Negative Income Elasticity (b) Unit Income Elasticity
 (c) Zero Income Elasticity (d) Infinite Income Elasticity
13. Demand for a commodity refers to _____ ()
 (a) Desire for a Commodity (b) Need for a commodity
 (c) Quantity demanded of that commodity
 (d) Quantity of the commodity demanded at a certain price during any particular period of time
14. A single point on the Demand curve shows _____ ()
 (a) Demand & Supply relationship (b) Price & Supply relationship
 (c) Price & Quantity Demanded relationship (d) None of these

II) Problems:

- 1) If the price of a product is 1000/- and the quantity demand is 10,000 units. When the price falls to 800/- and the quantity demanded rises to 16,000units, calculate the price elasticity of demand
- 2) Determine the Advertising elasticity of demand given that
 - The quantity demanded for product M is 10,000 units per day at a monthly advertising budget of Rs.10,000
 - The monthly advertising budget is slashed to Rs.5000; the quantity demanded will fall down to 30,000 units per day.

UNIT – II

Objective:

- To understand the concept of production function
- Know about the various factors of production
- To analyze different costs in solving managerial problems.
- Identify economies and diseconomies of scale

Syllabus: Theory of Production and Cost Analysis

Production Function : Isoquant and Is costs , MRTS, least cost combinations of inputs , Cob-Douglas production function , production function , laws of returns, internal and external economies of scale .

Cost analysis- cost concepts & BEP Analysis break –Even point (simple problems)

Learning Outcomes:

- Understanding and estimating production function.
- Isoquant and Isocost and finding out optimal combinations of inputs.

- Understanding cost function and the difference between short-run and long-run cost function.
- Understanding and calculating break-even point. • BEP and demand analysis.
- Access the minimum level of production that a firm should carry by using BEP and get aware of costs incurred in the production

Learning Material

PRODUCTION FUNCTION

Introduction: The production function expresses a functional relationship between physical inputs and physical outputs of a firm at any particular time period. The output is thus a function of inputs. Mathematically production function can be written as

$$Q = f(A, B, C, D)$$

Where “Q” stands for the quantity of output and A, B, C, D are various input factors such as land, labour, capital and organization. Here output is the function of inputs. Hence output becomes the dependent variable and inputs are the independent variables.

The above function does not state by how much the output of “Q” changes as a consequence of change of variable inputs. In order to express the quantitative relationship between inputs and output, Production function has been expressed in a precise mathematical equation i.e.

$$Y = a + b(x)$$

Which shows that there is a constant relationship between applications of input (the only factor input ‘X’ in this case) and the amount of output (y) produced.

Importance:

1. When inputs are specified in physical units, production function helps to estimate the level of production.
2. It becomes is equates when different combinations of inputs yield the same level of output.
3. It indicates the manner in which the firm can substitute on input for another without altering the total output.
4. When price is taken into consideration, the production function helps to select the least combination of inputs for the desired output.
5. It considers two types’ input-output relationships namely ‘law of variable proportions’ and ‘law of returns to scale’. Law of variable propositions explains the pattern of output in the short-run as the units of variable inputs are increased to increase the output. On the other hand law of returns to scale explains the pattern of output in the long run as all the units of inputs are increased.
6. The production function explains the maximum quantity of output, which can be produced, from any chosen quantities of various inputs or the minimum quantities of various inputs that are required to produce a given quantity of output.

Production function can be fitted the particular firm or industry or for the economy as whole. Production function will change with an improvement in technology.

Assumptions:

Production function has the following assumptions.

1. The production function is related to a particular period of time.

2. There is no change in technology.
3. The producer is using the best techniques available.
4. The factors of production are divisible.
5. Production function can be fitted to a short run or to long run.

Cobb-Douglas production function:

Production function of the linear homogenous type is invented by Juntwicksell and first tested by C. W. Cobb and P. H. Douglas in 1928. This famous statistical production function is known as Cobb-Douglas production function. Originally the function is applied on the empirical study of the American manufacturing industry. Cobb – Douglas production function takes the following mathematical form.

$$Y = (AK^{\alpha}L^{1-\alpha})$$

Where Y=output

K=Capital

L=Labour

A, α =positive constant

Assumptions:

It has the following assumptions

1. The function assumes that output is the function of two factors viz. capital and labour.
2. It is a linear homogenous production function of the first degree
3. The function assumes that the logarithm of the total output of the economy is a linear function of the logarithms of the labour force and capital stock.
4. There are constant returns to scale
5. All inputs are homogenous
6. There is perfect competition
7. There is no change in technology

ISOQUANTS

The term Isoquant is derived from the words ‘iso’ and ‘quant’ – ‘Iso’ means equal and ‘quant’ implies quantity. Isoquant therefore, means equal quantity. A family of iso-product curves or isoquant or production difference curves can represent a production function with two variable inputs, which are substitutable for one another within limits.

Isoquant are the curves, which represent the different combinations of inputs producing a particular quantity of output. Any combination on the isoquant represents the some level of output.

For a given output level firm’s production become,

$$Q = f(L, K)$$

Where ‘Q’, the units of output is a function of the quantity of two inputs ‘L’ and ‘K’.

Thus an isoquant shows all possible combinations of two inputs, which are capable of producing equal or a given level of output. Since each combination yields same output, the producer becomes indifferent towards these combinations.

Assumptions:

1. There are only two factors of production, viz. labour and capital.
2. The two factors can substitute each other up to certain limit
3. The shape of the isoquant depends upon the extent of substitutability of the two inputs.
4. The technology is given over a period.

An isoquant may be explained with the help of an arithmetical example.

| Combinations | Labour (units) | Capital (Units) | Output (quintals) |
|--------------|----------------|-----------------|-------------------|
| A | 1 | 10 | 50 |
| B | 2 | 7 | 50 |
| C | 3 | 4 | 50 |
| D | 4 | 4 | 50 |
| E | 5 | 1 | 50 |

Combination 'A' represent 1 unit of labour and 10 units of capital and produces '50' quintals of a product all other combinations in the table are assumed to yield the same given output of a product say '50' quintals by employing any one of the alternative combinations of the two factors labour and capital.

LAW OF PRODUCTION:

Production analysis in economics theory considers two types of input-output relationships.

1. When quantities of certain inputs, are fixed and others are variable and
2. When all inputs are variable.

These two types of relationships have been explained in the form of laws.

- i) Law of variable proportions
- ii) Law of returns to scale

I. Law of variable proportions:

The law of variable proportions which is a new name given to old classical concept of "Law of diminishing returns has played a vital role in the modern economics theory. Assume that a firms production function consists of fixed quantities of all inputs (land, equipment, etc.) except labour which is a variable input when the firm expands output by employing more and more labour it alters the proportion between fixed and the variable inputs. The law can be stated as follows:

"If equal increments of one input are added, the inputs of other production services being held constant, beyond a certain point the resulting increments of product will decrease i.e. the marginal product will diminish". (G. Stigler)

The law of variable proportions refers to the behaviour of output as the quantity of one Factor is increased Keeping the quantity of other factors fixed and further it states that the marginal product and average product will eventually do cline. This law states three types of productivity an input factor – Total, average and marginal physical productivity.

Assumptions of the Law: The law is based upon the following assumptions:

- i) The state of technology remains constant. If there is any improvement in technology, the average and marginal output will not decrease but increase.
- ii) Only one factor of input is made variable and other factors are kept constant. This law does not apply to those cases where the factors must be used in rigidly fixed proportions.
- iii) All units of the variable factors are homogenous.

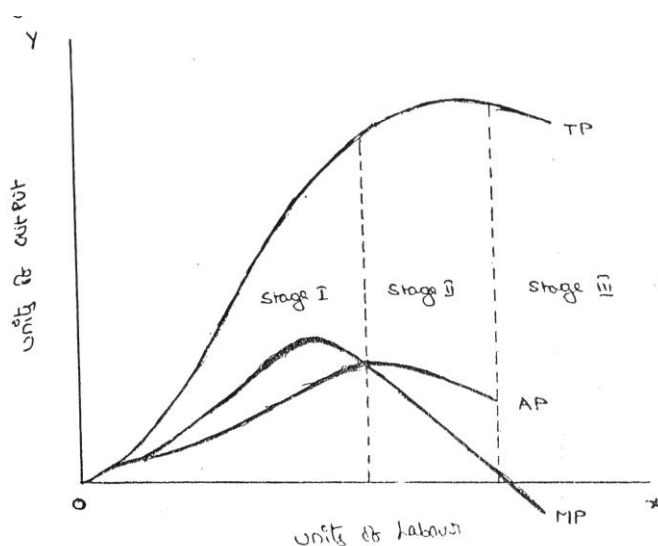
Three stages of law:

The behaviors of the Output when the varying quantity of one factor is combines with a fixed quantity of the other can be divided in to three district stages. The three stages can be better understood by following the table.

| Fixed factor | Variable factor (Labour) | Total product | Average Product | Marginal Product | |
|--------------|--------------------------|---------------|-----------------|------------------|-----------|
| 1 | 1 | 100 | 100 | - | Stage I |
| 1 | 2 | 220 | 120 | 120 | |
| 1 | 3 | 270 | 90 | 50 | |
| 1 | 4 | 300 | 75 | 30 | Stage II |
| 1 | 5 | 320 | 64 | 20 | |
| 1 | 6 | 330 | 55 | 10 | |
| 1 | 7 | 330 | 47 | 0 | Stage III |
| 1 | 8 | 320 | 40 | -10 | |

Above table reveals that both average product and marginal product increase in the beginning and then decline of the two marginal products drops of faster than average product. Total product is maximum when the farmer employs 6th worker, nothing is produced by the 7th worker and its marginal productivity is zero, whereas marginal product of 8th worker is '-10', by just creating credits 8th worker not only fails to make a positive contribution but leads to a fall in the total output.

Production function with one variable input and the remaining fixed inputs is illustrated as below



From the above graph the law of variable proportions operates in three stages. In the first stage, total product increases at an increasing rate. The marginal product in this stage increases at an increasing rate resulting in a greater increase in total product. The average product also increases. This stage continues up to the point where average product is equal to marginal product. The law of increasing returns is in operation at this stage. The law of diminishing returns starts operating from the second stage onwards. At the second stage total product increases only at a diminishing rate. The average product also declines. The second stage comes to an

end where total product becomes maximum and marginal product becomes zero. The marginal product becomes negative in the third stage. So the total product also declines. The average product continues to decline.

II. Law of Returns of Scale:

The law of returns to scale explains the behavior of the total output in response to change in the scale of the firm, i.e., in response to a simultaneous to changes in the scale of the firm, i.e., in response to a simultaneous and proportional increase in all the inputs. More precisely, the Law of returns to scale explains how a simultaneous and proportionate increase in all the inputs affects the total output at its various levels.

The concept of variable proportions is a short-run phenomenon as in these period fixed factors cannot be changed and all factors cannot be changed. On the other hand in the long-term all factors can be changed as made variable. When we study the changes in output when all factors or inputs are changed, we study returns to scale. An increase in the scale means that all inputs or factors are increased in the same proportion. In variable proportions, the cooperating factors may be increased or decreased and one faster (Ex. Land in agriculture (or) machinery in industry) remains constant so that the changes in proportion among the factors result in certain changes in output. In returns to scale all the necessary factors or production are increased or decreased to the same extent so that whatever the scale of production, the proportion among the factors remains the same.

When a firm expands, its scale increases all its inputs proportionally, then technically there are three possibilities. (i) The total output may increase proportionately (ii) The total output may increase more than proportionately and (iii) The total output may increase less than proportionately. If increase in the total output is proportional to the increase in input, it means constant returns to scale. If increase in the output is greater than the proportional increase in the inputs, it means increasing return to scale. If increase in the output is less than proportional increase in the inputs, it means diminishing returns to scale.

Let us now explain the laws of returns to scale with the help of isoquants for a two-input and single output production system.

ECONOMIES OF SCALE

Production may be carried on a small scale or on a large scale by a firm. When a firm expands its size of production by increasing all the factors, it secures certain advantages known as economies of production. Marshall has classified these economies of large-scale production into internal economies and external economies.

Internal economies are those, which are opened to a single factory or a single firm independently of the action of other firms. They result from an increase in the scale of output of a firm and cannot be achieved unless output increases. Hence internal economies depend solely upon the size of the firm and are different for different firms.

External economies are those benefits, which are shared in by a number of firms or industries when the scale of production in an industry or groups of industries increases. Hence external economies benefit all firms within the industry as the size of the industry expands.

Causes of internal economies:

Internal economies are generally caused by two factors

1. Indivisibilities
2. Specialization.

Internal Economies:

Internal economies may be of the following types.

- A). *Technical Economies.*
- B). *Managerial Economies*
- C). *Marketing Economies*
- D). *Financial Economies*
- E). *Risk bearing Economies*
- F). *Economies of Research*
- G). *Economies of welfare*

External Economies.

Business firm enjoys a number of external economies, which are discussed below:

- A). *Economies of Concentration*
- B). *Economies of Information*
- C). *Economies of Welfare*
- D). *Economies of Disintegration*

DISECONOMIES OF LARGE SCALE PRODUCTION

Internal Diseconomies:

- A). *Financial Diseconomies*
- B). *Managerial diseconomies*
- .C). *Marketing Diseconomies*
- D). *Technical Diseconomies:*
- E). *Diseconomies of Risk-taking*

External Diseconomies:

When many firm get located at a particular place, the costs of transportation increases due to congestion. The firms have to face considerable delays in getting raw materials and sending finished products to the marketing centers. The localization of industries may lead to scarcity of raw material, shortage of various factors of production like labour and capital, shortage of power, finance and equipments. All such external diseconomies tend to raise cost per unit.

COST ANALYSIS

Profit is the ultimate aim of any business and the long-run prosperity of a firm depends upon its ability to earn sustained profits. Profits are the difference between selling price and cost of production. In general the selling price is not within the control of a firm but many costs are under its control. The firm should therefore aim at controlling and minimizing cost. Since every business decision involves cost consideration, it is necessary to understand the meaning of various concepts for clear business thinking and application of right kind of costs.

COST CONCEPTS:

A managerial economist must have a clear understanding of the different cost concepts for clear business thinking and proper application. The several alternative bases of classifying cost and the relevance of each for different kinds of problems are to be studied. The various relevant concepts of cost are:

1. *Opportunity costs and outlay costs*
2. *Explicit and implicit costs*
3. *Historical and Replacement costs*
4. *Short – run and long – run costs*
5. *Out-of pocket and books costs*
6. *Fixed and variable costs*
7. *Past and Future costs*
8. *Avoidable and unavoidable costs.*
9. *Controllable and uncontrollable costs*
10. *Incremental and sunk costs*
11. *Total, average and marginal costs*

Accounting costs are the costs recorded for the purpose of preparing the balance sheet and profit and ton statements to meet the legal, financial and tax purpose of the company. The accounting concept is a historical concept and records what has happened in the post.

Economics concept considers future costs and future revenues, which help future planning, and choice, while the accountant describes what has happened, the economics aims at projecting what will happen.

BREAKEVEN ANALYSIS

The study of cost-volume-profit relationship is often referred as BEA. The term BEA is interpreted in two senses. In its narrow sense, it is concerned with finding out BEP; BEP is the point at which total revenue is equal to total cost. It is the point of no profit, no loss. In its broad determine the probable profit at any level of production.

Assumptions:

1. All costs are classified into two – fixed and variable.
2. Fixed costs remain constant at all levels of output.
3. Variable costs vary proportionally with the volume of output.
4. Selling price per unit remains constant in spite of competition or change in the volume of production.
5. There will be no change in operating efficiency.
6. There will be no change in the general price level.
7. Volume of production is the only factor affecting the cost.
8. Volume of sales and volume of production are equal. Hence there is no unsold stock.
9. There is only one product or in the case of multiple products. Sales mix remains constant.

Merits:

1. Information provided by the Break Even Chart can be understood more easily than those contained in the profit and Loss Account and the cost statement.
2. Break Even Chart discloses the relationship between cost, volume and profit. It reveals how changes in profit. So, it helps management in decision-making.
3. It is very useful for forecasting costs and profits long term planning and growth
4. The chart discloses profits at various levels of production.

5. It serves as a useful tool for cost control.
6. It can also be used to study the comparative plant efficiencies of the industry.
7. Analytical Break-even chart present the different elements, in the costs – direct material, direct labour, fixed and variable overheads.

Demerits:

1. Break-even chart presents only cost volume profits. It ignores other considerations such as capital amount, marketing aspects and effect of government policy etc., which are necessary in decision making.
2. It is assumed that sales, total cost and fixed cost can be represented as straight lines. In actual practice, this may not be so.
3. It assumes that profit is a function of output. This is not always true. The firm may increase the profit without increasing its output.
4. A major drawback of BEC is its inability to handle production and sale of multiple products.
5. It is difficult to handle selling costs such as advertisement and sale promotion in BEC.
6. It ignores economics of scale in production.
7. Fixed costs do not remain constant in the long run.
8. Semi-variable costs are completely ignored.
9. It assumes production is equal to sale. It is not always true because generally there may be opening stock.
10. When production increases variable cost per unit may not remain constant but may reduce on account of bulk buying etc.
11. The assumption of static nature of business and economic activities is a well-known defect of BEC.

Important terms in BEP

1. *Fixed cost*
2. *Variable Cost*
3. *Contribution*
4. *Margin of safety*
5. *Angle of incidence*
6. *Profit Volume Ratio*
7. *Break – Even- Point*

Assignment-Cum-Tutorial Questions

A. Questions testing the remembering / understanding level of students

I) Objective Questions

1. When different combinations of inputs yield the same level of output is known as -----
2. _____ is a 'group of firms producing the same or slightly different products for the same market or using same raw material'
3. When Total Fixed Cost (TFC) and Total Variable Cost (TVC) are added, we get _____
4. The quantities of output through a given _____ are equal.
5. The cost that are to be paid currently if the asset were to be replaced to be are called _____.
6. The rate at which one input factor is substituted with the other to attain a given level of output is called _____
7. Addition to costs as a result of change in the level of business activity is called _____.
8. Production function mathematically can be written as _____.
9. P/V ratio is also known as _____.
10. Conversion of inputs into output is called as _____.

II) Descriptive Questions

1. Explain the operation of law of diminishing returns and its business implications.
2. Explain Cobb-Douglas Production function.
3. How come Iso-Quants and Iso cost analysis help in Production decision making.
4. Briefly explain various Economies of scale.
5. Break even analysis is highly important in output Decision making. Discuss?
6. Define cost. Explain the different cost concepts used in the process of cost analysis.
7. Explain the following with reference to production functions
 - a. MRTS
 - b. Variable proportion of factor

B. Question testing the ability of students in applying the concepts.

I) Multiple Choice Questions:

1. When a firm expands its size of production by increasing all factors, it secures certain advantages, known as _____ ()
(a) Optimum Size (b) Diseconomies of Scale
(c) Economies of Scale (d) None
2. When Proportionate increase in all inputs results in less than Equal Proportionate increase in output, then we call _____. ()
(a) Increasing Returns to Scale (b) Constant Returns to Scale
(c) Decreasing Returns to Scale (d) None
3. The point of no profit and no loss is _____ ()
(a) Maximum point (b) Minimum point
(c) Break-Even point (d) Average point
4. The price of pen is Rs.18/- and the variable cost to produce 1 unit is Rs.7/- .calculate contribution per unit?
(a) 10 (b) 11

- (c) 21 (d) 25

5. A curve showing equal amount of outlay with varying Proportions of two inputs are called _____ ()

- (a) Total Cost Curve (b) Variable Cost Curve
(c) Isocost Curve (d) Marginal Cost Curve

6. _____ cost is the additional cost to produce an additional unit of output. ()

- (a) Incremental (b) Sunk
(c) Marginal (d) Total

7. The cost incurred to purchase machinery worth Rs.1,00,000/- is _____ Cost

- (a) Incremental (b) Variable
(c) Fixed (d) Total.

8. Telephone charges or Electricity charges are _____ costs.

- (a) fixed (b) Variable
(c) Semi-Fixed and Semi variable (d) Total.

9." Delegating routine matters to the office staff and leaving managers free to concentrate on problem areas" represent _____ economies. ()

- (a) Managerial (b) Technical
(c) Decision (d) Delegation.

10. The line representing the least cost combination of inputs for different levels of output ()

- (a) Straight line (b) Expansion path.
(c) Engel line (d) output path

II) Problems:

1. The information about Raj & Co are given below:

PV ratio : 20%
Fixed Cost : Rs. 36,000/-
Selling Price per Unit: Rs. 150/-

Calculate (i) BEP in rupees (ii) BEP in Units.

2. Mrs. Venu and co. is producing Water purifiers. The cost incurred in the production are as below

- a) Fixed cost Rs.1, 20,000/-.
b) Variable cost per unit is Rs.400/-

When the organization is selling each unit Rs.800/-find the Break-even point in volume and sales.

UNIT – III

Objective: To understand different types of markets based on market structure and price output determination in those markets and also to understand different pricing methods.

Syllabus:

Market structures- types of competition, features of perfect competition, monopoly and monopolistic competition. Price output determination under perfect competition

Pricing strategies- methods of pricing, cost plus pricing, marginal cost pricing, sealed bid pricing, going rate pricing, limit pricing, market skimming pricing, penetration pricing, block pricing, bundling pricing, peak load pricing.

Learning Outcomes:

After completing this unit the student is able to understand

- Different types of markets and their competitive situations based on market structure
- Characteristics of perfect market, monopoly and monopolistic competition
- Price output determination under perfect competition and monopoly and monopolistic competition
- Different pricing methods and strategies based on market conditions

Learning Material

INTRODUCTION TO MARKET AND PRICING STRATEGIES

Pricing

Introduction: Pricing is an important, if not the most important function of all enterprises. Since every enterprise is engaged in the production of some goods or/and service. Incurring some expenditure, it must set a price for the same to sell it in the market. It is only in extreme cases that the firm has no say in pricing its product; because there is severe or rather perfect competition in the market of the good happens to be of such public significance that its price is decided by the government. In an overwhelmingly large number of cases, the individual producer plays the role in pricing its product.

Price: Price denotes the exchange value of a unit of good expressed in terms of money.

MARKET

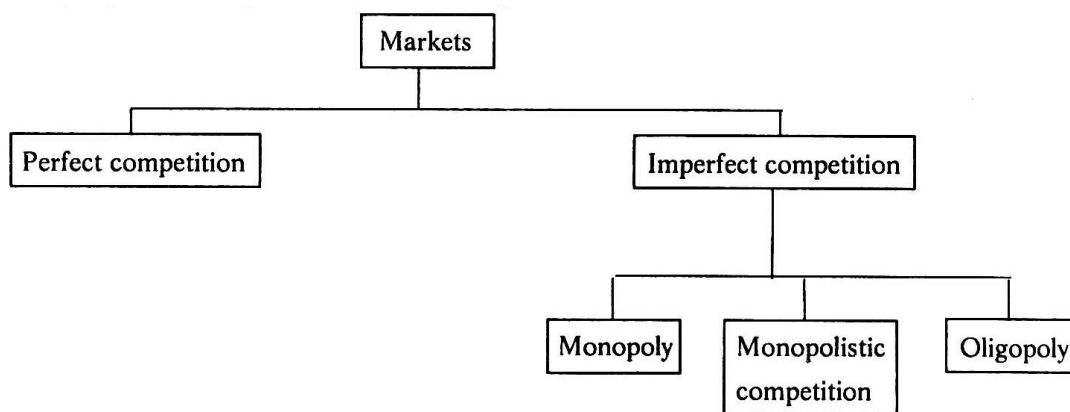
Market is a place where buyer and seller meet, goods and services are offered for the sale and transfer of ownership occurs. A market may be also defined as the demand made by a certain group of potential buyers for a good or service. The former one is a narrow concept and later one, a broader concept. Economists describe a market as a collection of buyers and sellers who transact over a particular product or product class (the housing market, the clothing market, the grain market etc.). For business purpose we define a market as people or organizations with wants (needs) to satisfy, money to spend, and the willingness to spend it. Broadly, market represents the structure and nature of buyers and sellers for a commodity/service and the

process by which the price of the commodity or service is established. Hence the understanding on the market structure and the nature of competition are a pre-requisite in price determination.

Different Market Structures

Market structure describes the competitive environment in the market for any good or service. A market consists of all firms and individuals who are willing and able to buy or sell a particular product. This includes firms and individuals currently engaged in buying and selling a particular product, as well as potential entrants.

The determination of price is affected by the competitive structure of the market. This is because the firm operates in a market and not in isolation. In making decisions concerning economic variables it is affected, as are all institutions in society by its environment.



Perfect Competition

Perfect competition refers to a market structure where competition among the sellers and buyers prevails in its most perfect form. In a perfectly competitive market, a single market price prevails for the commodity, which is determined by the forces of total demand and total supply in the market.

Characteristics of Perfect Competition: The following features characterize a perfectly competitive market:

- 1. A large number of buyers and sellers:** The number of buyers and sellers is large and the share of each one of them in the market is so small that none has any influence on the market price.
- 2. Homogeneous product:** The product of each seller is totally undifferentiated from those of the others.
- 3. Free entry and exit:** Any buyer and seller is free to enter or leave the market of the commodity.
- 4. Perfect knowledge:** All buyers and sellers have perfect knowledge about the market for the commodity.
- 5. Indifference:** No buyer has a preference to buy from a particular seller and no seller to sell to a particular buyer.

6. **Non-existence of transport costs:** Perfectly competitive market also assumes the non-existence of transport costs.
7. **Perfect mobility of factors of production:** Factors of production must be in a position to move freely into or out of industry and from one firm to the other.

Under such a market no single buyer or seller plays a significant role in price determination. On the other hand all of them jointly determine the price. The price is determined in the industry, which is composed of all the buyers and seller for the commodity. The demand curve facing the industry is the sum of all consumers' demands at various prices. The industry supply curve is the sum of all sellers' supplies at various prices.

Monopoly

The word monopoly is made up of two syllables, Mono and poly. Mono means single while poly implies selling. Thus monopoly is a form of market organization in which there is only one seller of the commodity. There are no close substitutes for the commodity sold by the seller. Pure monopoly is a market situation in which a single firm sells a product for which there is no good substitute.

Features of monopoly: The following are the features of monopoly.

1. **Single person or a firm:** A single person or a firm controls the total supply of the commodity. There will be no competition for monopoly firm. The monopolist firm is the only firm in the whole industry.
2. **No close substitute:** The goods sold by the monopolist shall not have closely competition substitutes. Even if price of monopoly product increase people will not go in for substitute. For example: If the price of electric bulb increase slightly, consumer will not go in for kerosene lamp.
3. **Large number of Buyers:** Under monopoly, there may be a large number of buyers in the market who compete among themselves.
4. **Price Maker:** Since the monopolist controls the whole supply of a commodity, he is a price-maker, and then he can alter the price.
5. **Supply and Price:** The monopolist can fix either the supply or the price. He cannot fix both. If he charges a very high price, he can sell a small amount. If he wants to sell more, he has to charge a low price. He cannot sell as much as he wishes for any price he pleases.
6. **Downward Sloping Demand Curve:** The demand curve (average revenue curve) of monopolist slopes downward from left to right. It means that he can sell more only by lowering price.

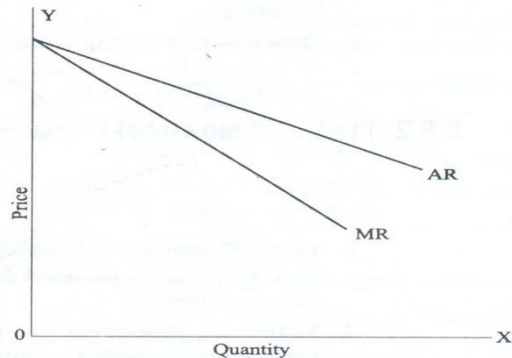


Fig. 6.11

Monopolistic

competition

Perfect competition and

pure monopoly are rare phenomena

in the real world. Instead, almost every market seems to exhibit characteristics of both perfect competition and monopoly. Hence in the real world it is the state of imperfect competition lying between these two extreme limits that work. Edward. H. Chamberlain developed the theory of monopolistic competition, which presents a more realistic picture of the actual market structure and the nature of competition.

Characteristics of Monopolistic Competition:

The important characteristics of monopolistic competition are:

1. **Existence of Many firms:** Industry consists of a large number of sellers, each one of whom does not feel dependent upon others. Every firm acts independently without bothering about the reactions of its rivals. The size is so large that an individual firm has only a relatively small part in the total market, so that each firm has very limited control over the price of the product. As the number is relatively large it is difficult for these firms to determine its price- output policies without considering the possible reactions of the rival forms. A monopolistically competitive firm follows an independent price policy.
2. **Product Differentiation:** Product differentiation means that products are different in some ways, but not altogether so. The products are not identical but the same time they will not be entirely different from each other. IT really means that there are various monopolist firms competing with each other. An example of monopolistic competition and product differentiation is the toothpaste produced by various firms.
3. **Large Number of Buyers:** There are large number buyers in the market. But the buyers have their own brand preferences. So the sellers are able to exercise a certain degree of monopoly over them. Each seller has to plan various incentive schemes to retain the customers who patronize his products.
4. **Free Entry and Exist of Firms:** As in the perfect competition, in the monopolistic competition too, there is freedom of entry and exit. That is, there is no barrier as found under monopoly.
5. **Selling costs:** Since the products are close substitute much effort is needed to retain the existing consumers and to create new demand. So each firm has to spend a lot on selling cost, which includes cost on advertising and other sale promotion activities.

6. **Imperfect Knowledge:** Imperfect knowledge about the product leads to monopolistic competition. If the buyers are fully aware of the quality of the product they cannot be influenced much by advertisement or other sales promotion techniques. But in the business world we can see that though the quality of certain products is the same, effective advertisement and sales promotion techniques make certain brands monopolistic. For examples, effective dealer service backed by advertisement-helped popularization of some brands through the quality of almost all the cement available in the market remains the same.
7. **The Group:** Under perfect competition the term industry refers to all collection of firms producing a homogenous product. But under monopolistic competition the products of various firms are not identical though they are close substitutes. Prof. Chamberlin called the collection of firms producing close substitute products as a group.

Oligopoly

The term oligopoly is derived from two Greek words, oligos meaning a few, and pollen meaning to sell. Oligopoly is the form of imperfect competition where there are a few firms in the market, producing either a homogeneous product or producing products, which are close but not perfect substitute of each other.

Characteristics of Oligopoly

The main features of oligopoly are:

1. **Few Firms:** There are only a few firms in the industry. Each firm contributes a sizeable share of the total market. Any decision taken by one firm influence the actions of other firms in the industry. The various firms in the industry compete with each other.
2. **Interdependence:** As there are only very few firms, any steps taken by one firm to increase sales, by reducing price or by changing product design or by increasing advertisement expenditure will naturally affect the sales of other firms in the industry. An immediate retaliatory action can be anticipated from the other firms in the industry every time when one firm takes such a decision. He has to take this into account when he takes decisions. So the decisions of all the firms in the industry are interdependent.
3. **Indeterminate Demand Curve:** The interdependence of the firms makes their demand curve indeterminate. When one firm reduces price other firms also will make a cut in their prices. So he firm cannot be certain about the demand for its product. Thus the demand curve facing an oligopolistic firm loses its definiteness and thus is indeterminate as it constantly changes due to the reactions of the rival firms.
4. **Advertising and selling costs:** Advertising plays a greater role in the oligopoly market when compared to other market systems. According to Prof. William J. Banumol “it is only oligopoly that advertising comes fully into its own”. A huge expenditure on advertising and sales promotion

techniques is needed both to retain the present market share and to increase it. So Banumol concludes “under oligopoly, advertising can become a life-and-death matter where a firm which fails to keep up with the advertising budget of its competitors may find its customers drifting off to rival products.”

- 5. Price Rigidity:** In the oligopoly market price remain rigid. If one firm reduced price it is with the intention of attracting the customers of other firms in the industry. In order to retain their consumers they will also reduce price. Thus the pricing decision of one firm results in a loss to all the firms in the industry. If one firm increases price. Other firms will remain silent there by allowing that firm to lost its customers. Hence, no firm will be ready to change the prevailing price. It causes price rigidity in the oligopoly market.

Other Market Structures

Duopoly

Duopoly refers to a market situation in which there are only two sellers. As there are only two sellers any decision taken by one seller will have reaction from the other Eg. Coca-Cola and Pepsi. Usually these two sellers may agree to co-operate each other and share the market equally between them, So that they can avoid harmful competition.

The duopoly price, in the long run, may be a monopoly price or competitive price, or it may settle at any level between the monopoly price and competitive price. In the short period, duopoly price may even fall below the level competitive price with the both the firms earning less than even the normal price.

Monopsony

Mrs. Joan Robinson was the first writer to use the term monopsony to refer to market, which there is a single buyer. Monoposony is a single buyer or a purchasing agency, which buys the show, or nearly whole of a commodity or service produced. It may be created when all consumers of a commodity are organized together and/or when only one consumer requires that commodity which no one else requires.

Bilateral Monopoly

A bilateral monopoly is a market situation in which a single seller (Monopoly) faces a single buyer (Monoposony). It is a market of monopoly-monoposy.

Oligopsony

Oligopsony is a market situation in which there will be a few buyers and many sellers. As the sellers are more and buyers are few, the price of product will be comparatively low but not as low as under monopoly.

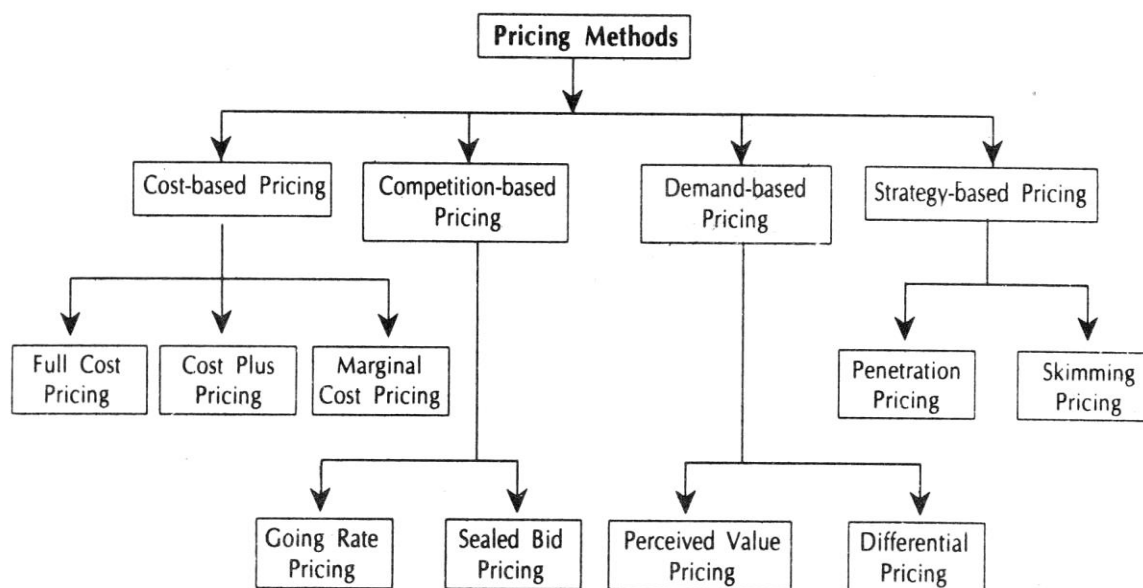
Pricing Methods

The micro – economic principle of profit maximization suggests pricing by the marginal analysis. That is by equating MR to MC. However the pricing methods followed by the firms in practice around the world rarely

follow this procedure. This is for two reasons; uncertainty with regard to demand and cost function and the deviation from the objective of short run profit maximization.

It was seen that there is no unique theory of firm behavior. While profit certainly on important variable for which every firm cares. Maximization of short – run profit is not a popular objective of a firm today. At the most firms seek maximum profit in the long run. If so the problem is dynamic and its solution requires accurate knowledge of demand and cost conditions over time. Which is impossible to come by?

In view of these problems economic prices are a rare phenomenon. Instead, firms set prices for their products through several alternative means. The important pricing methods followed in practice are shown in the chart.



Assignment-Cum-Tutorial Questions

A. Questions testing the remembering / understanding level of students

I) Objective Questions

1. Exchange value of a unit of good expressed in terms of money is called ()
 (a) Price (b) Capital (c) Cost (d) Expenditure
2. The price at which demand and supply of a commodity equal is known as ()
 (a) High price (b) Equilibrium price (c) Low price (d) Marginal price
3. The Price determined in the very short period is known as _____ ()
 (a) Secular price (b) Normal price
 (c) Market price (d) Short run price
4. _____ is a place in which goods and services are bought and sold. ()

(a) Factory (b) Workshop (c) Warehouse (d) Market

5. ____ is a form of market organization in which there is only one seller of the commodity ()

(a) Perfect Competition (b) Duopoly

(c) Monopoly (d) Oligopoly

6. A market where large number of buyers and sellers dealing in homogeneous product with perfect knowledge is called ()

(a) Imperfect competition (b) Monopoly

(c) Perfect competition (d) Monopolistic competition

7. _____ is the example for perishable goods. ()

(a) Pens (b) Vegetables (c) Chairs (d) Cloths

B. Question testing the ability of students in applying the concepts.

1. What is a market? Explain, in brief, the different market structures.

2. Explain the following with the help of the diagram under perfect competition and monopoly

Total Revenue

Marginal Revenue

Average Revenue

3. Discuss the differences between Monopoly and Perfect competition

4. What are the characteristics of Oligopoly?

5. What is price? Explain the objectives of pricing.

Multiple Choice Questions:

1. The price of a product is determined by the _____ of that product ()

(a) Demand and supply (b) Production and sales (c) Place and time (d) Cost and income

2. The firm is said to be in equilibrium, when it's Marginal Cost (MC) equals to ____ ()

(a) Total cost (b) Marginal Revenue

(c) Total revenue (d) Average Revenue

3. ____ is a position where the firm has no incentive either to expand or contract its output ()

(a) Maximum output (b) Minimum output

(c) Equilibrium (d) None

4. In which market, single market price prevails for the commodity ()

(a) Monopoly market (b) Oligopoly market

(c) Duopoly market (d) Perfect competition market

5. Marginal revenue, Average revenue and Demand are the same in ____ market environment

- (a) Monopoly (b) Duopoly (c) Perfect Competition (d) Imperfect Competition ()
6. In Monopoly market environment, seller is the _____. ()
 (a) Price - Taker (b) Price - Acceptor (c) Price - Maker (d) None
7. In perfect competition market, seller is the _____. ()
 (a) Price – Maker (b) Price changer
 (c) Price – Taker (d) Price Dictator
8. Charging very high price in the beginning and reducing it gradually is called ()
 (a) Differential pricing (b) Sealed bid pricing
 (c) Penetration pricing (d) Skimming pricing
9. Charging Very Low price in the beginning and increasing it gradually is called _____ ()
 (a) Differential pricing (b) Sealed bid Pricing
 (c) Penetration Pricing (d) Skimming Pricing

Questions testing the analyzing / evaluating ability of students

1. What do you mean by Perfect Market Structure and explain its features?
2. Write short notes on the following
 - a) Monopoly.
 - b) Monopolistic competition.
 - c) Oligopoly competition.
3. _____ Discuss important methods of pricing?

UNIT – IV

Objective:

- To build a foundation of knowledge on the different forms of Business Organizations and Business Cycle.
- To provide a comprehensive introduction to the key elements of the business organisation.

Syllabus:

Unit IV: Introduction to Business Organizations

Characteristics features of Business, features and evaluation of sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario & Phases of Business Cycle.

Learning Outcomes:

- Distinguish among the various forms of business ownership and various ways of getting a business started.
- Describe and discuss the various factors necessary for cultivating a business in a diverse global environment.

Learning Material

Introduction:

Factors affecting the choice of form of business organization

The following are the factors affecting the choice of a business organization:

1. **Easy to start and easy to close:** The form of business organization should be such that it should be easy to close. There should not be hassles or long procedures in the process of setting up business or closing the same.
2. **Division of labour:** There should be possibility to divide the work among the available owners.
3. **Large amount of resources:** Large volume of business requires large volume of resources. Some forms of business organization do not permit to raise larger resources. Select the one which permits to mobilize the large resources.
4. **Liability:** The liability of the owners should be limited to the extent of money invested in business. It is better if their personal properties are not brought into business to make up the losses of the business.
5. **Secrecy:** The form of business organization you select should be such that it should permit to take care of the business secrets. We know that century old business units are still surviving only because they could successfully guard their business secrets.
6. **Transfer of ownership:** There should be simple procedures to transfer the ownership to the next legal heir.
7. **Ownership, Management and control:** If ownership, management and control are in the hands of one or a small group of persons, communication will be effective and coordination will be easier. Where ownership, management and control are widely distributed, it calls for a high degree of professional's skills to monitor the performance of the business.
8. **Continuity:** The business should continue forever and ever irrespective of the uncertainties in future.
9. **Quick decision-making:** Select such a form of business organization, which permits you to take decisions quickly and promptly. Delay in decisions may invalidate the relevance of the decisions.
10. **Personal contact with customer:** Most of the times, customers give us clues to improve business. So choose such a form, which keeps you close to the customers.
11. **Flexibility:** In times of rough weather, there should be enough flexibility to shift from one business to the other. The lesser the funds committed in a particular business, the better it is.
12. **Taxation:** More profit means more tax. Choose such a form, which permits to pay low tax.

SOLE TRADER

The sole trader is the simplest, oldest and natural form of business organization. It is also called sole proprietorship. 'Sole' means one. 'Sole trader' implies that there is only one trader who is the owner of the business.

It is a one-man form of organization wherein the trader assumes all the risk of ownership carrying out the business with his own capital, skill and intelligence. He is the boss for himself. He has total operational freedom. He is the owner, Manager and controller. He has total freedom and flexibility. Full control lies with him. He can take his own decisions. He can choose or drop a particular product or business based on its merits. He need not discuss this with anybody. He is responsible for himself. This form of organization is popular all over the world. Restaurants, Supermarkets, pan shops, medical shops, hosiery shops etc.

Features

- It is easy to start a business under this form and also easy to close.
- He introduces his own capital. Sometimes, he may borrow, if necessary
- He enjoys all the profits and in case of loss, he lone suffers.
- He has unlimited liability which implies that his liability extends to his personal properties in case of loss.
- He has a high degree of flexibility to shift from one business to the other.
- Business secretes can be guarded well
- There is no continuity. The business comes to a close with the death, illness or insanity of the sole trader. Unless, the legal heirs show interest to continue the business, the business cannot be restored.
- He has total operational freedom. He is the owner, manager and controller.
- He can be directly in touch with the customers.
- He can take decisions very fast and implement them promptly.
- Rates of tax, for example, income tax and so on are comparatively very low.

Advantages

The following are the advantages of the sole trader from of business organization:

1. **Easy to start and easy to close:** Formation of a sole trader from of organization is relatively easy even closing the business is easy.
2. **Personal contact with customers directly:** Based on the tastes and preferences of the customers the stocks can be maintained.
3. **Prompt decision-making:** To improve the quality of services to the customers, he can take any decision and implement the same promptly. He is the boss and he is responsible for his business Decisions relating to growth or expansion can be made promptly.
4. **High degree of flexibility:** Based on the profitability, the trader can decide to continue or change the business, if need be.
5. **Secrecy:** Business secrets can well be maintained because there is only one trader.
6. **Low rate of taxation:** The rate of income tax for sole traders is relatively very low.

7. **Direct motivation:** If there are profits, all the profits belong to the trader himself. In other words. If he works more hard, he will get more profits. This is the direct motivating factor. At the same time, if he does not take active interest, he may stand to lose badly also.
8. **Total Control:** The ownership, management and control are in the hands of the sole trader and hence it is easy to maintain the hold on business.
9. **Minimum interference from government:** Except in matters relating to public interest, government does not interfere in the business matters of the sole trader. The sole trader is free to fix price for his products/services if he enjoys monopoly market.
10. **Transferability:** The legal heirs of the sole trader may take the possession of the business.

Disadvantages

The following are the disadvantages of sole trader form:

1. **Unlimited liability:** The liability of the sole trader is unlimited. It means that the sole trader has to bring his personal property to clear off the loans of his business. From the legal point of view, he is not different from his business.
2. **Limited amounts of capital:** The resources a sole trader can mobilize cannot be very large and hence this naturally sets a limit for the scale of operations.
3. **No division of labour:** All the work related to different functions such as marketing, production, finance, labour and so on has to be taken care of by the sole trader himself. There is nobody else to take his burden. Family members and relatives cannot show as much interest as the trader takes.
4. **Uncertainty:** There is no continuity in the duration of the business. On the death, insanity of insolvency the business may be come to an end.
5. **Inadequate for growth and expansion:** This form is suitable for only small size, one-man-show type of organizations. This may not really work out for growing and expanding organizations.
6. **Lack of specialization:** The services of specialists such as accountants, market researchers, consultants and so on, are not within the reach of most of the sole traders.
7. **More competition:** Because it is easy to set up a small business, there is a high degree of competition among the small businessmen and a few who are good in taking care of customer requirements along can service.
8. **Low bargaining power:** The sole trader is the in the receiving end in terms of loans or supply of raw materials. He may have to compromise many times regarding the terms and conditions of purchase of materials or borrowing loans from the finance houses or banks.

PARTNERSHIP

Partnership is an improved form of sole trader in certain respects. Where there are like-minded persons with resources, they can come together to do the business and share the profits/losses of the business in an agreed ratio. Persons who have entered into such an agreement are individually called 'partners' and collectively called 'firm'. The relationship among partners is called a partnership.

Indian Partnership Act, 1932 defines partnership as the relationship between two or more persons who agree to share the profits of the business carried on by all or any one of them acting for all.

Features

1. **Relationship:** Partnership is a relationship among persons. It is relationship resulting out of an agreement.
2. **Two or more persons:** There should be two or more number of persons.
3. **There should be a business:** Business should be conducted.
4. **Agreement:** Persons should agree to share the profits/losses of the business

5. **Carried on by all or any one of them acting for all:** The business can be carried on by all or any one of the persons acting for all. This means that the business can be carried on by one person who is the agent for all other persons. Every partner is both an agent and a principal. Agent for other partners and principal for himself. All the partners are agents and the 'partnership' is their principal.

The following are the other features:

- (a) **Unlimited liability:** The liability of the partners is unlimited. The partnership and partners, in the eye of law, are not different but one and the same. Hence, the partners have to bring their personal assets to clear the losses of the firm, if any.
- (b) **Number of partners:** According to the Indian Partnership Act, the minimum number of partners should be two and the maximum number is restricted, as given below:
 - 10 partners in case of banking business
 - 20 in case of non-banking business
- (c) **Division of labour:** Because there are more than two persons, the work can be divided among the partners based on their aptitude.
- (d) **Personal contact with customers:** The partners can continuously be in touch with the customers to monitor their requirements.
- (e) **Flexibility:** All the partners are likeminded persons and hence they can take any decision relating to business.

Partnership Deed

The written agreement among the partners is called 'the partnership deed'. It contains the terms and conditions governing the working of partnership. The following are contents of the partnership deed.

1. Names and addresses of the firm and partners
2. Nature of the business proposed
3. Duration
4. Amount of capital of the partnership and the ratio for contribution by each of the partners.
5. Their profit sharing ratio (this is used for sharing losses also)
6. Rate of interest charged on capital contributed, loans taken from the partnership and the amounts drawn, if any, by the partners from their respective capital balances.
7. The amount of salary or commission payable to any partner
8. Procedure to value good will of the firm at the time of admission of a new partner, retirement or death of a partner
9. Allocation of responsibilities of the partners in the firm
10. Procedure for dissolution of the firm
11. Name of the arbitrator to whom the disputes, if any, can be referred to for settlement.
12. Special rights, obligations and liabilities of partners(s), if any.

KIND OF PARTNERS

The following are the different kinds of partners:

1. **Active Partner:** Active partner takes active part in the affairs of the partnership. He is also called working partner.
2. **Sleeping Partner:** Sleeping partner contributes to capital but does not take part in the affairs of the partnership.
3. **Nominal Partner:** Nominal partner is partner just for namesake. He neither contributes to capital nor takes part in the affairs of business. Normally, the nominal partners are those who have good business connections, and are well placed in the society.

4. **Partner by Estoppels:** Estoppels means behavior or conduct. Partner by estoppels gives an impression to outsiders that he is the partner in the firm. In fact he neither contributes to capital, nor takes any role in the affairs of the partnership.
5. **Partner by holding out:** If partners declare a particular person (having social status) as partner and this person does not contradict even after he comes to know such declaration, he is called a partner by holding out and he is liable for the claims of third parties. However, the third parties should prove they entered into contract with the firm in the belief that he is the partner of the firm. Such a person is called partner by holding out.
6. **Minor Partner:** Minor has a special status in the partnership. A minor can be admitted for the benefits of the firm. A minor is entitled to his share of profits of the firm. The liability of a minor partner is limited to the extent of his contribution of the capital of the firm.

Right of partners

Every partner has right

- (a) To take part in the management of business
- (b) To express his opinion
- (c) Of access to and inspect and copy and book of accounts of the firm
- (d) To share equally the profits of the firm in the absence of any specific agreement to the contrary
- (e) To receive interest on capital at an agreed rate of interest from the profits of the firm
- (f) To receive interest on loans, if any, extended to the firm.
- (g) To be indemnified for any loss incurred by him in the conduct of the business
- (h) To receive any money spent by him in the ordinary and proper conduct of the business of the firm.

Advantages

The following are the advantages of the partnership from:

1. **Easy to form:** Once there is a group of like-minded persons and good business proposal, it is easy to start and register a partnership.
2. **Availability of larger amount of capital:** More amount of capital can be raised from more number of partners.
3. **Division of labour:** The different partners come with varied backgrounds and skills. This facilitates division of labour.
4. **Flexibility:** The partners are free to change their decisions, add or drop a particular product or start a new business or close the present one and so on.
5. **Personal contact with customers:** There is scope to keep close monitoring with customers requirements by keeping one of the partners in charge of sales and marketing. Necessary changes can be initiated based on the merits of the proposals from the customers.
6. **Quick decisions and prompt action:** If there is consensus among partners, it is enough to implement any decision and initiate prompt action. Sometimes, it may take more time for the partners on strategic issues to reach consensus.
7. **The positive impact of unlimited liability:** Every partner is always alert about his impending danger of unlimited liability. Hence he tries to do his best to bring profits for the partnership firm by making good use of all his contacts.

Disadvantages:

The following are the disadvantages of partnership:

1. **Formation of partnership is difficult:** Only like-minded persons can start a partnership. It is sarcastically said, 'it is easy to find a life partner, but not a business partner'.
2. **Liability:** The partners have joint and several liabilities beside unlimited liability. Joint and several liability puts additional burden on the partners, which means that even the personal properties of the partner or partners can be attached. Even when all but one partner become insolvent, the solvent partner has to bear the entire burden of business loss.
3. **Lack of harmony or cohesiveness:** It is likely that partners may not, most often work as a group with cohesiveness. This result in mutual conflicts, an attitude of suspicion and crisis of confidence. Lack of harmony results in delay in decisions and paralyses the entire operations.
4. **Limited growth:** The resources when compared to sole trader, a partnership may raise little more. But when compare to the other forms such as a company, resources raised in this form of organization are limited. Added to this, there is a restriction on the maximum number of partners.
5. **Instability:** The partnership form is known for its instability. The firm may be dissolved on death, insolvency or insanity of any of the partners.
6. **Lack of Public confidence:** Public and even the financial institutions look at the unregistered firm with a suspicious eye. Though registration of the firm under the Indian Partnership Act is a solution of such problem, this cannot revive public confidence into this form of organization overnight. The partnership can create confidence in other only with their performance.

JOINT STOCK COMPANY

The joint stock company emerges from the limitations of partnership such as joint and several liability, unlimited liability, limited resources and uncertain duration and so on. Normally, to take part in a business, it may need large money and we cannot foretell the fate of business. It is not literally possible to get into business with little money. Against this background, it is interesting to study the functioning of a joint stock company. The main principle of the joint stock company from is to provide opportunity to take part in business with a low investment as possible say Rs.1000. Joint Stock Company has been a boon for investors with moderate funds to invest.

The word 'company' has a Latin origin, com means 'come together', pany means 'bread', joint stock company means, people come together to earn their livelihood by investing in the stock of company jointly.

Company Defined

Lord justice Lindley explained the concept of the joint stock company from of organization as 'an association of many persons who contribute money or money's worth to a common stock and employ it for a common purpose.

Features

This definition brings out the following features of the company:

1. **Artificial person:** The Company has no form or shape. It is an artificial person created by law. It is intangible, invisible and existing only, in the eyes of law.
2. **Separate legal existence:** it has an independence existence, it separate from its members. It can acquire the assets. It can borrow for the company. It can sue other if they are in default in payment of dues, breach of contract with it, if any. Similarly, outsiders for any claim can sue it. A shareholder is not liable for the acts of the company. Similarly, the shareholders cannot bind the company by their acts.

3. **Voluntary association of persons:** The Company is an association of voluntary association of persons who want to carry on business for profit. To carry on business, they need capital. So they invest in the share capital of the company.
4. **Limited Liability:** The shareholders have limited liability i.e., liability limited to the face value of the shares held by him. In other words, the liability of a shareholder is restricted to the extent of his contribution to the share capital of the company. The shareholder need not pay anything, even in times of loss for the company, other than his contribution to the share capital.
5. **Capital is divided into shares:** The total capital is divided into a certain number of units. Each unit is called a share. The price of each share is priced so low that every investor would like to invest in the company. The companies promoted by promoters of good standing (i.e., known for their reputation in terms of reliability character and dynamism) are likely to attract huge resources.
6. **Transferability of shares:** In the company form of organization, the shares can be transferred from one person to the other. A shareholder of a public company can sell his holding of shares at his will. However, the shares of a private company cannot be transferred. A private company restricts the transferability of the shares.
7. **Common Seal:** As the company is an artificial person created by law has no physical form, it cannot sign its name on a paper; so, it has a common seal on which its name is engraved. The common seal should affix every document or contract; otherwise the company is not bound by such a document or contract.
8. **Perpetual succession:** ‘Members may come and members may go, but the company continues for ever and ever’ A. company has uninterrupted existence because of the right given to the shareholders to transfer the shares.
9. **Ownership and Management separated:** The shareholders are spread over the length and breadth of the country, and sometimes, they are from different parts of the world. To facilitate administration, the shareholders elect some among themselves or the promoters of the company as directors to a Board, which looks after the management of the business. The Board recruits the managers and employees at different levels in the management. Thus the management is separated from the owners.
10. **Winding up:** Winding up refers to the putting an end to the company. Because law creates it, only law can put an end to it in special circumstances such as representation from creditors of financial institutions, or shareholders against the company that their interests are not safeguarded. The company is not affected by the death or insolvency of any of its members.
11. **The name of the company ends with ‘limited’:** it is necessary that the name of the company ends with limited (Ltd.) to give an indication to the outsiders that they are dealing with the company with limited liability and they should be careful about the liability aspect of their transactions with the company.

Formation of Joint Stock Company

There are two stages in the formation of a joint stock company. They are:

- (a) To obtain Certificates of Incorporation
- (b) To obtain certificate of commencement of Business

Certificate of Incorporation: The certificate of Incorporation is just like a ‘date of birth’ certificate. It certifies that a company with such and such a name is born on a particular day.

Certificate of commencement of Business: A private company need not obtain the certificate of commencement of business. It can start its commercial operations immediately after obtaining the certificate of Incorporation.

The persons who conceive the idea of starting a company and who organize the necessary initial resources are called promoters. The vision of the promoters forms the backbone for the company in the future to reckon with.

The promoters have to file the following documents, along with necessary fee, with a registrar of joint stock companies to obtain certificate of incorporation:

- (a) **Memorandum of Association:** The Memorandum of Association is also called the charter of the company. It outlines the relations of the company with the outsiders. It furnishes all its details in six clauses such as (i) Name clause (ii) situation clause (iii) objects clause (iv) Capital clause and (v) subscription clause duly executed by its subscribers.
- (b) **Articles of association:** Articles of Association furnish the byelaws or internal rules governing the internal conduct of the company.
- (c) The list of names and address of the proposed directors and their willingness, in writing to act as such, in case of registration of a public company.
- (d) A statutory declaration that all the legal requirements have been fulfilled. The declaration has to be duly signed by any one of the following: Company secretary in whole practice, the proposed director, legal solicitor, chartered accountant in whole time practice or advocate of High court.

The registrar of joint stock companies peruses and verifies whether all these documents are in order or not. If he is satisfied with the information furnished, he will register the documents and then issue a certificate of incorporation, if it is private company, it can start its business operation immediately after obtaining certificate of incorporation.

Advantages

The following are the advantages of a joint Stock Company

1. **Mobilization of larger resources:** A joint stock company provides opportunity for the investors to invest, even small sums, in the capital of large companies. The facilities arising from larger resources.
2. **Separate legal entity:** The Company has separate legal entity. It is registered under Indian Companies Act, 1956.
3. **Limited liability:** The shareholder has limited liability in respect of the shares held by him. In no case, does his liability exceed more than the face value of the shares allotted to him.
4. **Transferability of shares:** The shares can be transferred to others. However, the private company shares cannot be transferred.
5. **Liquidity of investments:** By providing the transferability of shares, shares can be converted into cash.
6. **Inculcates the habit of savings and investments:** Because the share face value is very low, this promotes the habit of saving among the common man and mobilizes the same towards investments in the company.
7. **Democracy in management:** the shareholders elect the directors in a democratic way in the general body meetings. The shareholders are free to make any proposals, question the practice of the management, suggest the possible remedial measures, as they perceive, The directors respond to the issue raised by the shareholders and have to justify their actions.
8. **Economics of large scale production:** Since the production is in the scale with large funds at
9. **Continued existence:** The Company has perpetual succession. It has no natural end. It continues forever and ever unless law put an end to it.
10. **Institutional confidence:** Financial Institutions prefer to deal with companies in view of their professionalism and financial strengths.
11. **Professional management:** With the larger funds at its disposal, the Board of Directors recruits competent and professional managers to handle the affairs of the company in a professional manner.
12. **Growth and Expansion:** With large resources and professional management, the company can earn good returns on its operations, build good amount of reserves and further consider the proposals for growth and expansion.

Disadvantages

1. **Formation of company is a long drawn procedure:** Promoting a joint stock company involves a long drawn procedure. It is expensive and involves large number of legal formalities.
2. **High degree of government interference:** The government brings out a number of rules and regulations governing the internal conduct of the operations of a company such as meetings, voting, audit and so on, and any violation of these rules results into statutory lapses, punishable under the companies act.
3. **Inordinate delays in decision-making:** As the size of the organization grows, the number of levels in organization also increases in the name of specialization. The more the number of levels, the more is the delay in decision-making. Sometimes, so-called professionals do not respond to the urgencies as required. It promotes delay in administration, which is referred to 'red tape and bureaucracy'.
4. **Lack of initiative:** In most of the cases, the employees of the company at different levels show slack in their personal initiative with the result, the opportunities once missed do not recur and the company loses the revenue.
5. **Lack of responsibility and commitment:** In some cases, the managers at different levels are afraid to take risk and more worried about their jobs rather than the huge funds invested in the capital of the company lose the revenue.
6. **Lack of responsibility and commitment:** In some cases, the managers at different levels are afraid to take risk and more worried about their jobs rather than the huge funds invested in the capital of the company. Where managers do not show up willingness to take responsibility, they cannot be considered as committed. They will not be able to handle the business risks.

Assignment-Cum-Tutorial Questions

A. Questions testing the remembering / understanding level of students

I) Objective Questions (10 to 15)

1. The liability extending to the personal property of the trader is called _____
2. Joint Stock Company has _____ Liability.
3. Company is treated as _____ Person.
4. The shares of a _____ company can be transferred.
5. Maximum number of persons required to form a partnership in case of non-banking Business _____.

6. The stages in the formation of a joint stock company are _____ and _____.

II) Descriptive Questions (6 to 8)

1. Discuss the factors affecting the choice of form of business organization.
2. Define a joint stock company & explain its basic features, advantages & disadvantages
3. Explain in basic features of Government Company from of public enterprise.
4. What do you mean by sole proprietorship? Explain its merits and limitations.
5. Define partnership form of business. Explain its salient features.
6. Explain the formation of Joint Stock Company.
7. What is partnership deed and explain the different types of partners.

B. Question testing the ability of students in applying the concepts.

I) Multiple Choice Questions: (10 to 15)

1. Which one of the following is not a factor affecting the choice of a business organization?
()
(a) Liability (b) Agreement
(c) Quick Decision making (d) Flexibility
2. An agreement to share profit implies: ()
(a) To share only profits (c) To share only negative profits
(b) To share both profits and losses (d) Neither to share profits nor losses
3. "People may come and people may leave, but I go on forever" is applicable to _____ Business organization.
()
(a) Sole proprietorship (b) Partnership
(c) Company (d) Joint Hindu Family
4. In the absence of agreement the partners are entitled to share the profits ()
(a) Proportionate to capital brought in (c) equally
(b) Proportionate to their drawings (d) based on their admission.
5. Certificate of commencement of business should be obtained by ___ company to start its functions.
()
(a) Private (b) Statutory
(c) Public (d) Chartered
6. ___ is not required to private company to start its functions. ()
(a) Certificate of incorporation (b) Registration
(c) Certificate of commencement of business (d) None

7. ___ partner can enjoy profits but no liability for losses. ()
(a) Active (b) Sleeping (c) Minor (d) Nominal
8. F is a sole proprietor; D is admitted as a partner where D does not bring any capital then, ()
(a) D and F are Partners (c) D is to be treated as an employee
(b) D is not partner as no capital is brought in (d) F is the Principal
9. Which of the following statement is incorrect about a nominal partner? ()
(a) He does not invest in the firm nor does he share in profit.
(b) He does not take part in management of the firm.
(c) He is liable along with other partners for all the debts of the firm.
(d) He is not liable along with other partners for all the debts of the firm.

UNIT – V

PROJECT MANAGEMENT CONCEPTS

Objectives:

- To learn about the concept of project and its characteristics
- To know about the importance of project management
- To Study the steps in project planning process
- To understand the process of project evaluation and sources of finance.

Project-Introduction

A project is defined as a “temporary endeavor with a beginning and an end and it must be used to create a unique product, service or result”. Further, it is progressively elaborated. What this definition of a project means is that projects are those activities that cannot go on indefinitely and must have a defined purpose.

A project is an activity to meet the creation of a unique product or service and thus activities that are undertaken to accomplish routine activities cannot be considered projects.

Project management is the practice of initiating, planning, executing, controlling, and closing the work of a team to achieve specific goals and meet specific success criteria at the specified time.

Characteristics of Project management

These seven characteristics are

1. A single definable purpose or result. This is usually specified in terms of cost, schedule and performance requirements.
2. Every project is unique.
3. Projects are temporary activities.
4. Projects cut across organizational lines.
5. Projects involve unfamiliarity.
6. The organization usually has something at stake when undertaking a project.
7. A project is the process of working to achieve a goal.

Importance of Project management

1. Strategic Alignment

Project management is important because it ensures what is being delivered, is right, and will deliver real value against the business opportunity.

2. Leadership

Project management is important because it brings leadership and direction to projects.

3. Clear Focus & Objectives

Project management is important because it ensures there's a proper plan for executing on strategic goals.

4. Realistic Project Planning

Project management is important because it ensures proper expectations are set around what can be delivered, by when, and for how much.

5. Quality Control

Projects management is important because it ensures the quality of whatever is being delivered, consistently hits the mark.

6. Risk Management

Project management is important because it ensures risks are properly managed and mitigated against to avoid becoming issues.

7. Orderly Process

Project management is important because it ensures the right people do the right things, at the right time – it ensures proper project process is followed throughout the project lifecycle.

8. Continuous Oversight

Project management is important because it ensures a project's progress is tracked and reported properly.

9. Subject Matter Expertise

Project management is important because someone needs to be able to understand if everyone's doing what they should.

10. Managing and Learning from Success and Failure

Project management is important because it learns from the successes and failures of the past.

Project Management

A Project is composed of jobs, activities, junction or tasks that are related one to the other in some manner, and all of these should be completed in order to complete the project.

For completion of a project, two basic things are required:

- i) material resources
- ii) manpower resources

Many countries, rich in material resources are exceedingly poor in terms of level of production or plan achievement, while there are other countries which have very limited natural resources but have achieved higher level of productivity mainly because of talents, skills, experience and know-how of their people. Availability, quality and use of human resources is a single determinant factor in accomplishing project objectives, which every project has.

Rapid accumulation of scientific techniques in the recent past has not been matched by a corresponding improvement in the sphere of human group relations. In other words, sociology has not kept pace with technology. We are not in a position to utilize fully our technology advancement unless we are also able to advance in social sphere. Here comes the role of management. While technology deals with material things, management deals with both material things as well as human-beings.

Management increases the productivity through technological innovations taking into account human factors involved in these advances.

Each project, whether big or small has three objectives:

- i) The project should be completed with a minimum of elapsed time.
- ii) It should use available manpower and other resources as sparingly (using minimum/without wasting) as possible without delay.
- iii) It should be completed with a minimum of capital investment, without delay.

Project management is a highly specialised job, to achieve the above objectives.

Project management involves, the following three phases:

1. Project planning
2. Project scheduling
3. Project controlling

The first two phases are accomplished before the actual project starts. The third phase is operative during the execution of the project, and its aim is to recognize the difficulties during the execution and to apply measures to deal with these difficulties.

Project Planning:

Planning is the most important phase of project management. ~~essence~~ Planning involves i) defining objectives of the project, listing of tasks or jobs that must be performed, ii) determining gross requirements for materials, equipment and manpower and iii) preparing estimates of costs and duration for the various jobs or activities to bring about the satisfactory completion of the project.

Planning is important because:

- i) It provides direction
- ii) It provides unifying
- iii) It helps to reveal future opportunities and threats
- iv) It provide performance standards.

In the planning phase, Plan is made and strategies are set, taking into consideration the company's policies, procedures and rules.

Plan : It is a statement of intent (purpose), i.e. what is to be done. It is interpreted in terms of what has to be done to resources to achieve the intent. The resources to be used may be: ~~the staff~~ office-staff, firemen, labour, materials, plant, machinery, space and funds.

Plans are detailed methods, formulated before hand for doing or making something. Plans simply list the goals, (target) and defines the means of achieving them.

These listed goals are called events and means of achieving these goals are known as operations or activities in attaining final target. The size of the activities depends on the nature and scale of project.

Activities are those operations of the plan which take time to carry out and on which resources are expended.

Strategies: strategy is one important type of plan. It specifies the central concept or purpose of the enterprise as well as the means by which it intend to carry that purpose.

Policies, procedures and rules:

Policies, procedures and rules differ from each other in degree of specificity.

Policies usually set broad guide-lines for the enterprise.

Ex: The policy of a departmental store might be, if a customer is dissatisfied with any of its sale item, his/her money will be refunded.

Procedures specify how to proceed in some situation.

Ex: "before refunding the money of the customer, the salesman should carefully inspect the article to be returned and then obtain approval from the manager for the refund."

A rule is even more specific guide for action.

Ex: The store may have a rule that 'under no conditions will the money be refunded to the customer if he/she brings the defective article after 15 days of the purchase.'

Steps in project planning

Following steps are generally recognised in the planning process of project:

1. Define: The objectives of the project in definite words.
2. Establish: Goals and stages intermediate to attain the final target.
3. Develop: Forecast and means of ~~attain~~ achieving goals i.e. activities.
4. Evaluate: Organisation's resources - financial, managerial and operational - to carry out activities and to determine what is feasible and what is not.
5. Determine: Alternatives - individual courses of action that will allow to accomplish goals.
6. Test: for consistency with company's policy
7. Choose: An alternative which is not only consistent with its goals and concept but also one that can be accomplished with the evaluated resources.
8. Decide: on a plan/ approve it

During the planning phase, the information needed is about all those operations or activities, which have to be carried out before the project is completed, their sequence and their logical inter relationship.

Resources: In running a project, there is a basic need of resources.

These resources can be classified as under:

- i) Material resources - (what) → including financial resources.
- ii) Equipment resources - (how)
- iii) Space resources - (where)
- iv) Effort or manpower resources - (who)
- v) Time resources - (when)

Resources are the starting point of many problems that have to be solved by the manager in the planning phase, before proceeding for scheduling phase.

Scheduling: Scheduling is the allocation of resources. These resources are time and energy in conceptual sense, but in practical sense are time, space, equipment and effort applied to material. More specifically, scheduling is the mechanical process of formalising the planned functions, assigning the starting and completion dates to each part (or activity) of the work in such a manner that the whole work (or project) proceeds in a logical sequence and in an orderly and systematic manner. In other words, schedule is the laying out of the actual activities of the project in time order in which they are to be performed, and calculating the manpower and material requirements (resources) needed at each stage of production, along with the expected completion time of each of the activity.

Steps in Project scheduling phase:

Scheduling is carried out in advance of the project commencing which involves:

- i) Identifying the tasks that need to be carried out -
calculate - detailed controlled information
- ii) Estimating how long they will take
Assign - timings to events and activities
- iii) Allocating resources
Give - incidental considerations to the resources whose availability is limited and which thereby impose constraint on the project.

Schedule essentially transforms the project from a vision to a time-based plan. Scheduling helps in

- i) basis to monitor and control project activities
- ii) help to determine how best to allocate resources in order to achieve the project goal.
- iii) to assess how time delays will impact the project
- iv) to figure out where excess resources are available to allocate to other projects
- v) provide a basis to help in tracking project progress.

Controlling: The planning and scheduling phases of a project are undertaken before the actual project starts while the controlling phase is undertaken during the actual project operations.

Project control is a project management function intended for achieving objectives and expectations within a predetermined timetable. It involves three processes, that to be carried out through out the project

- * setting standards
- * Measuring performance
- * Taking corrective actions

controlling consists of reviewing the difference between the schedule and actual performance once the project has begun.

Project control is the formal mechanism established to determine deviations from the base plan, to determine the precise effect of those deviations on the plan, and to replan and reschedule to compensate for the deviations

Steps in control Process

controlling is accomplished in the following steps

1. Establish : standards or targets. These ~~are~~ targets are generally expressed in terms of time.
2. Measure : Performance against the standards set down in the first step.
3. Identify : the deviations from the standards
4. Suggest and select : correcting measures. This will involve all the problems-identifying, decision-making and organising and leadership skill of the decision maker.

Some of the tools or techniques of project Management are:

1. Bar charts and Milestone charts
Bar charts were introduced by Henry Gantt around 1900 AD.
Milestone chart is a modification over the original Gantt chart.
2. Network Methods
Network diagram is an outcome of the improvements in the milestone charts.
The two major network systems are i) PERT ii) CPM
PERT - Program Evaluation and Review Technique.
CPM - Critical Path Method.

Project Evaluation

The following points highlight the methods of project evaluation in a firm.

Capital Budgeting Process:

The capital budgeting process involves generation of investment, proposal estimation of cash-flows for the proposals, evaluation of cash-flows, selection of projects based on acceptance criterion and finally the continues revaluation of investment after their acceptance the steps involved in capital budgeting process are as follows.

1. Project generation
2. Project evaluation
3. Project selection
4. Project execution

The following points highlight the methods of project evaluation in a firm.

The capital budgeting appraisal methods are techniques of evaluation of investment proposal will help the company to decide upon the desirability of an investment proposal depending upon their; relative income generating capacity and rank them in order of their desirability. These methods provide the company a set of norms on the basis of which either it has to accept or reject the investment proposal. The most widely accepted techniques used in estimating the cost-returns of investment projects can be grouped under two categories.

1. Traditional methods
2. Discounted Cash flow methods

1. Traditional methods

These methods are based on the principles to determine the desirability of an investment project on the basis of its useful life and expected returns. These methods depend upon the accounting information available from the books of accounts of the company. These will not take into account the concept of ‘time value of money’, which is a significant factor to determine the desirability of a project in terms of present value.

A. Pay-back period method: It is the most popular and widely recognized traditional method of evaluating the investment proposals. It can be defined, as ‘the number of years required to recover the original cash out lay invested in a project’.

According to Weston & Brigham, “The pay back period is the number of years it takes the firm to recover its original investment by net returns before depreciation, but after taxes”.

According to James. C. Vanhorne, “The payback period is the number of years required to recover initial cash investment.

The pay back period is also called payout or payoff period. This period is calculated by dividing the cost of the project by the annual earnings after tax but before depreciation under this method the projects are ranked on the basis of the length of the payback period. A project with the shortest payback period will be given the highest rank and taken as the best investment. The shorter the payback period, the less risky the investment is the formula for payback period is

$$\text{Pay-back period} = \frac{\text{Cash outlay (or) original cost of project}}{\text{Annual cash inflow}}$$

Merits:

1. It is one of the earliest methods of evaluating the investment projects.
2. It is simple to understand and to compute.
3. It does not involve any cost for computation of the payback period
4. It is one of the widely used methods in small scale industry sector
5. It can be computed on the basis of accounting information available from the books.

Demerits:

1. This method fails to take into account the cash flows received by the company after the pay back period.
2. It doesn't take into account the interest factor involved in an investment outlay.
3. It doesn't take into account the interest factor involved in an investment outlay.
4. It is not consistent with the objective of maximizing the market value of the company's share.
5. It fails to consider the pattern of cash inflows i. e., the magnitude and timing of cash in flows.

B. Accounting (or) Average rate of return method (ARR):

It is an accounting method, which uses the accounting information repeated by the financial statements to measure the probability of an investment proposal. It can be determined by dividing the average income after taxes by the average investment i.e., the average book value after depreciation.

According to ‘Soloman’, accounting rate of return on an investment can be calculated as the ratio of accounting net income to the initial investment, i.e.,

$$\text{ARR} = \frac{\text{Average net income after taxes}}{\text{Average Investment}} \times 100$$

Total Income after Taxes

$$\text{Average net income after taxes} = \frac{\text{-----}}{\text{No. Of Years}}$$

$$\text{Average investment} = \frac{\text{Total Investment}}{2}$$

On the basis of this method, the company can select all those projects whose ARR is higher than the minimum rate established by the company. It can reject the projects with an ARR lower than the expected rate of return. This method can also help the management to rank the proposal on the basis of ARR. A highest rank will be given to a project with highest ARR, whereas a lowest rank to a project with lowest ARR.

Merits:

It is very simple to understand and calculate.

1. It can be readily computed with the help of the available accounting data.
2. It uses the entire stream of earning to calculate the ARR.

Demerits:

1. It is not based on cash flows generated by a project.
2. This method does not consider the objective of wealth maximization
3. IT ignores the length of the projects useful life.
4. It does not take into account the fact that the profits can be re-invested.

II: Discounted cash flow methods:

The traditional method does not take into consideration the time value of money. They give equal weight age to the present and future flow of incomes. The DCF methods are based on the concept that a rupee earned today is more worth than a rupee earned tomorrow. These methods take into consideration the profitability and also time value of money.

A. Net present value method (NPV)

The NPV takes into consideration the time value of money. The cash flows of different years are valued differently and made comparable in terms of present values for this the net cash inflows of various periods are discounted using required rate of return which is predetermined.

According to Ezra Solomon, "It is a present value of future returns, discounted at the required rate of return minus the present value of the cost of the investment."

NPV is the difference between the present value of cash inflows of a project and the initial cost of the project.

According to the NPV technique, only one project will be selected whose NPV is positive or above zero. If a project's NPV is less than 'Zero', it gives negative NPV hence it must be rejected. If there are more than one project with positive NPV's the project is selected whose NPV is the highest.

The formula for NPV is

NPV = Present value of cash inflows – investment.

$$\text{NPV} = \frac{C_1}{(1+K)} + \frac{C_2}{(1+K)^2} + \frac{C_3}{(1+K)^3} + \dots + \frac{C_n}{(1+K)^n} - \text{Co- investment}$$

C1, C2, C3... Cn= cash inflows in different years.

K= Cost of the Capital (or) Discounting rate

D= Years.

Merits:

1. It recognizes the time value of money.
2. It is based on the entire cash flows generated during the useful life of the asset.
3. It is consistent with the objective of maximization of wealth of the owners.
4. The ranking of projects is independent of the discount rate used for determining the present value.

Demerits:

1. It is difficult to understand and use.
2. The NPV is calculated by using the cost of capital as a discount rate. But the concept of cost of capital. If self is difficult to understand and determine.
3. It does not give solutions when the comparable projects are involved in different amounts of investment.
4. It does not give correct answer to a question whether alternative projects or limited funds are available with unequal lines.

B. Internal Rate of Return Method (IRR)

The IRR for an investment proposal is that discount rate which equates the present value of cash inflows with the present value of cash out flows of an investment. The IRR is also known as cutoff or hurdle rate. It is usually the concern's cost of capital.

According to Weston and Brigham "The internal rate is the interest rate that equates the present value of the expected future receipts to the cost of the investment outlay.

When compared the IRR with the required rate of return (RRR), if the IRR is more than RRR then the project is accepted else rejected. In case of more than one project with IRR more than RRR, the one, which gives the highest IRR, is selected.

The IRR is not a predetermine rate, rather it is to be trial and error method. It implies that one has to start with a discounting rate to calculate the present value of cash inflows. If the obtained present value is higher than the initial cost of the project one has to try with a higher rate. Like wise if the present value of expected cash inflows obtained is lower than the present value of cash flow. Lower rate is to be taken up. The process is continued till the net present value becomes Zero. As this discount rate is determined internally, this method is called internal rate of return method.

$$IRR = L + \frac{P1 - Q}{P1 - P2} \times D$$

L- Lower discount rate

P1 - Present value of cash inflows at lower rate.

P2 - Present value of cash inflows at higher rate.

Q- Actual investment

D- Difference in Discount rates.

Merits:

- 1. It consider the time value of money
- 2. It takes into account the cash flows over the entire useful life of the asset.
- 3. It has a psychological appeal to the user because when the highest rate of return projects are selected, it satisfies the investors in terms of the rate of return an capital
- 4. It always suggests accepting to projects with maximum rate of return.
- 5. It is inconformity with the firm’s objective of maximum owner’s welfare.

Demerits:

- 1. It is very difficult to understand and use.
- 2. It involves a very complicated computational work.
- 3. It may not give unique answer in all situations.

C. Probability Index Method (PI)

The method is also called benefit cost ration. This method is obtained cloth a slight modification of the NPV method. In case of NPV the present value of cash out flows are profitability index (PI), the present value of cash inflows are divide by the present value of cash out flows, while NPV is a absolute measure, the PI is a relative measure.

It the PI is more than one (>1), the proposal is accepted else rejected. If there are more than one investment proposal with the more than one PI the one with the highest PI will be selected. This method is more useful incase of projects with different cash outlays cash outlays and hence is superior to the NPV method.

The formula for PI is

$$\text{Probability index} = \frac{\text{Present Value of Future Cash Inflow}}{\text{Investment}}$$

Merits:

- 1. It requires less computational work then IRR method
- 2. It helps to accept / reject investment proposal on the basis of value of the index.
- 3. It is useful to rank the proposals on the basis of the highest/lowest value of the index.
- 4. It is useful to tank the proposals on the basis of the highest/lowest value of the index.
- 5. It takes into consideration the entire stream of cash flows generated during the useful life of the asset.

Demerits:

- 1. It is some what difficult to understand
- 2. Some people may feel no limitation for index number due to several limitation involved in their competitions
- 3. It is very difficult to understand the analytical part of the decision on the basis of probability index.

SOURCE OF FINANCE

For any business enterprise, there are two sources of finance, viz, funds contributed by owners and funds available from loans and credits. In other words the financial resources of a business may be own funds and borrowed funds.

Owner funds or ownership capital:

The ownership capital is also known as 'risk capital' because every business runs the risk of loss or low profits, and it is the owner who bears this risk.

The second characteristic of this source of finance is that ownership capital remains permanently invested in the business.

Another characteristic of ownership capital related to the management of business. It is on the basis of their contribution to equity capital that owners can exercise their right of control over the management of the firm.

A joint stock company can raise large amount by issuing shares to the public.

Source of Company Finance

Based upon the time, the financial resources may be classified into (1) sources of long term (2) sources of short – term finance. Some of these sources also serve the purpose of medium – term finance.

I. The source of long – term finance are:

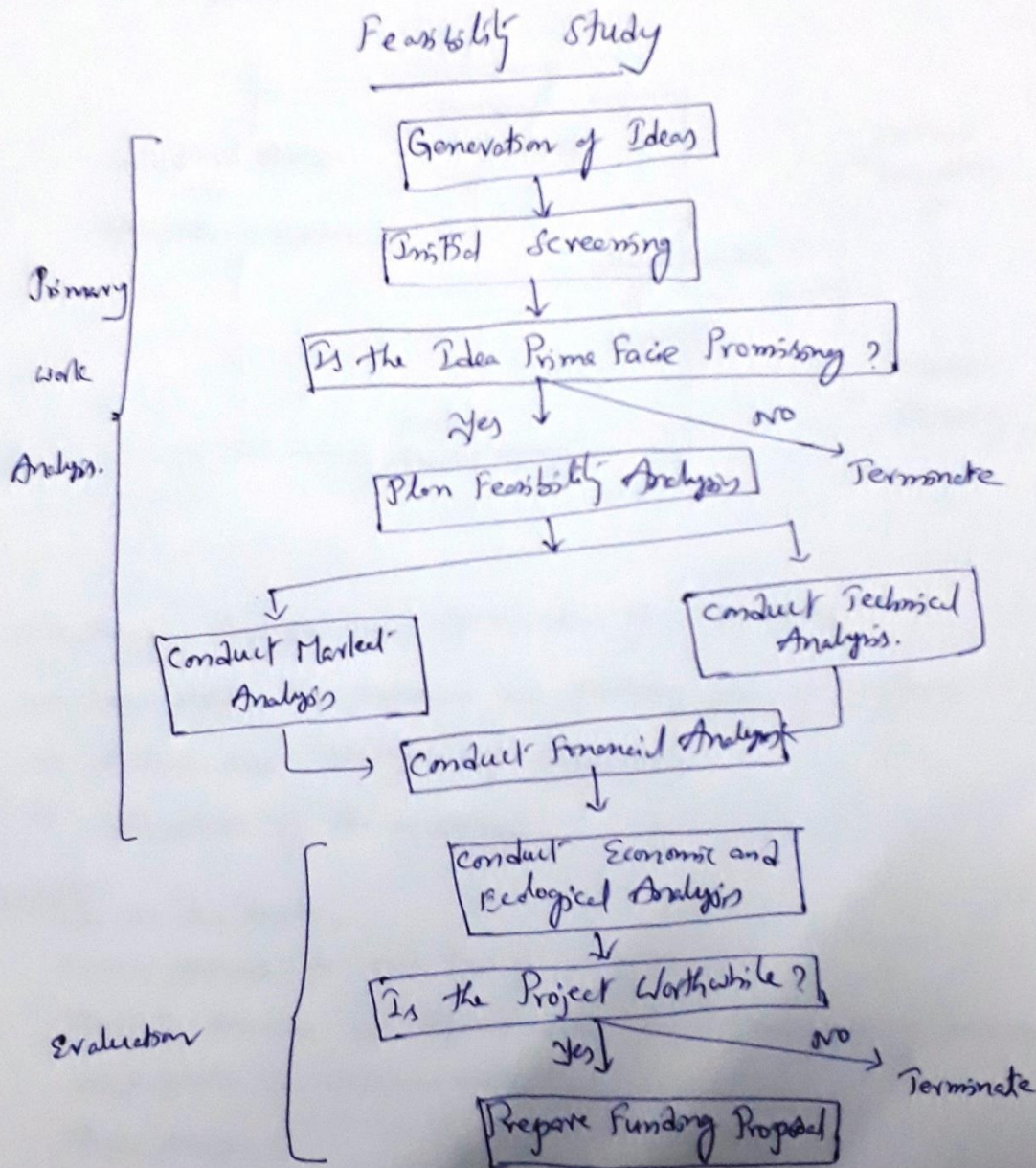
1. Issue of shares
2. Issue debentures
3. Loan from financial institutions
4. Retained profits and
5. Public deposits

II. Sources of Short-term Finance are:

1. Trade credit
2. Bank loans and advances and
3. Short-term loans from finance companies.

Feasibility Study :

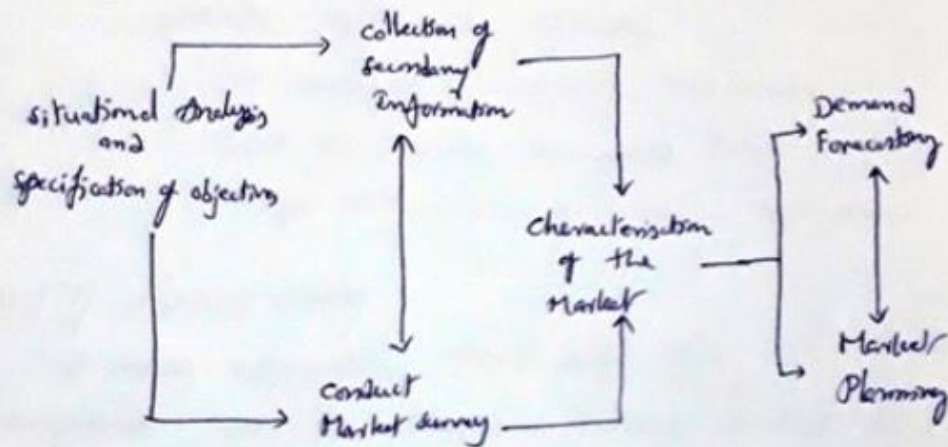
The feasibility study is concerned with the first four phases of capital budgeting ① Planning ② Analysis ③ selection (evaluation) and ④ financing and, involves ① market analysis ii) technical analysis iii) financial analysis iv) economic analysis and v) ecological analysis.



Market and Demand Analysis:

The first step in project analysis is to estimate the potential size of the market for the product proposed to be manufactured (service planned to be offered) and get an idea about the market share that is likely to be captured.

The important steps involved in market and demand analysis



Technical Analysis.

Analysis of technical and Engineering aspects is done continually when a project is being examined and formulated. Other types of analyses are closely intertwined with technical analysis.

The broad purpose of technical analysis is

- a) to ensure that the project is technically feasible (in the sense) i.e. all the inputs required to set up the project are available
- b) to facilitate the most optimal formulation of the project in terms of technology, size, location and so on.

Choice of Technology: The choice of technology is influenced by a variety of considerations:

- Plant capacity : which has close relationship with production technology
- Principal inputs : The raw materials available influence the technology chosen.
- Investment outlay and production cost : The effect of alternative technologies on investment outlay and production cost over a period of time should be carefully assessed.
- Product mix : The technology chosen must be judged in terms of the total product-mix generated by it, including saleable by-products.

MULTIPLE CHOICE QUESTIONS

1. Which of these is not one of the constraints of a project?

- a. Scope
- b. Resources
- c. Team
- d. Budget

2. Which of the following is not correct about initial phase of a project?

- a. The cost associated at the beginning of the project is highest.
- b. Stakeholders have maximum influence during this phase
- c. The highest uncertainty is at this stage of the project.
- d. All the above statements are correct.

3. Chances for successful completion of a multidisciplinary project are

- A. Very low
- B. Below expected
- C. High
- D. Above Expected

4. PM will also be involved in making choices that require balancing in

- A. Goals of the project
- B. Goals of the firm
- C. Both A and B
- D. Goals of the resources

5. A ____ is a set of activities which are networked in an order and aimed towards achieving the goals of a project.

(A) Project

(B) Process

(C) Project management

(D) Project cycle

6. Resources refers to

(A) Manpower

(B) Machinery

(C) Materials

(D) All of the above

7. Developing a technology is an example of

- (A) Process
- (B) Project
- (C) Scope
- (D) All of the above

8. The project life cycle consists of

- (A) Understanding the scope of the project
- (B) Objectives of the project
- (C) Formulation and planning various activities
- (D) All of the above

9. Following is(are) the responsibility(ies) of the project manager.

- (A) Budgeting and cost control
- (B) Allocating resources
- (C) Tracking project expenditure
- (D) All of the above

10. Common characteristics of effective project team members includes high-quality technical skills, political sensitivity and

- A. High self esteem
- B. Problem orientation
- C. Technical skills
- D. Both A & B

Descriptive Questions

1. Define project and discuss its characteristics.
2. Explain importance of project management in present day business.
3. Discuss different methods in evaluation of a project?
4. Explain different sources of project finance.
5. Discuss the importance of Feasibility studies in project management

UNIT – VI

PERT and CPM

Objectives:

- To study how the total project cost can be minimized.
- To examine how a trade off can be achieved between time and cost of project.
- To understand how Network Techniques (CPM/ PERT) can be effectively used project management
- To know how to minimize the total project duration.

Net work analysis: It is refers to a number of techniques for the planning and control of complex projects. The basis of network planning is the representation of sequential relationships between activities by means of a network of lines and circles. The idea is to link the various activities in such a way that the overall time spent on the project is kept to a minimum.

Features of Network Analysis:

Logical base of planning: Network analysis is highly applicable at several stages of project management right from early planning stage of selecting right option from various alternative to scheduling stage and operational stage.

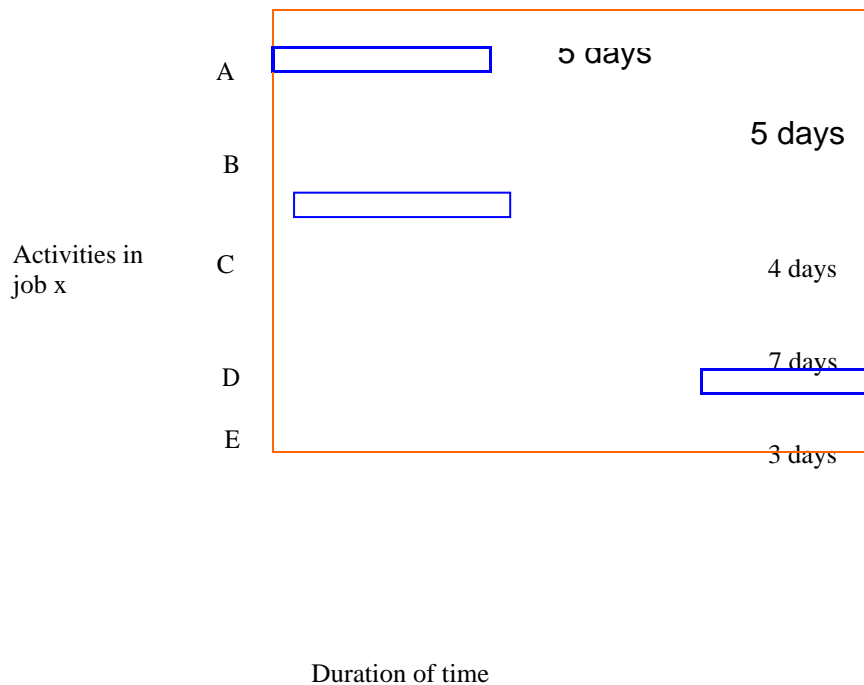
Simple in nature: Net work analysis is straightforward in concept and can be easily explained to any laymen. Data calculations are simple and for large projects computers can be used.

Improves coordination and communication: The graphs generated out of network analysis display simply and direct way the complex nature of various sub- divisions of project may, quickly perceive from the graph

Wider application: The network analysis is applied to many types of projects. Moreover, they may be applied at several levels within a given project from a single department working on a sub-system to multi-plant operations within corporation.

Gantt's bar chart: Before PERT and CPM were developed, Gantt charts and mile stone charts were used tools to monitor the project progress in complex projects. Gantt chart is a bar chart, which was developed by Henary Gantt around 1900.

It is consists of two coordinate axes, one represents the time and the other jobs or activities performed.



The above figure shows job x which contains five activities ABCDE the different time durations activity A is an independent activity followed by activities B, activity B is followed by activity C, activities D, E have no such sequence. Activities C,D and E reach completion together. However the total number of day taken for completing the job is 14 days.

Limitation of Gantt Chart:

1. This Gantt bar charts not useful for big projects, consisting of large number of complex activities
2. It does not show the relationship between various operations. It is very difficult to find the sequence of various operations on the Gantt chart or the most probable date of completion.
3. Does to indicate the progress of work
4. It cannot reflect uncertainty or tolerance in the duration time estimated for various activities
5. It simply a scheduling technique, but not effective planning tool.

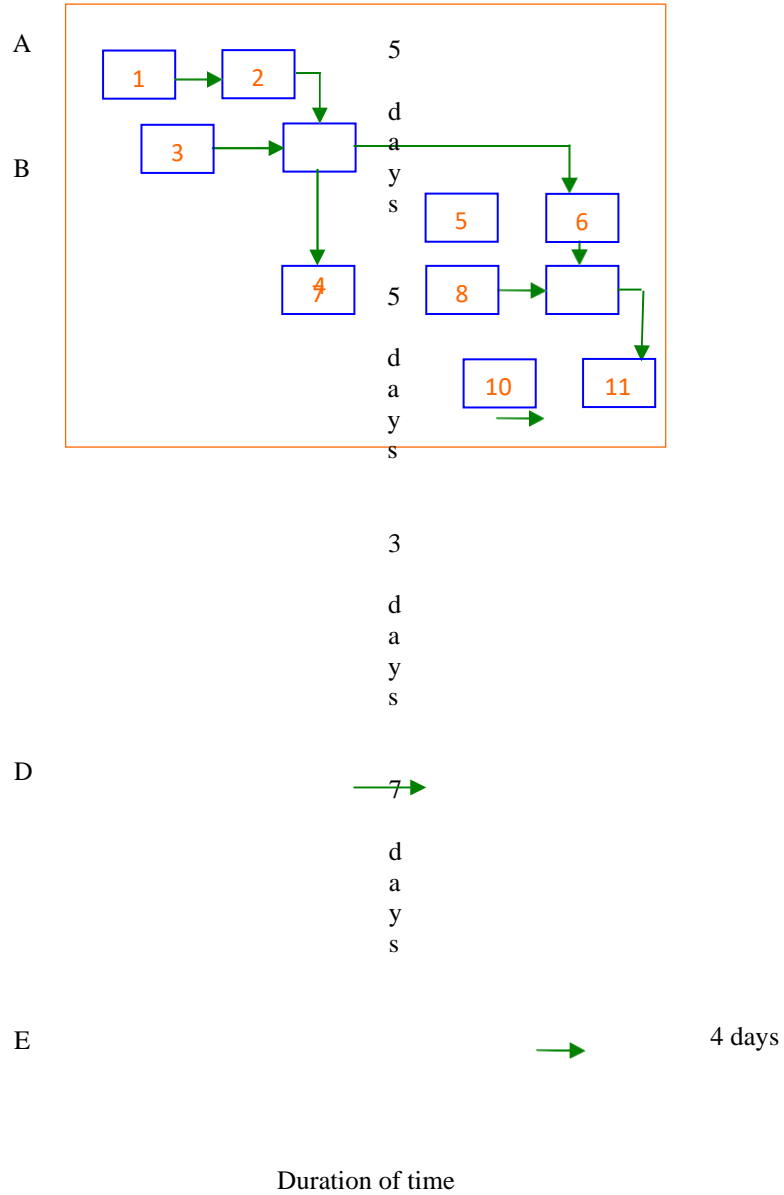
Milestone chart: Milestone chart is an improvement over Gantt chart. It has becomes a good line between Gantt chart and PERT and CPM network. Every task represented by a bar in Gantt's bar chart, is subdivided in terms event or point in time.

A
c
t
i
v
i
t
i
e
s

i
n

C
j
o
b

x



In the Gantt's bar charts bar representing an activity is divided into certain milestones. They are identified with a major event, and consecutively numbered such a breakdown enhances the awareness about the inter dependencies among all milestones.

Network analysis undergone several changes and many variants exist, which evaluate the randomness due to imperfection in all human and physical systems. PERT and CPM continue to be very popular, in handling the basic factors like time, cost, resources, probabilities and combinations of all these factors.

PERT AND CPM:

PERT: Programme evaluation and review technique (PERT) is a tool to evaluate a given programme and review the progress made in it from time to time. A programme is also called a project. A project is defined as a set of activities with a specific goal occupying a specific period. It may be a small or big project, such as construction of a college building, roads, marriage, picnics etc.

It is concerned with estimating the time for different stages in such a programme or a project and find out what the critical path is, which consumes a maximum resources.

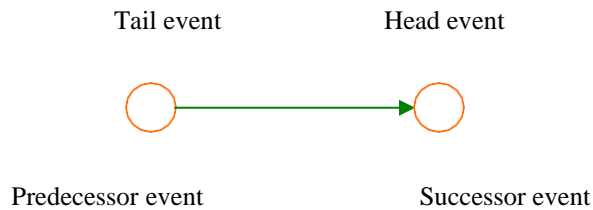
CPM: Critical path method assumes that the time required to complete an activity can be predicted fairly accurately, and thus, the costs involved can be quantified once the critical path has been identified. Since time is an important factor, CPM involves a trade-off between costs and time. It involves determining an optimum duration for the project, that is, a minimum duration that involves the lowest overall costs.

Application of PERT and CPM:

- Construction of projects such as building, highways, houses or bridges
- Preparation of bids and proposals for large projects such as multipurpose projects
- Maintenance and planning of oil refineries, ship repairs and other such as large operations
- Development of new weapon systems and new products and services
- Manufacture and assembly of large items such as aeroplanes or ships repairs and other such as large operations
- Simple projects such as home remodeling house keeping or painting and so on.

PERT Basic Terminology:

Event: A event is specific instant of time which indicates the beginning or end of the activity event is also known as a junction or node. It is represented by a circle and the event number is written with in the circle.



Activity: Every project consists of number of job operations or tasks which are called activity.



| | | |
|--------------------------------|---|-------------|
| Ex: Start machine installation | - | An event |
| Machine installation | - | An activity |
| Completion of machine | - | An event |

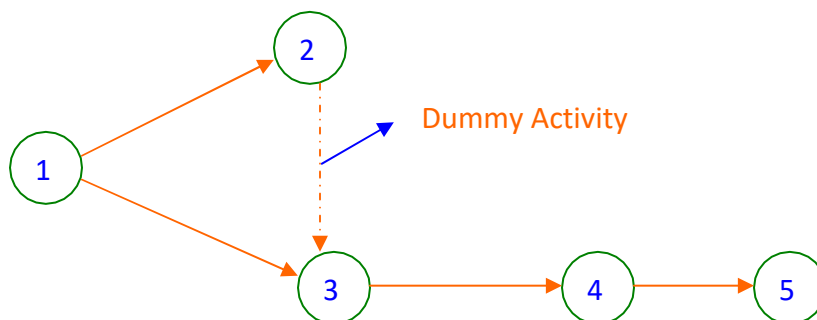
Classification of activities:

- 1) Critical activity
- 2) Non-Critical activity
- 3) Dummy activity

Critical activity: In a network diagram critical activities are those which if consume more than their estimated time, the project will be delayed. It shown with thick arrow.

Non-critical activity: Such activities have a provision of float or slack so that, even if they consume a specified time over and above the estimated time.

Dummy activity: When two activities start at the same instant of time like A and B the head event are jointed by dotted arrows and this is known as dummy activity.



CPM Basic terminology:

Critical Path: Critical path is that path which consumes the maximum amount of time or resources. It is that path which has zero slack value.

Slack: Slack means the time taken to delay a particular event without affecting the project completion time. If a path has zero slack that means it is the critical path.

$$\text{Slack} = \text{LFT} - \text{EFT}$$

Earliest Start Time (EST): It is the earliest possible time at which an activity can start, and is calculated by moving from first to last event in the network diagram. Earliest Finish Time (EFT): It is the earliest possible time at which an activity can finish

$$\text{EFT} = \text{EST} + \text{Duration of activity}$$

Latest Start Time (LST): It is the latest possible time by which an activity can start without delaying the date of completion of the project.

$$\text{LST} = \text{LFT} - \text{Duration of the activity}$$

Latest Finish Time (LFT): It is the latest time by which the activity must be completed. So that the scheduled date for the completion of the project may not be delayed. It is calculated by moving backwards.

Float: Floats in the network analysis represent the difference between the maximum time available to finish the activity and the time required to complete it.

The basic difference between slack and float times is a slack is used with reference to event, float is use with reference to activity.

Floats are three types:

- 1) Total float
- 2) Free float
- 3) Independent float

1) Total float: It is the additional time which a non critical activity can consume without increasing the project duration. However total float may affect the floats in previous and subsequent activities.

$$\text{Total float} = \text{LST} - \text{EST} \quad \text{or} \quad \text{LFT} - \text{EFT}$$

2) Free float: Free float refers to the time by which an activity can expand without affecting succeeding activities.

$$\text{Free float} = \text{EST of Head Event} - \text{EST of Trail Event} - \text{Activity duration}$$

3) Independent float: This is the time by which activity may be delayed or extended without affecting the preceding or succeeding activities in any way.

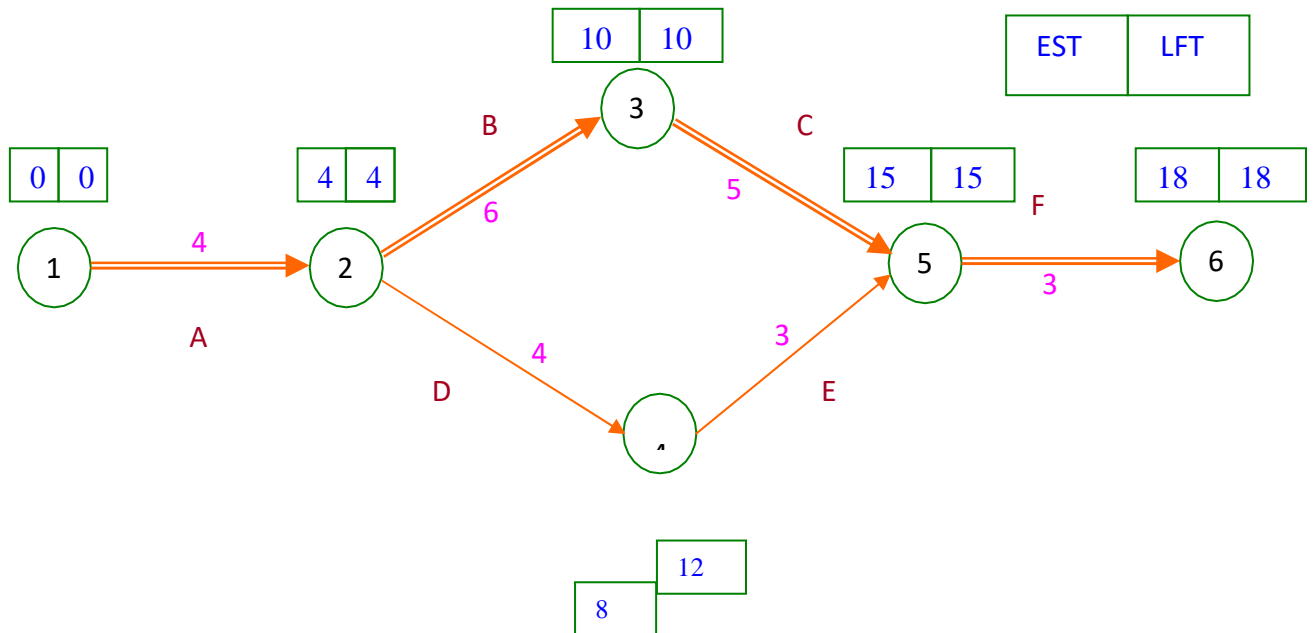
$$\text{Independent float} = \text{EST of Head event} - \text{LFT of Tail event} - \text{Activity duration}$$

Problems:

1) A small engineering project consists of 6 activities namely ABCDE & F with duration of 4, 6, 5, 4, 3 and 3 days respectively. Draw the network diagram and calculate EST, LST, EFT, LFT and floats. Mark the critical path and find total project duration.

| Activity | A | B | C | D | E | F |
|--------------------|---|---|---|---|---|-----|
| Preceding activity | - | A | B | A | D | C,E |
| Duration | 4 | 6 | 5 | 4 | 3 | 3 |

Solution:



Critical path = A-B-C-F

Project duration = 18 days

| Activity | Duration | EST | LST | EFT | LFT | Total float | Free float | Independent float |
|----------|----------|-----|-----|-----|-----|-------------|------------|-------------------|
| A | 4 | 0 | 0 | 4 | 4 | 0 | 0 | 0 |
| | 6 | 4 | 4 | 10 | 10 | 0 | 0 | 0 |
| B | 5 | 10 | 10 | 15 | 15 | 0 | 0 | 0 |
| C | 4 | 4 | 8 | 8 | 12 | 4 | 0 | 0 |
| D | 3 | 8 | 12 | 11 | 15 | 4 | 4 | 0 |
| E | 3 | 15 | 15 | 18 | 18 | 0 | 0 | 0 |
| F | | | | | | | | |

Note: $LST = LFT - \text{activity duration}$ $LFT =$

$EST + \text{activity duration}$

$\text{Total float} = LST - EST$ or $LFT - EFT$

$\text{Free float} = EST \text{ of Head Event} - EST \text{ of Trail Event} - \text{Activity duration}$ $\text{Independent float} =$
 $EST \text{ of Head event} - LFT \text{ of Trail event} - \text{Activity duration}$

2) A small engineering project consists of six activities. The three time estimates in number days for each activity are given below.

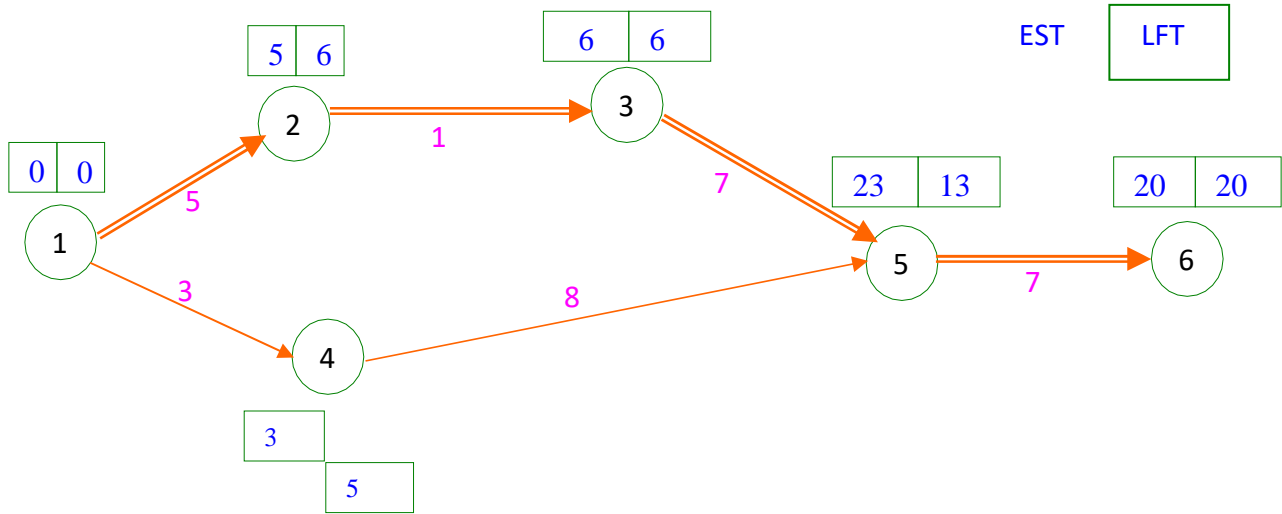
| Activity | t_o | t_m | t_p |
|----------|-------|-------|-------|
| 1-2 | 2 | 5 | 8 |
| 2-3 | 1 | 1 | 1 |
| 3-5 | 0 | 6 | 18 |
| 5-6 | 7 | 7 | 7 |
| 1-4 | 3 | 3 | 3 |
| 4-5 | 2 | 8 | 14 |

Find out:

1. Calculate the values of expected time (t_e), and variance (v) of each activity
2. Draw the network diagram and mark t_e on each activity
3. Calculate EST and LFT and mark them on the net work diagram
4. Calculate total slack for each activity
5. Identify the critical path and mark on the net work diagram
6. Probability of completing project in 25 days.

Solution:

| Activity | t_o | t_m | t_p | $t_e = \frac{t_o + 4t_m + t_p}{6}$ (Duration) | $S.D = \frac{t_p - t_o}{6}$ | Variance $= \left(\frac{t_p - t_o}{6}\right)^2$ |
|----------|-------|-------|-------|--|-----------------------------|---|
| 1-2 | 2 | 5 | 8 | 5 | 1 | ✓ 1 |
| 2-3 | 1 | 1 | 1 | 1 | 0 | ✓ 0 |
| 3-5 | 0 | 6 | 18 | 7 | 3 | ✓ 9 |
| 5-6 | 7 | 7 | 7 | 7 | 0 | ✓ 0 |
| 1-4 | 3 | 3 | 3 | 3 | 0 | 0 |
| 4-5 | 2 | 8 | 14 | 8 | 2 | 4 |



| Activity | EST | LFT | LST | EFT | Slack |
|----------|-----|-----|-----|-----|-------|
| 1-2 | 0 | 5 | 0 | 5 | 0 |
| 2-3 | 5 | 6 | 5 | 6 | 0 |
| 3-5 | 6 | 13 | 6 | 13 | 0 |
| 5-6 | 13 | 20 | 13 | 20 | 0 |
| 1-4 | 0 | 5 | 2 | 3 | 2 |
| 4-5 | 3 | 13 | 5 | 11 | 2 |

Critical path = 1-2-3-5-6 = 20 days

Probability for completing project in 25 days:

$$Z = \frac{t_s - t_e}{\sigma}$$

Here $t_s = 25$ days, $t_e = 20$ days, $\sigma =$

$$\sqrt{1+0+9+0} = \sqrt{10}$$

$$z = \frac{25 - 20}{\frac{5 - 5}{\sqrt{1+0+9+0}}} = \frac{5}{1.50} = 3.33$$

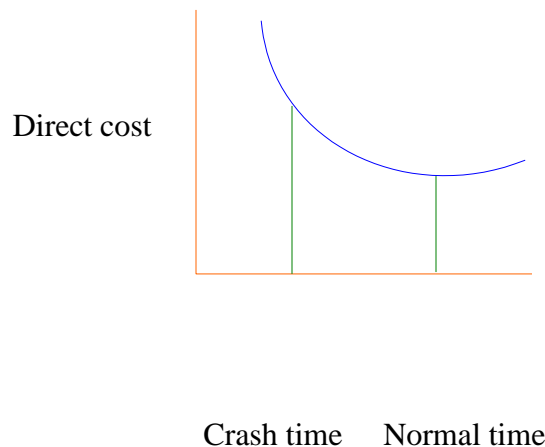
From the table value ($z = 1.50$) = **93.32%**

Project Management – II

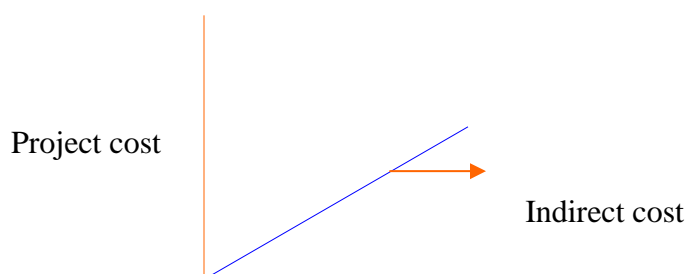
Project crashing: In this chapter, we will discuss the concepts of direct and indirect costs, the relationship between project time and project cost, the concept of cost slope and how the optimum cost and optimum duration are ensured for a given projects while crashing.

Project costs: Costs associated with any project can be classified into two categories a) Direct cost b) Indirect cost

a) Direct cost: These costs are those, which are directly proportional to the number of activities involved in the project Ex: Raw material cost



b) Indirect cost: In direct cost are those costs that are determined per day. Some of examples for indirect costs are supervisory personnel salary, supplies, rent, interest an borrowings, ads, depreciation. These costs are directly proportional to the number of days of the duration of the project. If the project duration is reduced the indirect cost also comes down.



Project duration

Normal cost (N_C): It is the lowest cost of completing an activity in the minimum time, employing normal means i.e. not using overtime or other special resource. Normal time (N_T): It is the minimum time required to achieve the normal cost Crash cost (C_C): It is the least cost of completing an activity by employing all possible means like overtime, additional machinery, proper materials etc.

Crash time (C_T): It is the absolute minimum time associated with the crash cost. Cost Slope: Cost Slope is the amount that has to be spent over and above the normal direct cost for reducing the duration by one unit of time (day, week etc.). Cost slope is defined as the additional cost for reducing one unit of time, assuming a given rate of increase in direct cost with a decrease in one unit of time.

Cost
slope
Crash
cost
Normal
cost

C
T

N
o
r
m
a
l

t
i
m
e

C
r
a
s
h

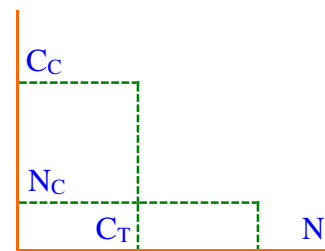
t
i
m
e

S

C
C

N
C

N
T



Activity Cost

T

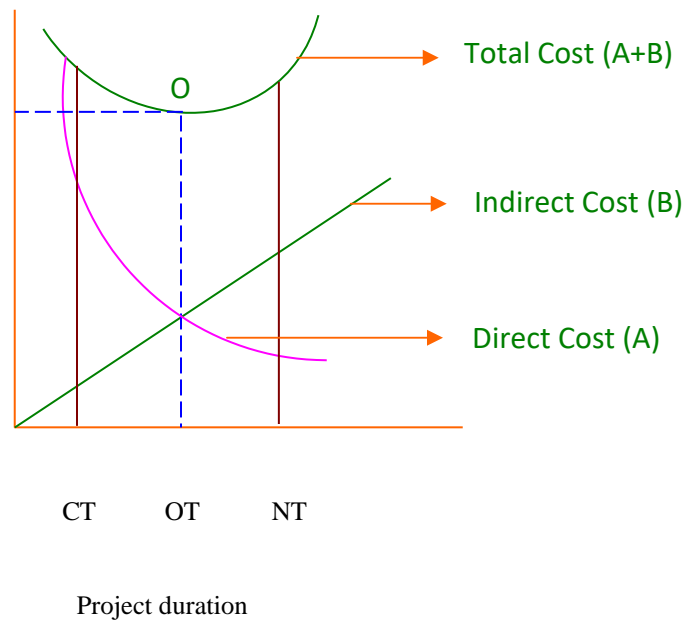
Activity time

Crashing of Network: After identifying the critical path, it is necessary to identify the priority to crash the activities by calculating the cost slope.

For reducing the duration extra expenditure to be incurred, but to save resources, organizations keep this extra expenditure at a minimum.

CT = Crash Time OT =
Optimum Time NT =
Normal Time

Project Cost



When the direct cost (A) decrease with an increase in time, as the project duration increase, the indirect cost (B) like overheads, depreciation, insurance etc. increases. The total cost (A+B) curve is a flat U-shaped curve, with implies that only up to a particular point (O) the crashing is economical, not beyond. The time duration, which involves the least total cost, is the optimum duration at optimum cost. Crashing the duration of a project may not be possible beyond a particular point.

Problems:

- 1) Given the following data, work out the minimum duration of the project and corresponding cost

| Activity | Job | Normal time | Crashing time | Normal cost | Crashing cost |
|----------|-----|-------------|---------------|-------------|---------------|
| A | 1-2 | 10 | 6 | 400 | 600 |
| B | 1-3 | 4 | 2 | 100 | 140 |
| C | 2-4 | 6 | 4 | 360 | 440 |
| D | 3-4 | 8 | 4 | 600 | 900 |
| E | 2-5 | 8 | 6 | 840 | 1100 |
| F | 4-6 | 6 | 2 | 200 | 300 |
| G | 5-6 | 10 | 8 | 1200 | 1400 |

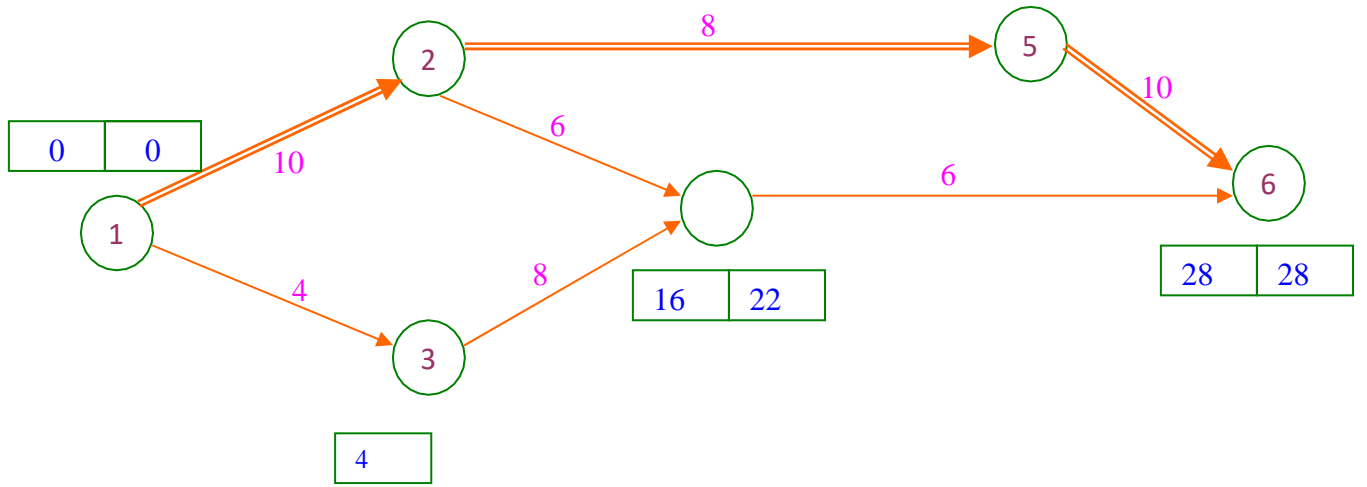
Solution:

| Activity | Job | Normal time (N _T) | Crashing time (C _T) | Normal cost (N _C) | Crashing cost (C _C) | Cost Slope $\frac{C_C - N_C}{N_T - C_T}$ | Priorities |
|----------|-----|-------------------------------|---------------------------------|-------------------------------|---------------------------------|--|------------|
| A | 1-2 | 10 | 6 | 400 | 600 | 50 | 1 |
| B | 1-3 | 4 | 2 | 100 | 140 | 20 | |
| C | 2-4 | 6 | 4 | 360 | 440 | 40 | |
| D | 3-4 | 8 | 4 | 600 | 900 | 75 | |
| E | 2-5 | 8 | 6 | 840 | 1100 | 130 | 2 |
| F | 4-6 | 6 | 2 | 200 | 300 | 50 | |
| G | 5-6 | 10 | 8 | 1200 | 1400 | 100 | 3 |

EST

10

18

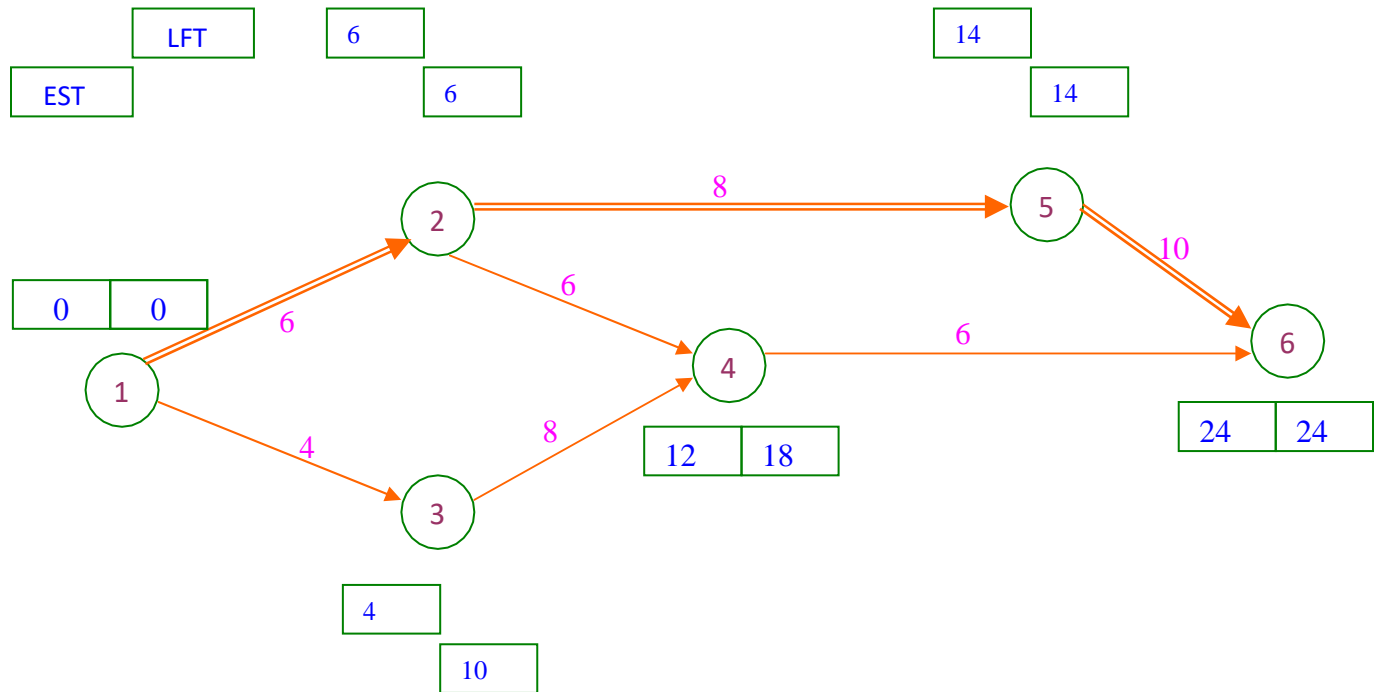


Critical path is 1-2-5-6 and Duration is 28 days Total cost is

= Direct cost + Indirect cost

$$= (10+4+6+8+8+6+10) + 0 = 52/-$$

1-2 activity crashing by 4 days:

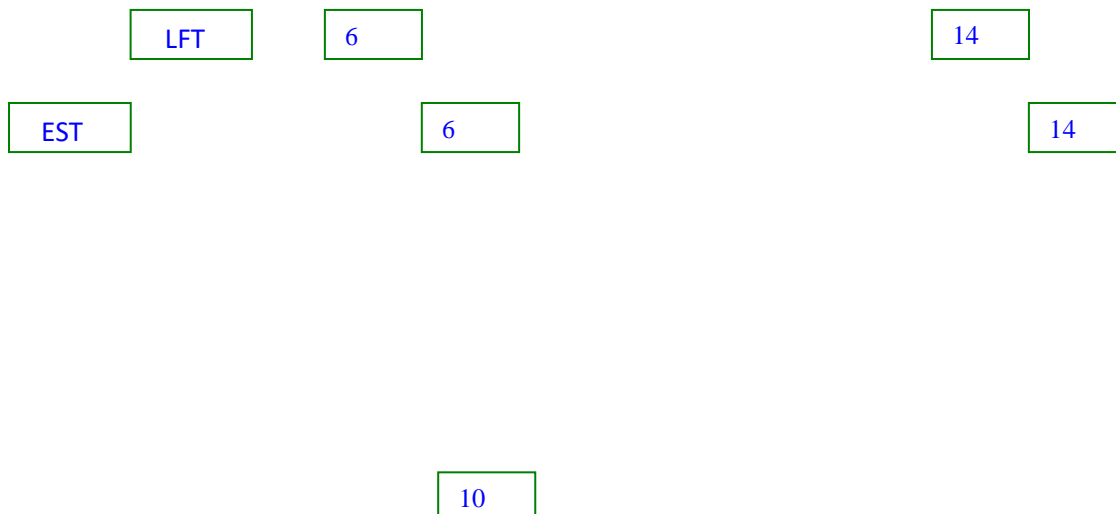


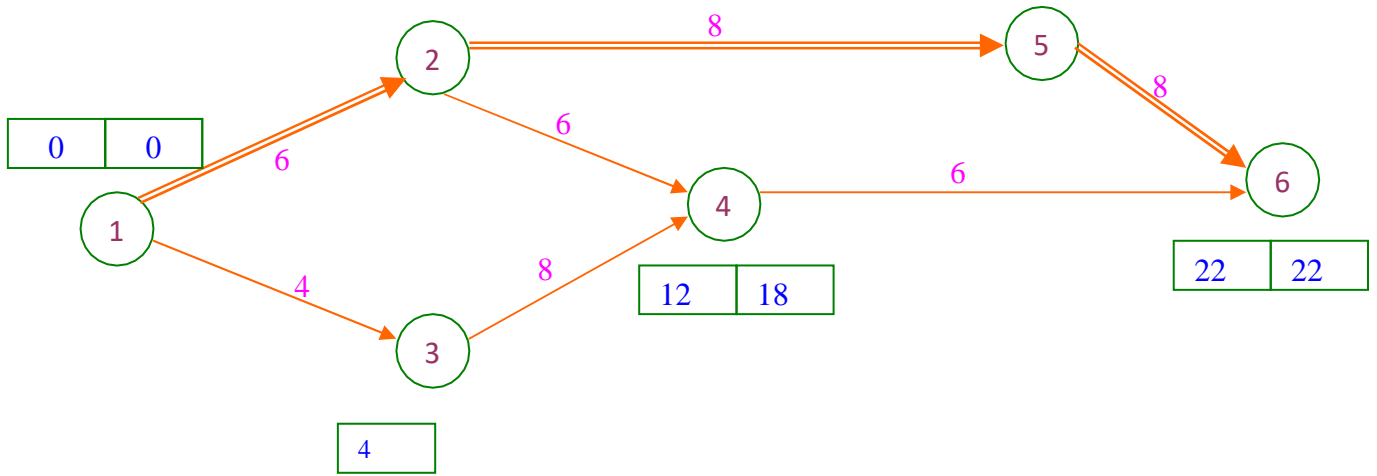
Critical path is 1-2-5-6 and Duration is 24 days Total cost is

= Direct cost + Indirect cost

$$= (52 + (4 \times 50) + 0) = 252/-$$

5-6 activity crashing by 2 days:

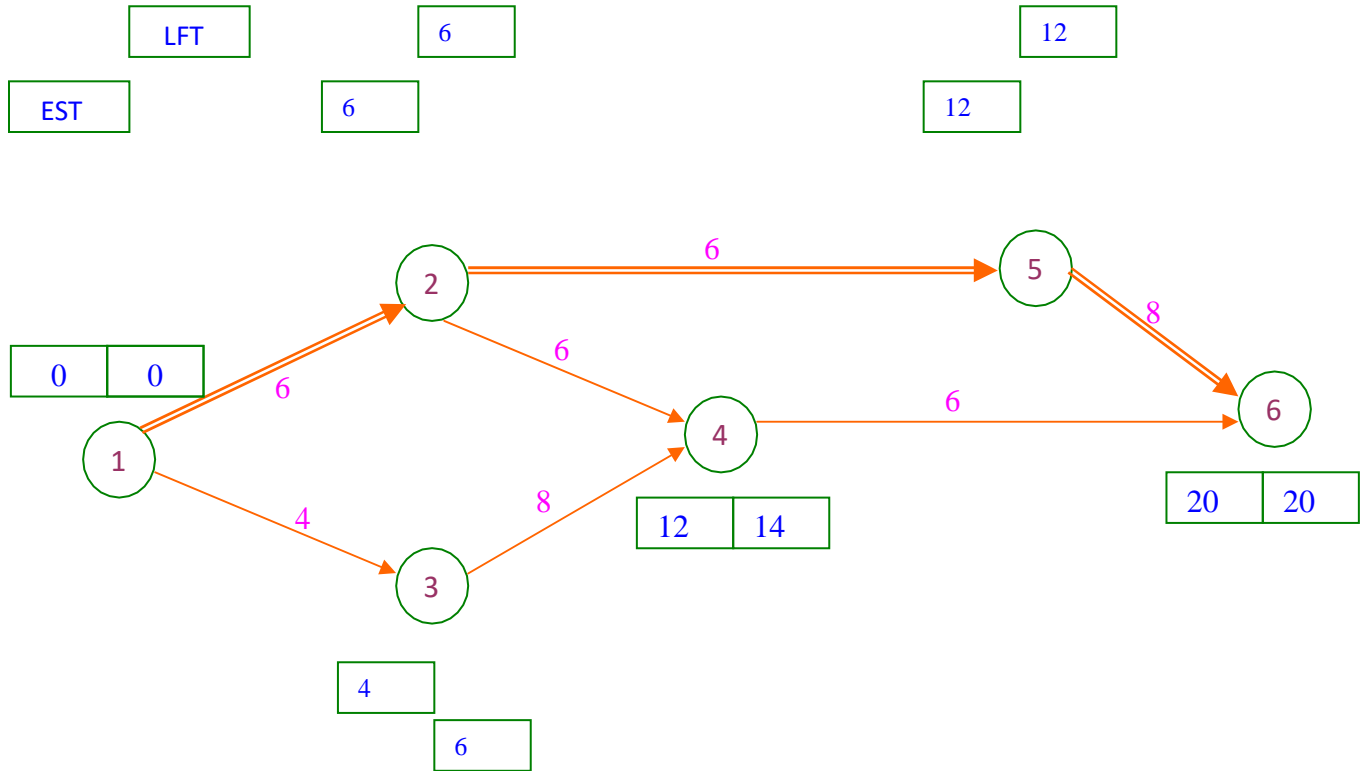




Critical path is 1-2-5-6 and Duration is 22 days

Total cost is = Direct cost + Indirect cost
 $= (252 + (2 \times 100) + 0) = 452/-$

2-5 activity crashing by 2 days:



Critical path is 1-2-5-6 and Project Duration is 20 days Total cost is =
 Direct cost + Indirect cost

$= (452 + (2 \times 130) + 0) = 712/-$

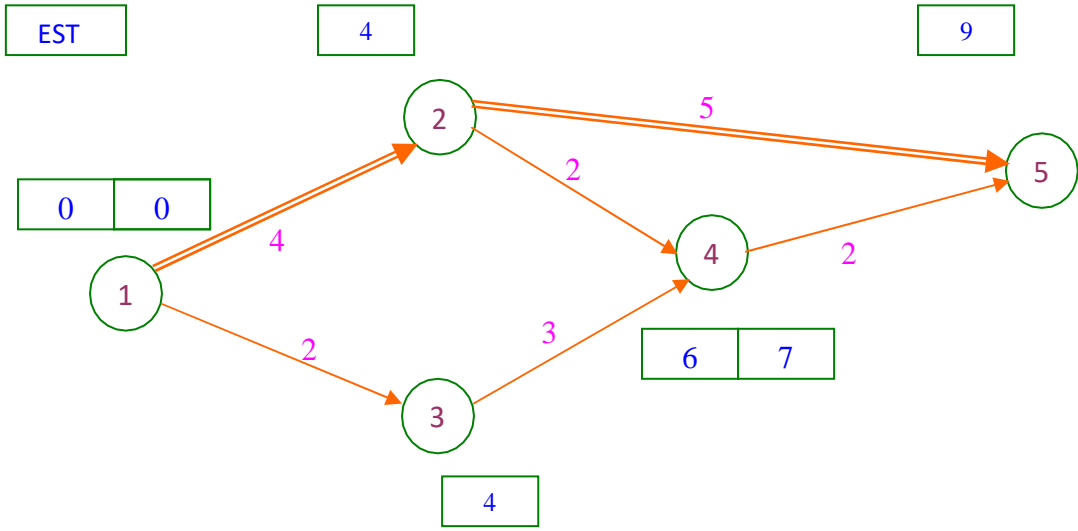
Optimum cost = 712/-
 Optimum Duration = 20
 days

2) The following table gives the information relating to a project. By using the given data calculate the optimum duration of the project. Where indirect cost is estimated Rs.2,000 per day.

| Activity | Normal | | Crash | |
|----------|------------|-----------|------------|-----------|
| | Time(days) | Cost(Rs.) | Time(days) | Cost(Rs.) |
| 1-2 | 4 | 1000 | 3 | 2000 |
| 1-3 | 2 | 1500 | 1 | 3500 |
| 2-4 | 2 | 500 | 1 | 900 |
| 2-5 | 5 | 1000 | 3 | 4000 |
| 3-4 | 3 | 1000 | 1 | 2000 |
| 4-5 | 2 | 800 | 1 | 1000 |

Solution:

| Activity | Normal | | Crash | | $Cost\ Slope = \frac{C_C - N_C}{N_T - C_T}$ | Priorities |
|-------------------|-------------|------------|-------------|------------|---|------------|
| | Time (days) | Cost (Rs.) | Time (days) | Cost (Rs.) | | |
| 1-2 | 4 | 1000 | 3 | 2000 | 1000 | 1 |
| 1-3 | 2 | 1500 | 1 | 3500 | 1000 | |
| 2-4 | 2 | 500 | 1 | 900 | 400 | |
| 2-5 | 5 | 1000 | 3 | 4000 | 1500 | 2 |
| 3-4 | 3 | 1000 | 1 | 2000 | 500 | |
| 4-5 | 2 | 800 | 1 | 1000 | 200 | |
| Total direct cost | | 5800 | 4 | | | 9 |



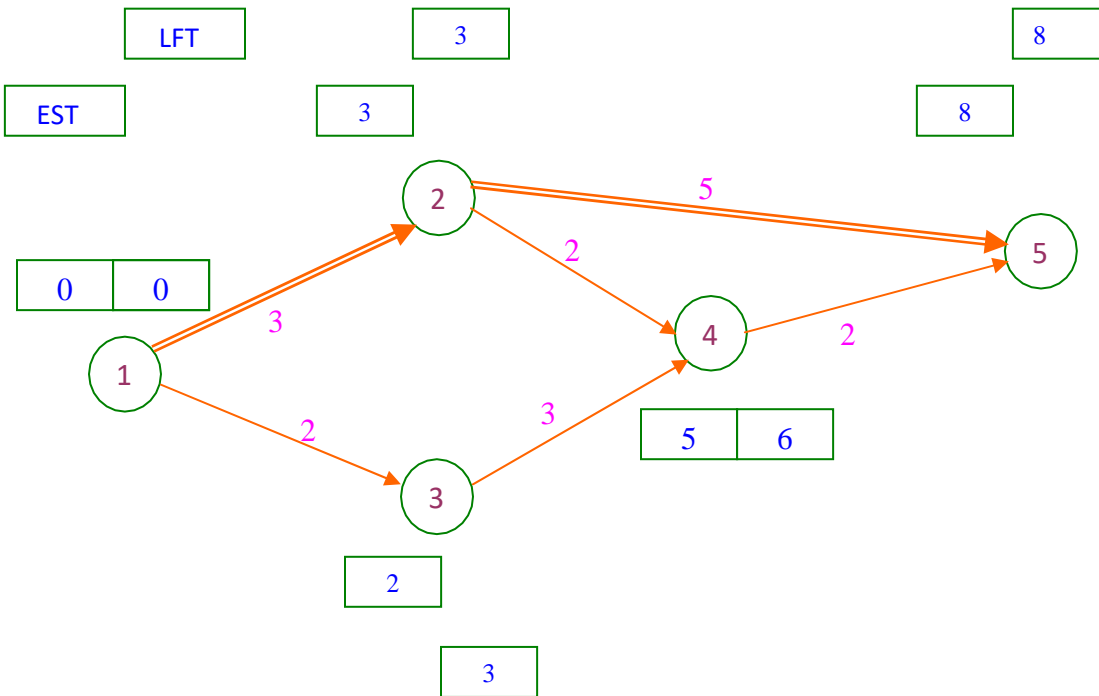
Critical path is 1-2-5 and Project Duration is 9 days Total cost is =

Direct cost + Indirect cost

$$= 5800 + (2000 \times 9)$$

$$= 23,800/-$$

1-2 crashing by 1 day:



Critical path is 1-2-5 and Project Duration is 8 days Total cost is =

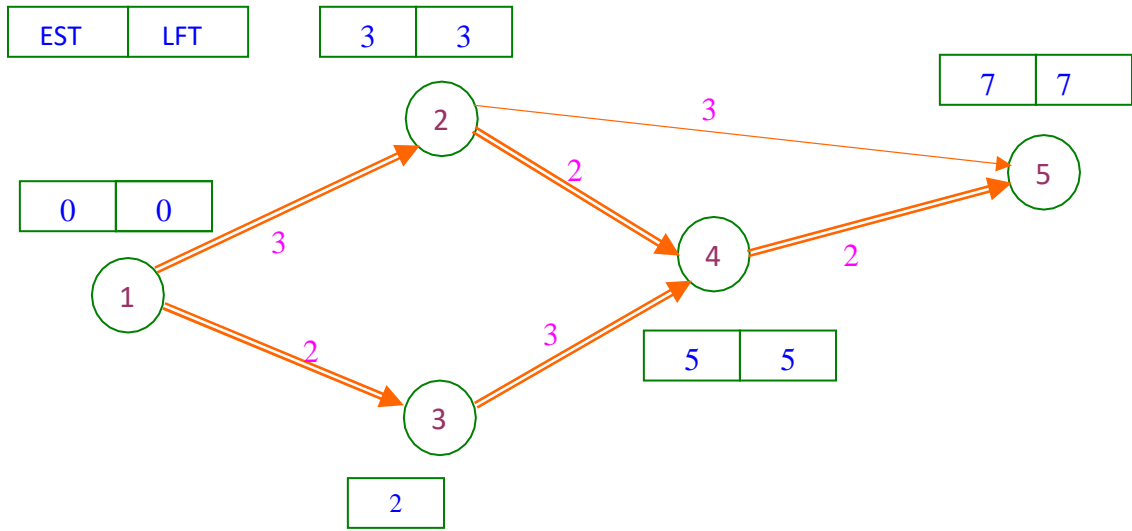
Direct cost + Indirect cost

$$= (5800 + (1 \times 1000)) + (2000 \times 8)$$

$$= 22,800/-$$

2-5(a) crashing by 2 days:

2



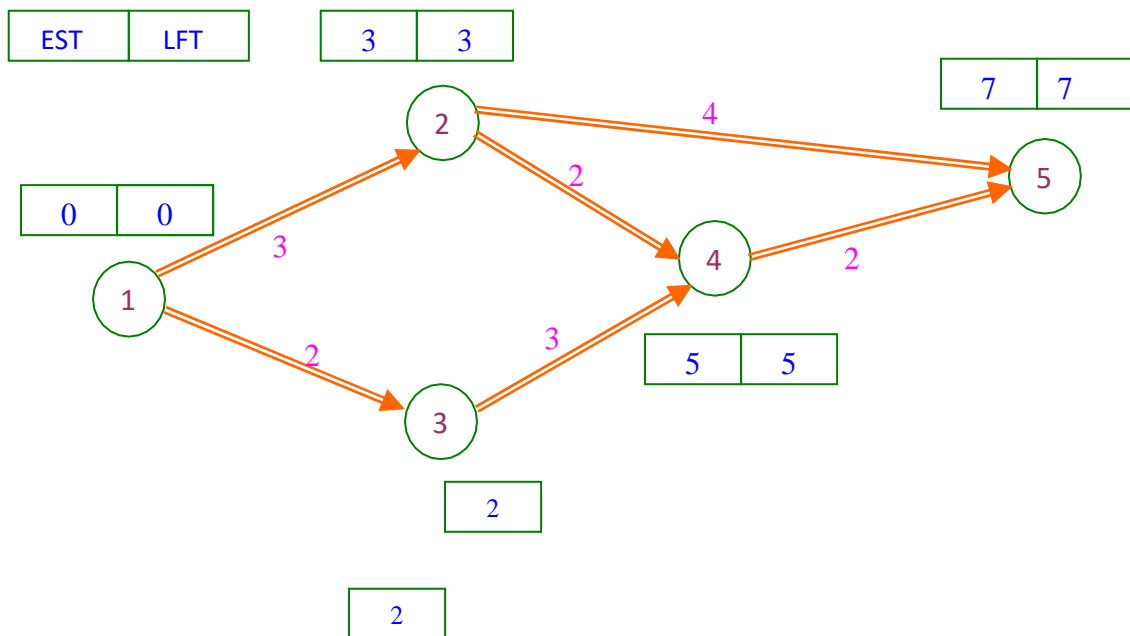
Critical paths are 1-2-4-5 and 1-3-4-5 and duration is 7 days only. Total cost =
 Direct cost + Indirect cost

$$= (6800 + (2 \times 1500)) + (2000 \times 7)$$

$$= 23,800/-$$

Here project crashed by 2 days and total cost incurred by the firm is 23,800/- but duration is reduced by only one day. So it is suggested to crash the network by only one day, It can help to reduce the cost. So that 2-5 activity crashing by only 1 day.

2-5(b) activity crashing by 1 day only



Duration is 7 days

Total cost = Direct cost + Indirect cost

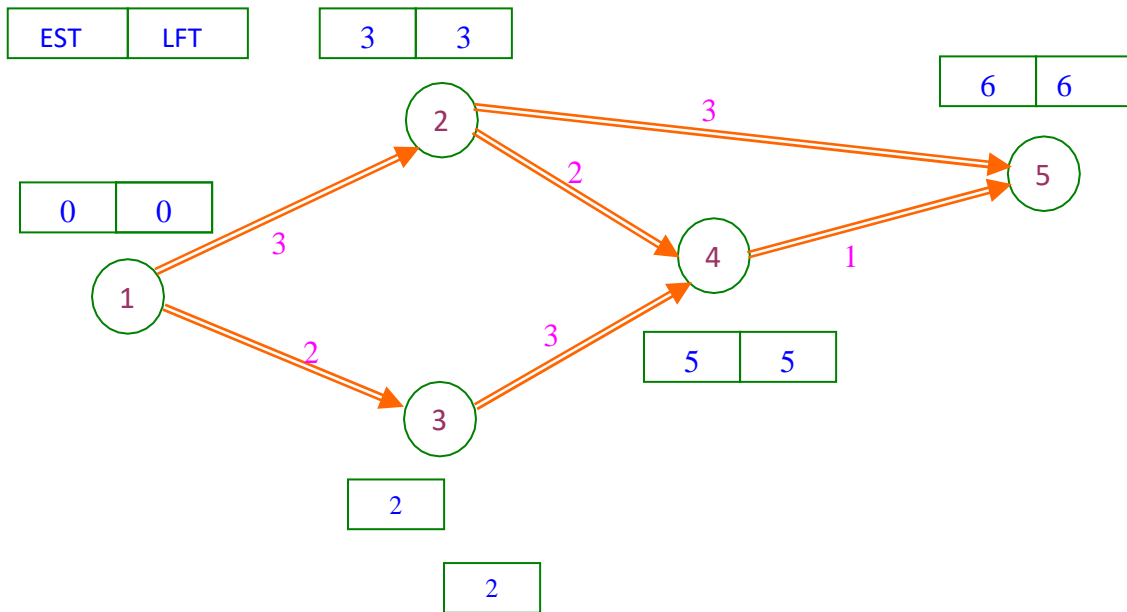
$$= (6800 + (1 \times 1500)) + (2000 \times 7)$$

$$= 8300 + 14000$$

$$= 22,300/-$$

All activities comes under the critical activities, the priority are changed according to the cost slope 4-5 activity having minimum cost slope. So that it is possible to crash out 4-5 activity by one day only and 2-5 by one day simultaneously

4-5 activity crashing by 1 day and 2-5 crashing by 1 day only:



Duration is 6 days

$$\begin{aligned}
 \text{Total cost} &= \text{Direct cost} + \text{Indirect cost} \\
 &= (8,300 + (1 \times 1500) + (1 \times 200)) + (2000 \times 6) \\
 &= (8300 + 1700) + (12000) \\
 &= 22,000/-
 \end{aligned}$$

This network diagram not possible to crashing further, So that the project duration is 6 days and optimum cost is Rs.22,000/-

Optimum cost= 22,000/-

Optimum Duration = 6 days

Descriptive Questions

1. Write the difference between PERT and CPM. List out the rules for constructing a network diagram.
2. Explain and illustrate what you understand by network analysis. How would you compare PERT with CPM?
3. Explain how you determine the probability of meeting the schedule date Completion of time?
4. Explain the uses of variance & expected time in relation to critical paths in a PERT network.
5. What do you mean by crashing a network? State step by step procedure of crashing.
6. A project has the following times schedule

| Activity | 1-2 | 1-3 | 2-4 | 3-4 | 3-5 | 4-9 | 5-6 | 5-7 | 6-8 | 7-8 | 8-9 | 8-10 | 9-10 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|

| | | | | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time in weeks | 4 | 1 | 1 | 1 | 6 | 5 | 4 | 8 | 1 | 2 | 1 | 8 | 7 |
|----------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|

Construct Network diagram and compute.

- a) Earlier Time and Latest Time for each event.
- b) Critical path and its duration.