F.Y.B.COM.
BUSINESS ECONOMICS - 1
SEMESTER - I
SUBJECT CODE : UBCOMFSI.3

(Revised Syllabus from Academic Year 2019-20 to IDOL Students)

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SEMESTER - I

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The basics of market demand, market supply and equilibrium price- shifts in the demand and supply curves and equilibrium

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Extension of cost analysis: Cost reduction through experience- LAC and Learning curve and Break Even Analysis (with business application)

Additional References:

1) Mehta, P.L.: Managerial Economics – Analysis, Problem and Cases (S. Chand & Sons, N. Delhi, 2000)

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5) Gregory Mankiw., Principles of Economics, Thomson South western (2002)

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UNIT 1

Unit - 1

INTRODUCTION TO BUSINESS ECONOMICS

Unit Structure :

1.0 OBJECTIVES

- To understand Scope and Importance of Business Economics.
- To study the basic tools of Economics.
- To explore Basic economic and functional relations.
- To understand use of Marginal analysis in decision making.

1.1 MEANING, SCOPE AND IMPORTANCE OF BUSINESS ECONOMICS

1.1.1 MEANING

Business Economics is also called as Managerial Economics. It involves application of economic theory and practice to business. In business, decision making is very important. Decision making is a process of selecting one course of action out of available alternatives. Thus business economics serves as a link between economic theory and decision-making in the context of business. Following are few definitions of Business Economics.

Spencer and Siegelman:

It is "the integration of economic theory with business practice for the purpose of facilitating decision making and forward planning by management."

Henry and Hayne:

"Business Economics is economics applied in decision making. It is a special branch of economics. That bridges the gap between abstract theory and managerial practice."

Salvatore:

"Business Economics refers to the application of economic theory and the tools of analysis of decision science to examine how an organisation can achieve its objectives most effectively."

1.1.2 SCOPE OF BUSINESS ECONOMICS

Scope is nothing but the subject matter of business economics. Scope of Business Economics is very wide.

1) Market Demand and Supply

In economics both demand and supply are the important forces through which market economy functions. Individual demand for a product is based on an individual's choice / Preferences among different products, price of the product, income etc. Individual demand is nothing but desire backed by individual's ability and willingness to pay. By summing up the demand of all the consumers or individuals for the product we get market demand for that particular product. Individual Supply is the amount of a product that producer is willing to sell at given prices. By summing up the supply of all the producers for the product we get market supply for that particular product. The market price where the quantity of goods supplied is equal to the quantity of goods demanded is called as equilibrium price. Existence, growth and future of business or firm depends on what price market determines for its product.

2) Production and Cost Analysis

Knowledge of business economics helps manager to do production and cost analysis. Production analysis helps to understand process of production and to make optimum utilisation of available resources. Cost analysis on the other hand helps firm to identify various costs and plan budget accordingly. Both production and cost analysis will help firm to maximize profit.

3) Market structure and Pricing Techniques

Markets are very important in business economics. Study of markets such as perfect completion, monopoly, oligopoly, monopolistic market etc. is very significant for producers. It is very imperative for manager or producer to identify type of market that will be there for their products. Knowledge of markets and competition will help them to take better decision regarding pricing of the product, marketing strategies etc. Pricing techniques, on the other hand, helps the firms to decide best remunerative price at different kinds of markets.

4) Forecasting and coverage of risk and uncertainty.

Knowledge of business economics helps manager to forecast future. For example Demand forecasting. It means estimation of demand for the product for a future period. Demand forecasting enables an organization to take various decisions in business, such as planning about production process, purchasing of raw materials, managing funds in the business, and determining the price of the commodity. Likewise forecasting future helps firm to take important decisions and cover risk and uncertainty associated with those decisions.

5) Inventory Management

Knowledge of business economics will help producer to reduce costs associated with maintenance of inventory such as raw materials, finished goods etc.

6) Allocation of resources

Business Economics provides advanced tools such as linear programming which helps to achieve optimal utilisation of available resources.

7) Capital Budgeting

Capital budgeting or investment appraisal is an official procedure used by firms for assessing and evaluating possible expenses or investments. It is a process of planning of expenditure which involves current expenditure on fixed/durable assets in return for estimated flow of benefits in the long run. Investment appraisal is the procedure which involves planning for determining whether firm's long term investments such as heavy machinery, new plant, research and development projects are worth the funding or not. Knowledge of business economics helps producer to take appropriate investment decisions with the help of capital budgeting.

1.1.3 IMPORTANCE OF BUSINESS ECONOMICS

1. Knowledge of business economics helps business organization to take important decisions as it deals with application of economics in real life situation.

2. It helps manager or owner of firm to design policies suitable for their firm or business.

3. Business economics is useful in planning future course of action.

4. It helps to control cost and monitor profit by doing cost benefit analysis.

5. It helps in forecasting future for taking important decisions in present.

6. It helps to set appropriate prices for various products by using available pricing techniques.

7. It helps to analyse effects of various government policies on business and take appropriate decision.

8. It helps to degree of efficiency of firms by using various economic tools.

1.2 BASIC TOOLS IN BUSINESS ECONOMICS

Opportunity cost

Individuals face Trade-offs in day to day life. It is a conflicting situation where people have to make decision or make choices among available alternatives. The moment selection takes place, the counterpart becomes opportunity cost. Opportunity lost is nothing but opportunity cost. If you decide to attend lecture, then you have to sacrifice on time that you could have spent otherwise. If you plant potatoes in your field, you must forego the chance of planting another crop because your resources are limited. Opportunity cost plays very important role in decision making. Doing one thing excludes doing something else. In other words, when we select something, we pay a cost, which is the cost of not being able to do the next best thing.

Marginalism

Rational decision makers will always think in terms of marginal quantities. One should compare the cost of an additional chocolate with the benefits of an extra chocolate in order to decide whether to have it or not. If the additional revenue that the producer is going to get by producing one more car is greater than the cost of producing the extra car, only then the seller will produce an extra car.

Let us take one example, an additional car sells for Rs. 10 lacks while it costs only Rs. 8 lakhs to produce the additional car. Clearly, a rational producer will decide to produce the car because he will make profit of Rs. 2 lakhs per car. On the other hand, if the price of car falls to Rs.7 lakhs while the cost of producing it remains Rs. 8 lakh, it will not make sense to produce the additional car since the cost surpasses the revenue to be earned from it. The cost of producing the extra car is called as marginal cost while the revenue obtained from selling an extra car is called as marginal revenue. If marginal revenue exceeds marginal cost, it obviously makes sense to produce the extra car. If the marginal revenue is less than marginal cost, it not advisable to produce the extra car.

Let us take another example from your day to day life. Suppose you may score 10 additional marks in economics by

studying for entire night. Getting the additional 10 marks is important because it makes you feel happy and proud. But suppose staying up for entire night makes you feel really sleepy in the morning hence makes you feel dull and unhappy. In this case, whether you should study for entire night depends upon whether the happiness that you get from the 10 additional marks in economics overshadows the unhappiness caused by the additional sleeplessness. In this way individuals can make use of marginalism principal in their day to day life for making appropriate decisions.

Incrementalism

Marginalism represents small unit change in the concerned variables. But many times in real life situations changes takes place in chunks or batches. For example firm producing car will not generally increase its production by one unit, but by a batch of additional units. Here we use concept of incrementalism instead of marginalism and decision will be taken by comparing incremental cost and incremental revenue.

Check your progress :

1) What do you mean by Business Economics?

2) Why knowledge of Business Economics is important?

3) Define opportunity cost.

4) Distinguish between Marginalism & Incrementalism.

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1.3 BASIC ECONOMIC RELATIONS - FUNCTIONAL RELATIONS: EQUATIONS- TOTAL, AVERAGE AND MARGINAL RELATIONS

The Relationship between Total, Average and Marginal can be explained with the help of concepts like utility, cost, revenue etc. Here we will take example of revenue concepts.

Where, P = Price & Q = Quantity
TR = Total Revenue
AR = Average Revenue
MR = Marginal Revenue

Quantity	Price	TR	AR	MR
1	30	30	30	30
2	28	56	28	26
3	26	78	26	22
4	24	96	24	18
5	22	110	22	14
6	20	120	20	10
7	18	126	18	6
8	16	128	16	2
9	14	126	14	-2
10	12	120	12	-6

Table 1.1

Total revenue is calculated by multiplying price and quantity. As quantity increases TR increases initially then it decreases. AR is same as price. MR decreases constantly and becomes negative eventually.

Important concepts

1. Variables

A variable is magnitude of interest that can be measured. Variables can be endogenous and exogenous variables. Variables can be independent and dependent.

2. Functions

Function shows existence of relationship between two or more variables. It indicates how the value of one variable depends on the value of another one. It does not give any direction of relation.

3. Equations

An equation specifies the relationship between the dependent and independent variables. It specifies the direction of relation.

4. Graph

Graph is a geometric tool used to express the relationship between variables. It is a pictorial representation of data which shows how two or more sets of data or variables are related to one another.

5. Curves

The functional relationship between the variables specified in the form of equations can be shown by drawing line or outline which gradually deviates from being straight for some or all of its length in the graph.

6. Slopes

Slopes show how fast or at what rate, the dependant variable is changing in response to a change in the independent variable.

1.4 SUMMARY

In this unit we have seen meaning, scope and importance of business economics. Business Economics is also called as Managerial Economics. It involves application of economic theory and practice to business. In business, decision making is very important. Decision making is a process of selecting one course of action out of available alternatives. Thus business economics serves as a link between economic theory and decision-making in the context of business. Scope of business economics involves Market Demand and Supply, Production and Cost Analysis, Market structure and Pricing Techniques, Forecasting and coverage of risk and uncertainty, Inventory Management, Allocation of resources, Capital Budgeting etc. We have also discussed basic tools in economics such as opportunity cost, marginalism and incrementalism. Business economics deals with many economic relations and various concepts such as variables, functions, equations, graph, curves and slopes.

1.5 QUESTIONS

1) Discuss scope and importance of business economics.
2) Write short note on Opportunity Cost.
3) Write short note on Marginalism
4) Discuss use of marginal analysis in decision making.
5) Write short note on Incrementalism.
6) Explain following concepts-
   a. Variables
   b. Functions
   c. Equations
   d. Graph
   e. Curves
   f. Slopes

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Unit – 1A

MARKET DEMAND AND MARKET SUPPLY

Unit Structure :

1A.0 Objectives
1A.1 The basics of market demand, market supply and equilibrium price
1A.2 Shifts in the demand and supply curves and equilibrium
1A.3 Summary
1A.4 Questions

1A.0 OBJECTIVES

1) To study the basics of market demand, market supply and equilibrium price.
2) To study shifts in the demand and supply curves and equilibrium.

1A.1 MARKET DEMAND, MARKET SUPPLY AND EQUILIBRIUM PRICE

In economics both demand and supply are the important forces through which market economy functions. Individual's demand is desire backed by his / her ability and willingness to pay. There is an indirect or negative relationship between price and quantity demanded. Individual Supply is the amount of a product that producer is willing to sell at given prices. There is a direct or positive relationship between price and quantity supplied.

Market Demand

Individual demand for a product is based on an individual's choice / Preference among different products, price of the product, income etc. Individual demand is nothing but desire backed by individual's ability and willingness to pay. By summing up the demand of all the consumers or individuals for the product we get market demand for that particular product.

Table 1A.1Market Demand Schedule

Price	Demand of Individual A	Demand of Individual B	Market Demand (Demand of Individual A + Demand of Individual B)
10	5	7	12
20	4	6	10
30	3	5	8
40	2	4	6
50	1	3	4

The above table 1A.1 represents demand schedule of individual A, individual B and Market Demand. Same schedule can be represented with the help of a graph.
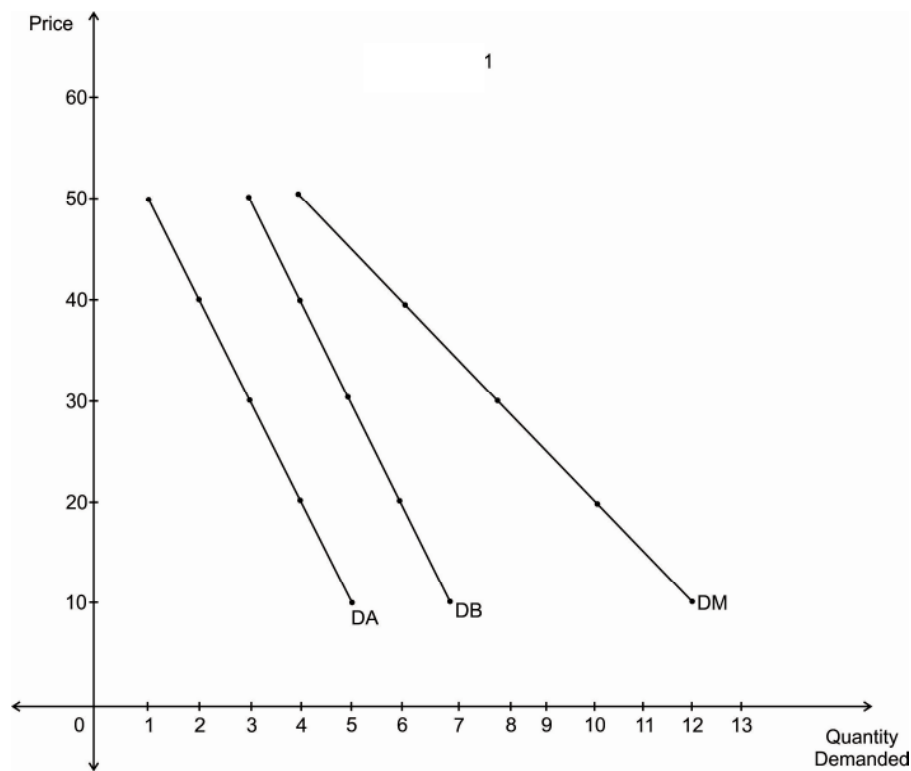
Diagram 1A.1 Market Demand Curve

Diagram 1A.1 represents demand curve of individual A, individual B and Market Demand. DA is a demand curve of individual A. DB is the demand curve of individual B. DM is the market demand curve. All curves are downward sloping indicating negative relationship between price and quantity demanded.

Market Supply

Individual Supply is the amount of a product that producer is willing to sell at given prices. By summing up the supply of all the producers for the product we get market supply for that particular product.

Table 1A.2 Market Supply Schedule

Price	Supply of Producer A	Supply of Producer B	Market Supply (Supply of Producer A + Supply of Producer B)
10	1	3	4
20	2	4	6
30	3	5	8
40	4	6	10
50	5	7	12

The above table 1A.2 represents supply schedule of producer A, producer B and Market supply. Same schedule can be represented with the help of a graph.
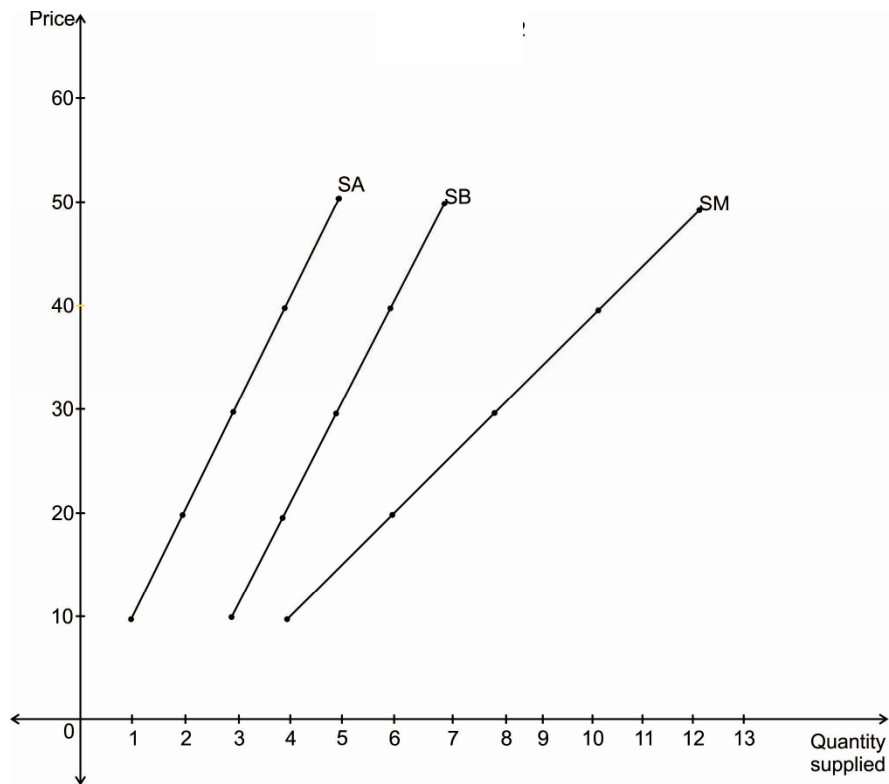
Diagram 1A.2 Market Supply Curve

Diagram 1A.2 represents supply curve of producer A, producer B and Market supply. SA is a supply curve of producer A. SB is the supply curve of producer B. SM is the market supply curve. All curves are upward sloping indicating positive relationship between price and quantity demanded.

Equilibrium Price

The market price where the quantity of goods supplied is equal to the quantity of goods demanded is called as equilibrium price. This is the point at which the market demand and market supply curves intersects.

Table 1A.3 Equilibrium Price Schedule

Price	Market Demand	Market Supply
10	12	4
20	10	6
30	8	8
40	6	10
50	4	12

The above table 1A.3 represents schedule of equilibrium price. Same schedule can be represented with the help of a graph to locate equilibrium price. Even in the table itself it is very clear that 30 is equilibrium price as at this price, market demand is equal to market supply i.e. 8 units.
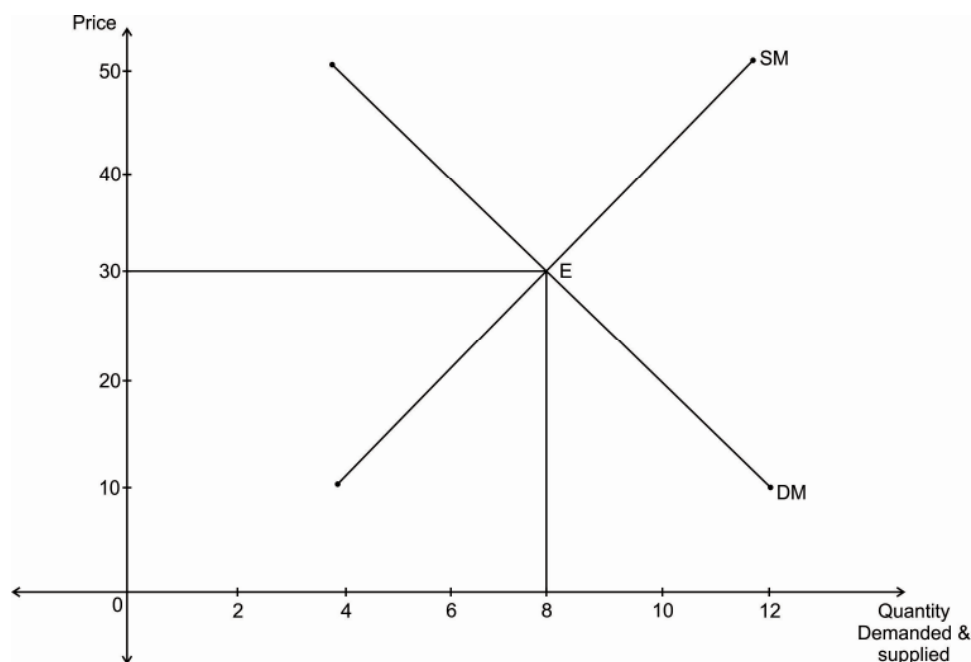
Diagram 1A.3 Equilibrium Price.

Diagram 1A.3 represents Equilibrium Price. DM is the market demand curve. DM is downward sloping curve indicating inverse or negative relationship between price and quantity demanded. SM is the market supply curve. SM is upward sloping curve indicating direct or positive relationship between price and quantity supplied. DM and SM curves intersect each other at point E where equilibrium price is 30 and equilibrium quantity demanded and supplied is 8 units.

Check your Progress :

1) What do you mean by Individual Demand & Market Demand?
2) What do you mean by Individual Supply & Market Supply?
3) Define Equilibrium Price.

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1A.2 SHIFTS IN DEMAND AND SUPPLY CURVES AND EQUILIBRIUM

1A.2.1 SHIFTS / CHANGES IN DEMAND :

Shifts in demand takes place due to changes in non-price factors such as income, population, government policies, tastes, preferences, habits, fashion etc. Whenever there are favourable changes in these factors then the demand curve shifts outward. It is also known as Increase in Demand. Whenever there are unfavourable changes in these factors then the demand curve shifts inward. It is also known as Decrease in demand.
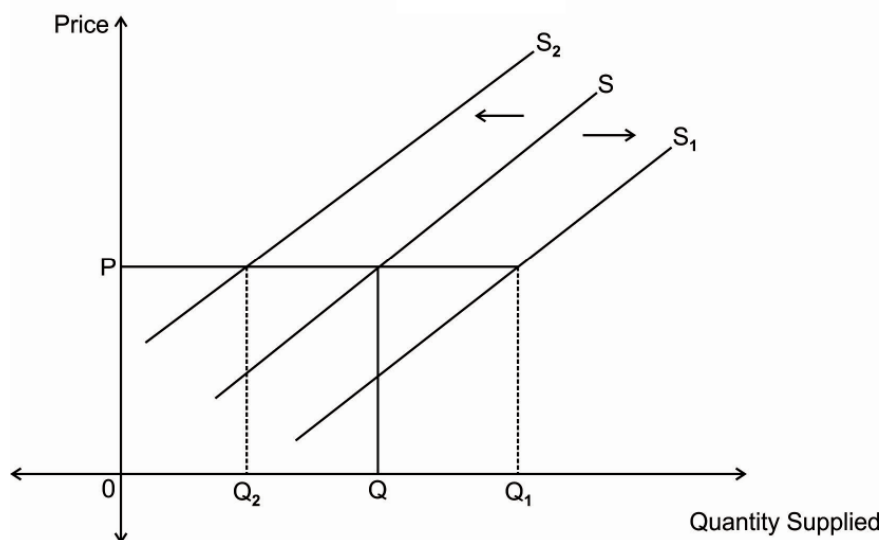
Diagram 1A.4 Changes in Demand
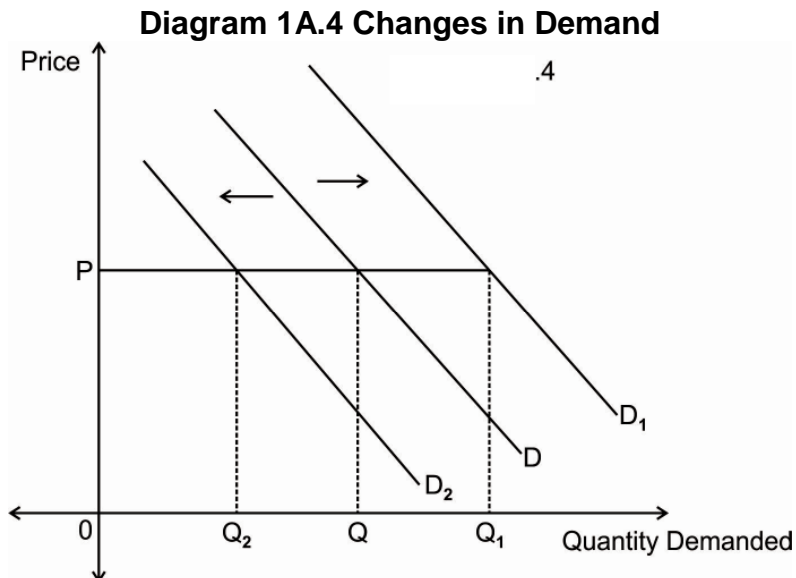
In the above diagram D is the original demand curve. At price P, OQ quantity is demanded. If there are favourable changes in the non-price factors affecting demand then the demand curve shifts outward and becomes D1. Here we can see that at same price P, now more quantity i.e. OQ1 quantity is demanded. If there are unfavourable changes in the non-price factors affecting demand then the demand curve shifts inward and becomes D2. Here we can see that at same price P, now less quantity i.e. OQ2 quantity is demanded. Shift from D to D1 is known as Increase in Demand and shift from D to D2 is known as Decrease in Demand.

1A.2.2 SHIFTS / CHANGES IN SUPPLY

Shifts in supply takes place due to changes in non-price factors such as cost of production, government policies, state of technology etc. Whenever there are favourable changes in these factors then the supply curve shifts outward. It is also known as Increase in supply. Whenever there are unfavourable changes in these factors then the supply curve shifts inward. It is also known as Decrease in supply.

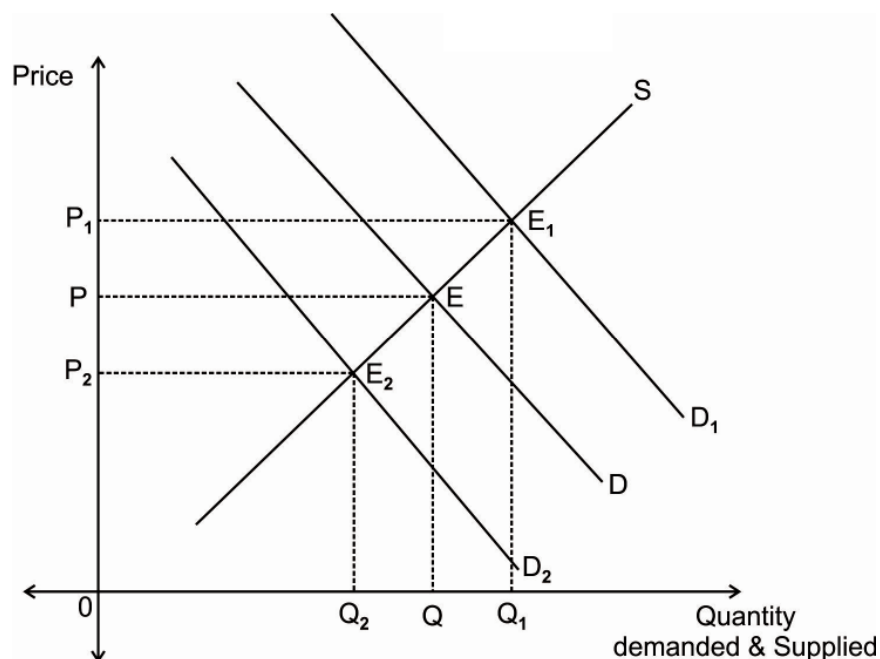**Diagram 1A.5 Changes in Supply**

In the above diagram S is the original supply curve. At price P, OQ quantity is supplied. If there are favourable changes in the non-price factors affecting supply then the supply curve shifts outward and becomes S1. Here we can see that at same price P, now more quantity i.e. OQ1 quantity is Supplied. If there are unfavourable changes in the non-price factors affecting supply then the supply curve shifts inward and becomes S2. Here we can see that at same price P, now less quantity i.e. OQ2 quantity is supplied. Shift from S to S1 is known as Increase in Supply and shift from S to S2 is known as Decrease in Supply.

1A.2.3 SHIFTS IN EQUILIBRIUM

The market price where the quantity of goods supplied is equal to the quantity of goods demanded is called as equilibrium price. This is the point at which the market demand and market supply curves intersects. Whenever there are changes in demand and supply, position of equilibrium will change.

Diagram 1A.6 Effects of Changes in Demand on Equilibrium

In the above diagram D is the original demand curve and S is the original Supply curve. At equilibrium E, equilibrium price is P and equilibrium quantity demanded and supplied is OQ. If there are favourable changes in the non-price factors affecting demand then the demand curve will shift outward and become D1. Now the new equilibrium is at E1. At E1, equilibrium price is P1 and equilibrium quantity demanded and supplied is OQ1. If there are unfavourable changes in the non-price factors affecting demand then the demand curve will shift inward and become D2. Now the new equilibrium is at E2. At E2, equilibrium price is P2 and equilibrium quantity demanded and supplied is OQ2. Thus increase in demand leads to higher price and decrease in demand leads to lower prices.

Diagram 1A.7 Effects of Changes in Supply on Equilibrium
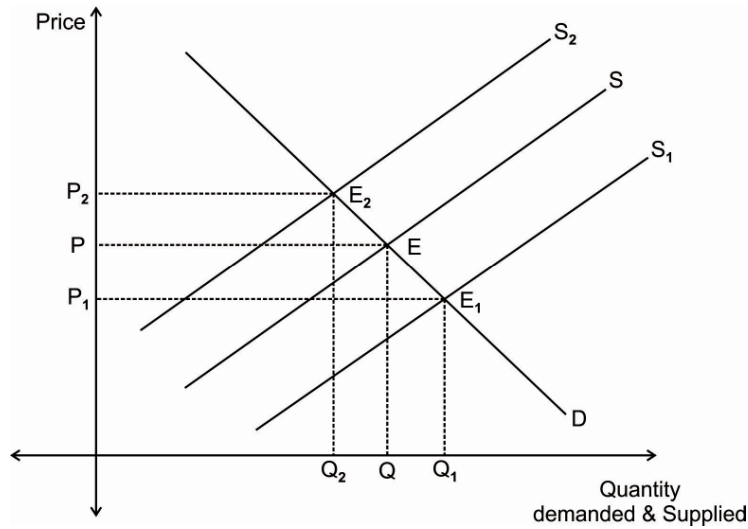
In the above diagram D is the original demand curve and S is the original Supply curve. At equilibrium E, equilibrium price is P and equilibrium quantity demanded and supplied is OQ. If there are favourable changes in the non-price factors affecting supply then the supply curve will shift outward and become S1. Now the new equilibrium is at E1. At E1, equilibrium price is P1 and equilibrium quantity demanded and supplied is OQ1. If there are unfavourable changes in the non-price factors affecting supply then the supply curve will shift inward and become S2. Now the new equilibrium is at E2. At E2, equilibrium price is P2 and equilibrium quantity demanded and supplied is OQ2. Thus increase in supply leads to lower price and decrease in supply leads to higher prices.

Check you Progress :

1) List out the factors that lead to changes in demand.
2) List out the factors that lead to changes in supply.

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1A.3 SUMMARY

In economics both demand and supply are the important forces through which market economy functions. Individual demand for a product is based on an individual's choice / Preference among different products, price of the product, income etc. Individual demand is nothing but desire backed by individual's ability and willingness to pay. By summing up the demand of all the

consumers or individuals for the product we get market demand for that particular product. Individual Supply is the amount of a product that producer is willing to sell at given prices. By summing up the supply of all the producers for the product we get market supply for that particular product. The market price where the quantity of goods supplied is equal to the quantity of goods demanded is called as equilibrium price. Existence, growth and future of business or firm depend on what price market determines for its product. In this unit we studied derivation of individual and market demand and supply curves along with derivation of equilibrium price and quantity. We have also seen how shifts in demand and supply takes place along with their effect on equilibrium level of price and quantity.

1A.4 QUESTIONS

1) Write short note on Market Demand.
2) Write short note on Market Supply.
3) Write short note on Equilibrium Price.
4) Complete the following table and draw the graph.

Price	Demand of Individual A	Demand of Individual B	Market Demand
10	15	10	?
20	14	9	?
30	13	8	?
40	12	7	?
50	11	6	?

5) Complete the following table and draw the graph.

Price	Supply of Producer A	Supply of Producer B	Market Supply
10	8	6	?
20	9	7	?
30	10	8	?
40	11	9	?
50	12	10	?

6) Write short note on changes in Demand.
7) Write short note on changes in supply.
8) What are the effects of changes in Demand on equilibrium?
9) What are the effects of changes in Supply on equilibrium?

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UNIT 2

Unit - 2

DEMAND ANALYSIS

Unit Structure :

2.0 OBJECTIVES

- To understand the demand and its function.
- To study the various factors which determines the demand.
- To familiarise with the various concepts of elasticities of demand.
- To understand with the concepts of revenue.

2.1 INTRODUCTION

In economics both demand and supply are the important forces through which market economy functions. The demand function shows the relationship between the quantity demanded and its various determinants. In this chapter we will explain the demand function in detail and the nature of demand curve under different market situation. We will also explain the relationship between elasticity of demand and revenue concepts.

2.2 DEMAND FUNCTION

Demand function is an arithmetic expression that shows the functional relationship between the demand for a commodity and the various factors affecting it. This includes the income of a consumer and the price of a commodity along with other various determining factors affecting demand. The demand for a commodity is the dependent variable, while its determinants factors are the independent variables.

The demand for a commodity depends on various factors which determines the quantity of a commodity demanded by various individuals or a group of individuals. The following equation shows the demand function which expresses the relationship between the quantity demanded of a commodity X and its determinants.

$$Qd_x = f\left(P_x, Y, P_y, T, A\right)$$

Where,

Qd_x = Quantity demanded of commodity X.

P_x = Price of commodity X.

Y = income of a consumer.

P_y = Price of related commodities.

T = Taste and Preference of an individual consumer.

A = Adverting expenditure made by producer.

2.3 DETERMINANTS OF DEMAND

The important determinants of demand for a commodity are explained below:

1. **Price of commodity (P_x):** The price of commodity is very important determinants of demand for any commodity. Other things remaining same, the rise in price of the commodity, the demand for the commodity contracts, and with the fall in price, its demand expands. So, the quantity demanded and price shows an inverse relationship in the case of normal goods. In other word changes in price brings changes in the consumer's demand for that commodity.

2. **Income (Y):** Another important determinant of demand for a commodity is consumer's income. Change in consumer's income also influences the change in consumer's demand for a commodities. The demand for normal goods increases with the

increasing level of income and vice versa. it shows a direct relationship between income and quantity demanded.

3. **Price of related commodities (P_y):** The demand for a commodity is also affected by the price of other commodities, especially of substitute or complementary goods. A good may have some related goods either substitute or complementary. The relation between two may be different.

Substitute Goods: Substitute Goods are those goods which can be substituted from each other. For Instance Tea & Coffee. When the rise in the price of Tea causes rise in demand for Coffee because there is no change in price of coffee such goods are called as substitute goods. In other words the relation between two substitute goods are positive. An incase the price of one commodity increase the demand for other.

Complementary Goods: Complementary goods are those goods which one purchased together. For Instance Car & Petrol. when their a rise in price of Petrol leads to fall in demand for Car such goods are called complementary good. In other words, the relation between two complementary goods are negative. An increase in price of one commodity leads to decrease in demand for other.

4. **Taste and Preference (T):** The demand for a commodity also depends on the consumer's taste and preferences such as change in fashion, culture, tradition etc. As the consumers taste and preference for a particular commodity changes the demand for that particular commodity also changes. Therefore, Taste and Preference of a consumer plays an important role.

5. **Advertising expenditure (A):** Advertising expenditure by a firm influence the demand for a commodity. The advertisements by the manufacturer and sellers attract more customers towards the commodity. There exists positive relationship between advertising expenditure and demand for the commodity.

2.4 MEANING OF DEMAND

The demand in economics means the desires to purchase the commodity backed by willingness and the ability to pay for it.

Demand= Desire + Willingness to buy + Ability to pay

2.5 THE LAW OF DEMAND

The law of demand was propounded by the famous economist Alfred Marshall in early 1892. Due to the general

observation of law, economists have come to accept the validity of the law under most situations. The law of demand states that other thing being equal the relationship between the price and the quantity demanded of a commodity are inversely related to each other. In other words, when the price of a commodity rises the quantity demand for the commodity falls. The law of demand helps to explain the consumer's choice behaviour due to change in the price of a commodity.

Assumptions:
The law of demand is based on the following assumption given below:

1. **No change in consumers income:** There should not be any change in the consumer income while operating under the law of demand. If income of a consumer increases the consumer may buy more goods at the same price or buy the same quantity even if price increases. The income is assumed to be constant, as it may lead to enticement to the consumer to buy more goods and raise the demand for a commodity despite an increase in the price of commodity.

2. **No change in the price of other goods:** The price of substitute goods and complimentary good should remain the same. If any of the price changes may lead to change in the demand for the other commodity and it will change the consumer preference will affect the law of demand.

3. **No change in taste and preference:** The law assumes that the consumer's taste and preference for a commodity remains the same. If there is a change in consumer's taste and preferences there will be a change in the demand for the commodity.

4. **No expectation of change in the future price:** The law of demand remains valid if there is no change in future expectation about price of commodities. If consumer is expecting rise in price in future, he will buy more quantities even at a higher price in present time and vice-versa.

5. **No change in the size and composition of population:** The law also assumes that the size and composition of the total population of a country should not change. That means, the population must neither increase nor decrease. Because a rise in the populations would increase the demand for commodities. Along with the size of population, composition of population also matters. If number of senior citizens is more then the demand for medical care will be more. If female population is more then the demand for cosmetics will be more.

6. **No change in government polices:** The law assumes that there is no change in the government policy which will either increases or decreases the demand for the commodity.
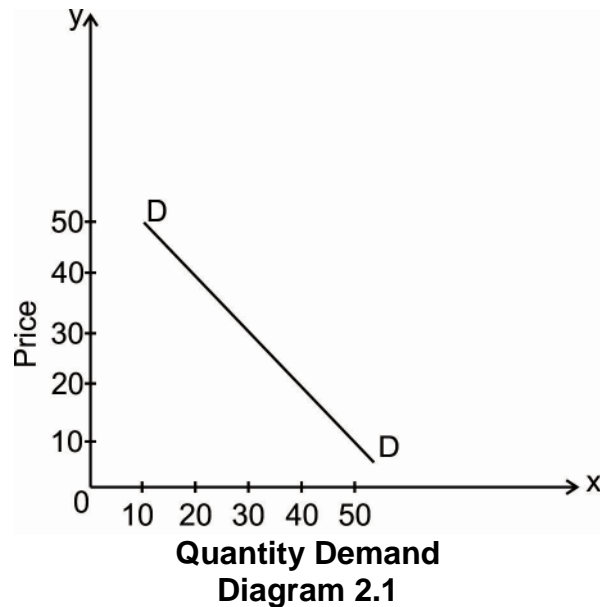
Demand Schedule and Demand Curve:

The law of demand can be simply explained through a demand schedule and demand curve. The demand schedule is a tabular representation of the law of demand which is shown below:

Demand Schedule: Table 2.1

Price (₹)	Quantity demanded of a commodity 'X' (Units)
50	10
40	20
30	30
20	40
10	50

Representation of table:

It can be seen from the above table, that when the price of a commodity 'X' is ₹50 per unit, the consumer purchases 10 units of the commodity. Further when the price of the commodity falls to ₹40, he purchases 20 units of commodity. Similarly, when the price falls further the quantity demand by the consumer goes on increasing by 30 units as so on. This demand schedule shows the inverse relationship between the price and quantity demanded of a commodity.

Demand curve:

Quantity Demand
Diagram 2.1

The demand schedule can also be explained through demand curve in a simpler way. The demand curve is a graphical representation of the quantities of good demanded by the consumer at various possible price in a period of time. The Diagram shows quantity demanded on X-axis and the price of a commodity

on Y-axis. If the demand schedule is plotted on the demand curve, we get the various price-quantity combination points and if we join these points, we get the downward slopping demand curve. Thus, the downward sloping demand curve according to law of demand shows, the inverse relationship between price and quantity demanded.

Exceptions to the Law of Demand: The law of demand is generally valid in most of the cases but there are few cases where the law is not applicable. Such cases are explained below:

1. **Goods having prestige value (Veblen effect):** This exception to the law of demand was propounded by an economists Thorstein Veblen in his work 'conspicuous consumption'. According to him, some consumer measures the utility of a commodity by its price i.e., the higher the price of a commodity, the higher its utility. For example, People sometimes buy certain expensive or prestigious goods like diamonds at high prices not due to their intrinsic value but only because it has snob value. On the other hand, as price falls, they demand less due to the loss of its snob value. This effect is called as Veblen effect or Snob value.

2. **Giffen goods:** Another exception to the law of demand was put forwarded by the economists Sir Robert Giffen. There is a direct price – demand relationship in case of giffen goods. When with the rise in the price of a giffen goods, its quantity demand increases and with the fall in its price its quantity demand decreases, the demand curve will slope upward to the right hand side and not downward.

3. **Price Expectations:** When the consumer expects there is rise in price of a commodity in future, he/she may purchase more of commodity at present. Where the law of demand is not applicable.

4. **Emergencies:** During the time of emergencies such as natural and man-made calamities, the law of demand becomes ineffective. In such circumstances, people often fear the shortage of the necessity goods and hence demand more goods and services even at higher prices.

5. **Change in fashion and taste &preferences:** The change in taste and preferences of the consumers denies the effect of law of demand. The consumer tends to buy those commodities which are in trends in the market even at higher prices. On the other hand, when a product goes out of fashion, a reduction in the price of the product may not increases the demand for it.

Check your Progress :

1) Who propounded the theory of law of demand?
2) What relationship does law of demand state between demand & price?
3) What is Veblen effect?

2.6 NATURE OF DEMAND CURVE UNDER DIFFERENT MARKETS

Economist have classified the various markets prevailing in a capitalist economy into (a) perfect competition or pure competition, (b) monopolistic competition, (c) oligopoly and (d) monopoly. According to Cournot, a French economist, "Economist understand by the term market not any particular market place in which things are bought and sold but the whole of any region in which buyers and sellers are in such free interaction with one another that the price of the same good tends to equality easily and quickly". The type of different market depends on number of factors. Accordingly, the nature of demand curve is different in different market. The nature of demand curve under various market structure are as follows:

Demand Curve in Perfect Competition:

Perfect competition is said to prevail when there are large number of producers (firms) producing and selling homogenous product. The maximum output produce by the individual firm is very small relatively to the total demand to the industry product so that firm cannot affect the price by varying its supply of output. The seller is the price taker he accepts the price determined in the market by market demand and market supply. Thus, the individual price under perfect competition is determine by the market demand and market supply.

Market Demand Curve: The market demand curve under perfect competition is downward sloping. Because price and quantity demand are inversely related to each other as the price of a commodity increases the demand for that good decreases. The market price at which the firms will sell their commodity is determined by the interaction of market demand and market supply. Once the market determines the price for the commodity all firms will fix their price equals to market price as they are price taker

under the perfect competition. Thus, the individual demand curve is equal to the equilibrium price of the market. The Diagram 2.2. shows the market demand curve which is downward sloping and P_0 is the equilibrium market price which is followed by all the individual firm and the individual firm is facing the horizontal demand curve.
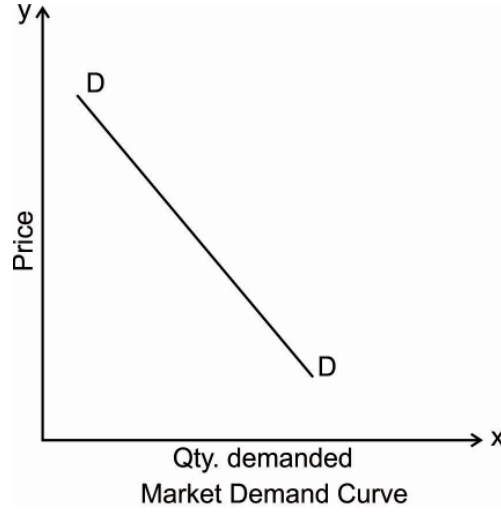

Market Demand Curve
Diagram 2.2

Individual Firm demand curve: Demand curve facing an individual firm working under prefect competition is perfectly elastic i.e. a horizontal straight line parallel to X axis at a given price which is determined by the market demand sand market supply. The Diagram 2.3 shows Qty demanded on X axis and Price of the commodity on Y axis. Where OP_1 is the price determined by the interaction of market demand and market supply curve. It shows if firm tries to lower the price, he will get negative profit.
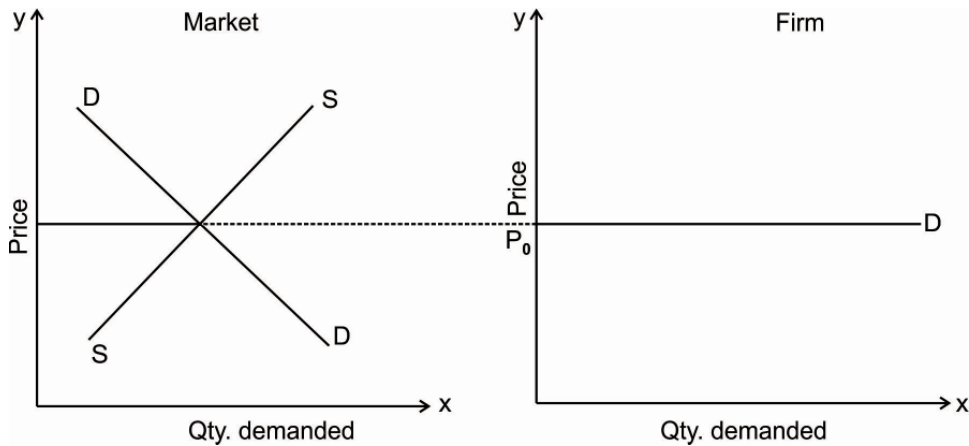

Diagram 2.3

Demand Curve under Monopoly: Monopoly is a market where there is single firm producing and selling product which has no close substitute. As being the single seller monopoly has a control on supply and he can also decide the price of a commodity. But however, a rational monopolist who aim at maximum profit will

control either price or supply. As monopolists is the only single seller in the market, he constitutes the whole industry. Therefore, the demand curve under monopoly market is downward sloping and has a steeper slope as shown in the Diagram 2.4. below:
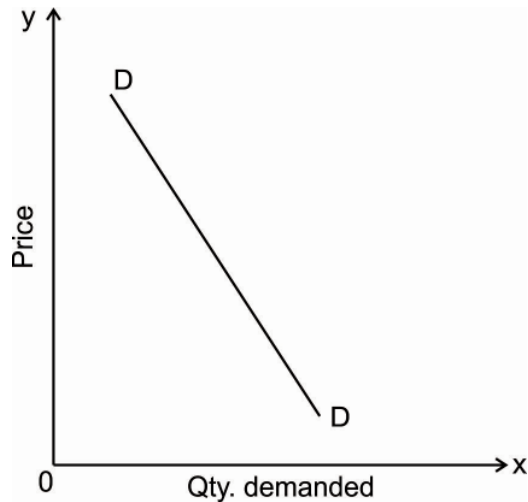

Diagram 2.4

Thus, in monopoly there is a strong barrier to entry new firm in the industry. If the monopolist firm wants to increases the sale in the market, he has to lower the price of its commodity.

Demand curve under Monopolistic competition: In the monopolistic market there is a large number of firms producing or selling somewhat differentiated product which have close substitute. As a result, demand curve facing a firm under monopolistic competition is sloping downward and has a flatter shape which is highly elastic and this indicate that a firm enjoy some control over the price of a commodity. The demand curve facing an individual firm under monopolistic competition is shown in the following Diagram 2.5.
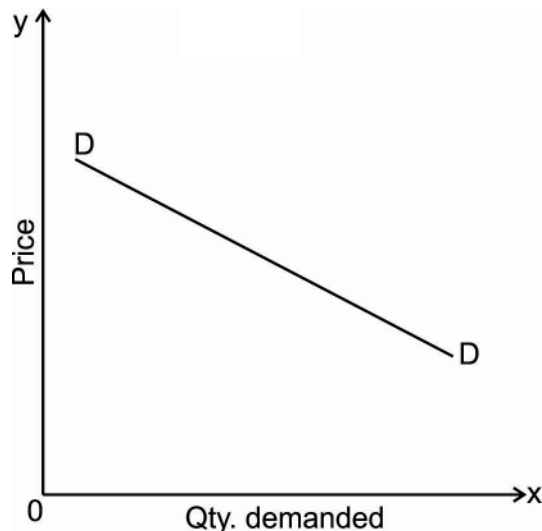

Diagram 2.5

Demand curve under oligopoly market : Oligopoly is a market where there are few firms or sellers producing or selling differentiated products. The fewness of firm ensures that each of them will have some control over the price of the product and the demand curve facing each other will be downward sloping which indicates the price elasticity of demand for each firm will not be infinite. As there are interdependence of firm. Any decision regarding change in the price of output attracts reaction from the rival firms. Therefore, the demand curve for an oligopoly firm is indeterminate, i.e. it cannot be drawn accurately as exact behaviour pattern of a producer with certainty.

The demand curve faced by the firm under oligopoly is shown in the following Diagram 2.6:
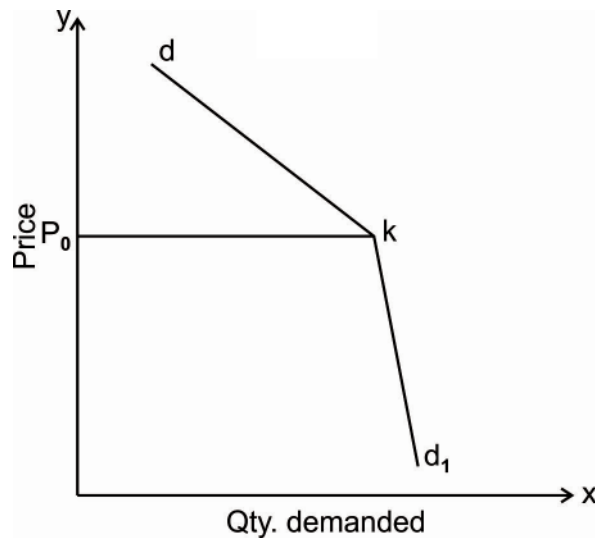

Diagram 2.6

The demand curve facing an oligopolist is kinked in nature. The kink is formed at a prevailing level the point K because the segment of the demand curve above the prevailing price level i.e. Kd is highly elastic and the segment the segment below the prevailing price level i.e. Kd_1 is inelastic. This is due to different reaction of the different firm.

2.7 ELASTICITY OF DEMAND

Elasticity of demand helps us to estimate the level of change in demand with respect to a change in any of the determinants of demand. The concept of elasticity of demand helps the firm or manager in decision making with respect to pricing, promotion and production polices. It has a very great importance in economic theory ss well for formulation of suitable economic policy.

Meaning of elasticity:

Elasticity is the measure of the degree of responsiveness of change in one variable to the degree of responsiveness change in another variable.

Thus, Elasticity $= \dfrac{\%\ \text{change in A}}{\%\ \text{change in B}}$

The concept of elasticity of demand therefore refers to the degree of responsiveness of quantity demanded of a good to the change in its price, consumers income and price of related goods.

Check your Progress :

1) In which market condition market demand & market supply determines the price of commodity?
2) Why Oligopoly demand Curve is kinked?
3) What is Elasticity?

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2.8 PRICE ELASTICITY OF DEMAND

Price elasticity of demand shows the degree of responsiveness of quantity demanded of a good to the change in its price, other factors such as income, prices of related commodities that determines demand for the commodity which are held constant. In other words, price elasticity of demand is defined as the ratio of the percentage change in quantity demanded of a commodity to a percentage change in price of the commodity. Thus,

$$e_p = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

The demand curve for most of the commodities, is downward sloping due to the inverse relationship between quantity demanded and price of the commodity, the value of the price elasticity of demand will always be negative. While interpreting the price elasticity of demand the negative sign is ignored or omitted. This is because we are interested in measuring the magnitude of responsiveness of quantity demanded of a good to changes in its prices.

2.9 FACTORS AFFECTING PRICE ELASTICITY OF DEMAND

The price elasticity of demand depends upon number of factors which affects its elasticity. They are as follows:

a. **Nature of goods or commodity:** The elasticity of demand for a commodity depends upon the nature of the commodity, i.e., whether the commodity is a necessary, comfort or luxury good. The elasticity of demand for a necessary commodity is relatively small. For example, if the price of such a good rise, its buyers generally are not able to reduce its demand as its necessity commodity.

The elasticity of demand for a luxury good is usually high. This is because the consumption of a such good, unlike that of a necessary commodity, can be delayed. That is why if the price of such a commodity increase, the demand for the good can be significantly reduced.

b. **Availability of Substitute Goods:** The price elasticity of demand also depends upon the substitution of goods. If there is a close substitute for a particular commodity in the market, then the demand for such commodity would be relatively more elastic. For example, since tea and coffee are close substitute for each other in the commodity market, a rise in the price of coffee will result in a considerable fall in its demand and a consequent rise in the demand for tea. Therefore, a demand for coffee will be relatively more elastic because of the availability of tea in the market.

c. **Alternative and Variety of Uses of the Product:** as we know that the resources have an alternative use. The demand for such goods has many uses. The more the alternative and variety of uses of a good, the more would be its elasticity of demand. For example, Electricity is used for many purposes such as lighting, heating, cooking, ironing and also use as a source of power in many industries & households. That is why when the price of electricity increases, its demand will decrease and vice versa.

d. **Role of Habits and custom:** if the consumer has a habit of something, he will not reduce his consumption even if the price of such commodity increases the demand for them do not decreases considerably and so their elasticity of demand will be inelastic. Ex; Alcohol, Cigarettes which are injurious for health but people still consume it because of their habit.

e. **Income Level of the consumer:** The elasticity of demand differs due to the change in the income level of the households. Elasticity of demand for a commodity is low for higher income level groups then the people with low incomes. This is because rich people are not influenced much by changes in the price of goods. Poor people are highly affected by the increase or decrease in the price of goods. As a result, demand for the lower income group is highly elastic in demand.

f. **Postponement of Consumption:** if the consumer postponed the consumption of commodity in future the demand is relatively elastic. For example, commodities whose demand is not urgent, have highly elastic demand as their consumption can be postponed if there is an increase in their prices. However, commodities with urgent demand like medicines have inelastic demand because it is an essential commodity whose consumption cannot be post pended.

g. **Time Period:** Price elasticity of demand is related to a period of time. The elasticity of demand varies directly with the time period. In the short run the demand is generally inelastic and in long-run it becomes relatively elastic. This is because consumers find it difficult to change their habits, in the short run, in order to response to the change in the price of the commodity. However, demand is more elastic in long run as their other substitutes available in the market, if the price of the given commodity rises.

2.10 MEASUREMENTS OF PRICE ELASTICITY OF DEMAND

There are various methods of measuring price elasticity of demand some of the important methods are explained below:

A. **Percentage method:** This method is associated with the name of Dr Alfred Marshall. This method is known by various names such as Proportionate method, Ratio method, Arithmetic method, and Flux method. The price elasticity of demand in this method is measured by dividing percentage change in quantity demanded by the percentage change in the price. In other it is the ratio of the percentage change in quantity demanded of a commodity by the percentage change in the price of the commodity itself.

Thus,
Ep= Percentage change in quantity demanded
          Percentage change in price

Symbolically, Ep = $\frac{\Delta q}{q} \div \frac{\Delta p}{p}$

$$= \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

Where, q = original quantity demanded.

p = original price.

Δq = change in quantity demanded.

Δ p= change in price.

As mentioned above, the price elasticity of demand has a negative sign this is due to inverse relationship between price and quantity demanded. But for simplicity in understanding the magnitude or the degree of responsiveness we ignore the negative sign and take only numerical value of elasticity.

B. Point method: Prof. Marshall devised a geometrical method for measuring the elasticity of demand at a point on the demand curve. In other word, the point elasticity of demand measures the elasticity of demand at the point on the demand curve.

This can be illustrated by the following given example:

Table 2.2

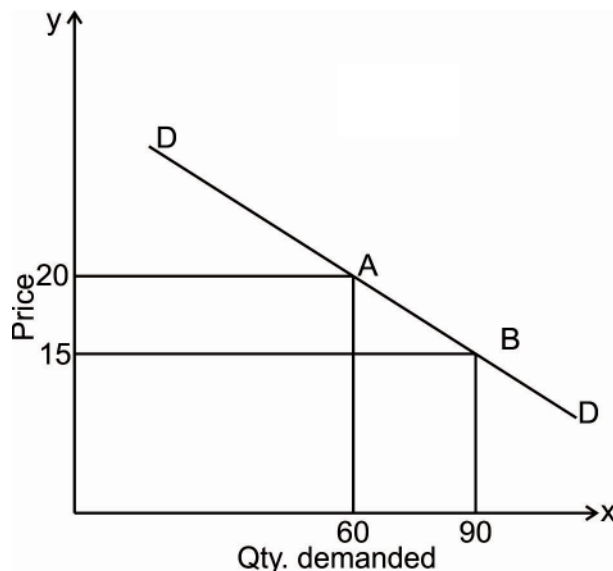| Price of commodity X	Quantity demanded of X	Point
20	60	A
15	90	B

The above table is represented in the following Diagram 3.7.

Diagram 2.7

The elasticity is at point A & B

Elasticity at point A $= \dfrac{\Delta q / q}{\Delta p / p}$

$= \dfrac{30 / 60}{-5 / 20}$

$= \dfrac{30}{-5} \times \dfrac{10}{60}$

$= -1.10$

Elasticity at point B

$= \dfrac{-30 / 90}{5 / 5}$

$= \dfrac{-30}{5} \times \dfrac{5}{90}$

$= -0.33$

C. Arc elasticity of demand: In the above measure we have studied the measurement of elasticity at a point on a demand curve. When elasticity is measured between two points on the same demand curve, it is known as arc elasticity. According to Prof. Baumol, "Arc elasticity is a measure of the average responsiveness to the change in price exhibited by a demand curve over some finite stretch of the demand curve.". Any two points on the same demand curve make an arc shows the arc elasticity of demand. In other words, arc price elasticity of demand measures elasticity of demand at two points on the demand curve.

$$Ep = \dfrac{\Delta q}{\dfrac{q_1 + q_2}{2}} \div \dfrac{\Delta p}{\dfrac{p_1 + p_2}{2}}$$

$$= \dfrac{q_2 - q_1}{q_2 + q_1} \div \dfrac{p_2 - p_1}{p_2 + p_1}$$

$$= \dfrac{q_2 - q_1}{p_2 - p_1} \times \dfrac{p_2 + p_1}{q_2 + q_1}$$

$$= \dfrac{(90 - 60) \times (15 + 20)}{(15 - 20) \times (90 + 60)}$$

$$= \dfrac{30}{-5} \times \dfrac{35}{150}$$

$$= -1.39$$

D. Geometrical measure of elasticity of demand: If there is a linear demand curve the point elasticity of demand is measured by geometrical method i.e. it is the ratio of lower segment of the

demand curve below the point to the upper segment of the demand curve above the point on the demand curve.

Symbolically,

$$E_p = \frac{\text{Lower segment of the demand curve below the point}}{\text{Upper segment of the demand curve above the point}}$$

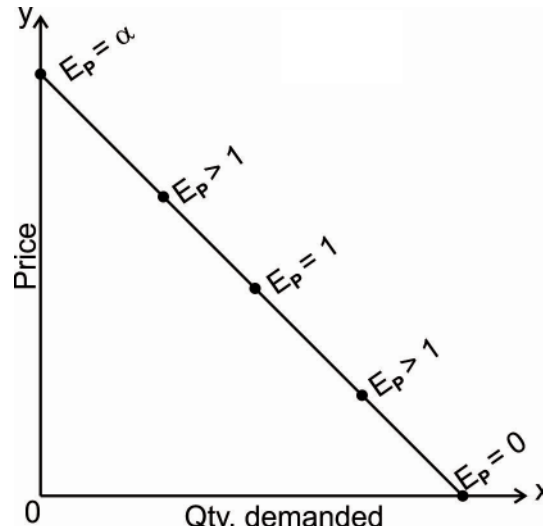The geometric method can be explained through the Diagram 3.8 given below:

Diagram 2.8

2.11 DEGREES OF ELASTICITY OF DEMAND

Different commodities have different elasticities of demand. Some commodities have more elastic demand then others, while other commodities have relative elastic demand. The elasticity of demand ranges from zero to infinity (0-∞). It can be equal to zero, one, less than one, greater than one and equal to unity.

"The degree of responsiveness to the change in demand in a market for a commodity is great or small, as the amount demanded increases much or little for a given fall in price and diminishes much or little for a given rise in price of the commodity".

The various level or the degree of elasticity of demand is explained in brief below:

1. **Perfectly elastic demand ($E_p = \infty$):** The demand is said to be perfectly elastic, if slight change in price leads to infinite change in the quantity demanded of the commodity. In other words, it is the level of responses where the consumer is able to buy all the available commodity at a particular price where the demand is elastic. The demand curve under this situation is horizontal straight line parallel to X axis shown in the Diagram 3.9 below.

This type of demand curve is relevant in perfect competition. But in the real world, this case is exceptionally rare and are not of any practical interest.
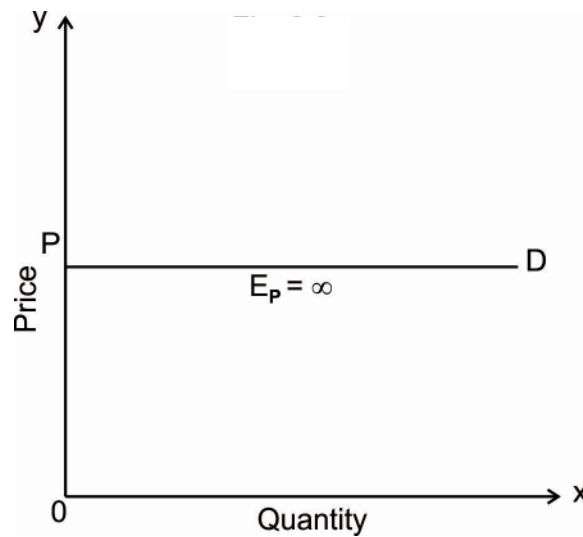

Diagram 2.9

2. **Perfectly inelastic demand ($E_p = 0$):** The demand is said to be perfectly inelastic, if the demand for a commodity does not change with a change in price of the commodity. In other words, the perfectly inelastic demand of a commodity is opposite to the perfectly elastic demand. Under the perfectly inelastic demand, a rise or fall in price of a commodity the quantity demanded for a commodity remains the same. The elasticity of demand will be equal to zero. The demand curve is vertical straight line parallel to Y-axis shown in the Diagram 2.10.
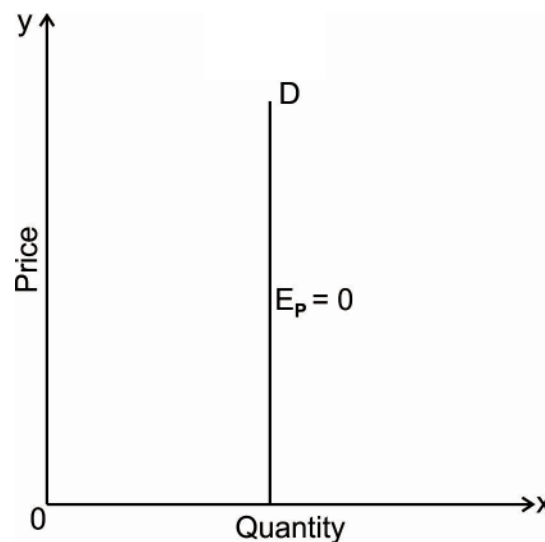

Diagram 2.10

3. **Unitary elastic demand ($E_p = 1$):** Demand is said to be unitary elastic when the percentage change in the quantity demanded for a commodity is equal to the percentage change in its price. The numerical value of unitary elastic of demand is exactly equal to one i.e. Marshall calls it as unit elastic. The demand curve is rectangular hyperbola shown in the Diagram 2.11.
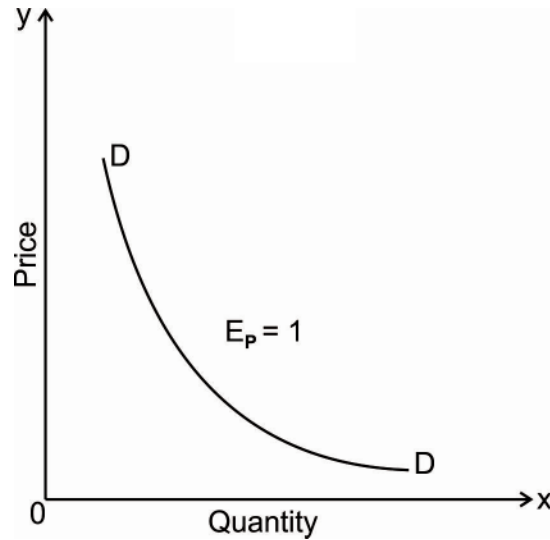

Diagram 2.11

4. **Relatively Elastic demand ($E_p > 1$):** Demand is said to be relatively elastic, when the percentage change in quantity demanded of a commodity is greater than the percentage change in its price. In other words, it refers to a situation in which a small change in price leads to a great change in quantity demanded. The demand curve under this situation is flatter as shown in Diagram 2.12. Such demand curve is seen under monopolistic competition.
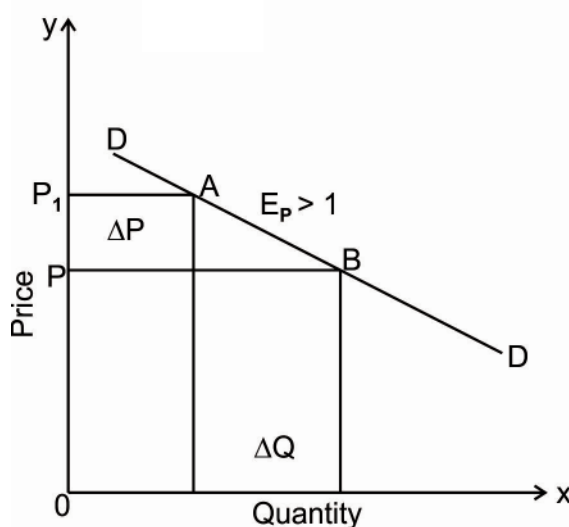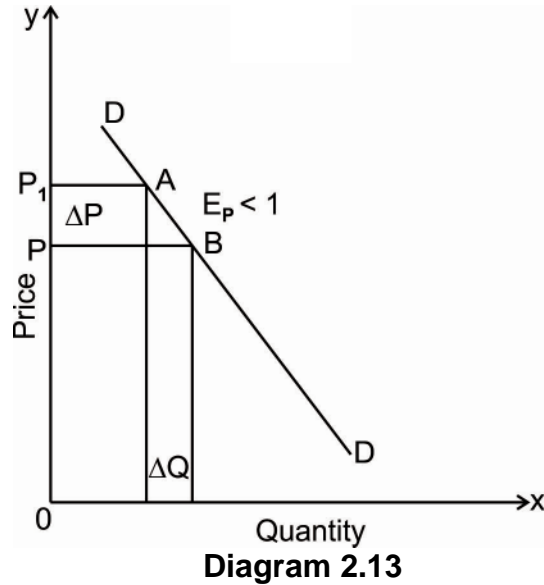

Diagram 2.12

5. **Relatively Inelastic demand ($E_p < 1$):** Demand is relatively inelastic when the percentage change in the quantity demanded of a commodity is less than the percentage change in the price of the commodity. The demand curve under this situation is steeper shown in Diagram 2.13. Such demand curve is observed under monopoly market.

Diagram 2.13

Check your Progress :

1) What is the nature elasticity of demand for luxurious good?
2) List down the degrees of Elasticity of Demand.

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2.12 INCOME ELASTICITY OF DEMAND

As we have discussed earlier the factor which determines elasticity of demand for a commodity. The consumer's income is one of the important determinants of demand for a commodity. The demand for a commodity and consumer's income is directly related to each other, unlike price-demand relationship.

Income elasticity of demand shows the degree of responsiveness of quantity demanded of a commodity to a small change in the income of a consumer. In other words, the degree of responsiveness of quantity demanded to a change in income is measured by dividing the proportionate change in quantity

demanded of a commodity by the proportionate change in the income of a consumer.

$$\text{Income Elasticity} = \frac{\text{Percentage change in purchases of a commodity}}{\text{Percentage change in income}}$$

2.12.1 MEASUREMENT OF INCOME ELASTICITY OF DEMAND

The income elasticity of demand can be calculated by either point method or arc method.

Point income elasticity of demand is measured by following formula: $E_y = \dfrac{\Delta Q / Q}{\Delta Y / Y}$

$$= \frac{\Delta Q}{\Delta Y} \cdot \frac{Y}{Q}$$

$$= \frac{\Delta Q}{\Delta Y} \cdot \frac{Y}{Q}$$

Where, Q = Original Quantity Demanded.
Y= Original Income.
ΔQ= Change in Quantity Demanded.
ΔY= Change in Income.

Arc income elasticity of demand is measured by following formula:

$$E_y = \frac{\left(Q_2 - Q_1\right)}{\left(Y_2 - Y_1\right)} \cdot \frac{\left(Y_2 - Y_1\right)}{\left(Q_2 - Q_1\right)}$$

Income elasticity of demand being zero is a great significance. It implies that a given increase in the income of a consumer does not at all lead to any increase in quantity demanded of a commodity or expenditure on it.

Classification of goods based on income elasticity of demand: We can broadly classify the various goods on the basis of value of income elasticity of demand.

1. **Normal Goods:** Normal goods are those goods which are usually purchased by consumer as his income increases. In other words, normal good means an increase in income causes an increase in the demand for a commodity. It has a positive income elasticity of demand. Normal goods are further classified as:

   a. **Necessity goods:** A good with an income elasticity less than one and which claims declining proportion of consumers income as he becomes richer is called a necessity good. Necessity goods are those goods where an

increase in income of a consumer leads to less than proportionate increases in the demand for a commodity. For example, daily used goods, basic goods etc. the income elasticity of demand for such goods positive and less then unity. i.e. $E_y < 1$.

b. **Luxuries goods:** A good having income elasticity more than one and which therefore bulks larger in consumers budget as he becomes richer is called a luxury good. Luxuries goods are those goods where a change in income leads to direct and more than proportionate change in quantity demand for a commodity. For example, diamonds, expensive cars, etc. Thus, income elasticity of demand for such goods is positive and greater than one i.e. $E_y > 1$.

c. **Comfort goods:** Comfort goods are those goods where change in income leads to direct and proportionate change in quantity demanded. For example, semi-luxury goods and comfort items. Income elasticity of such goods are positive and unity. i.e. $E_y = 1$.

2. **Inferior goods:** Inferior goods are those goods are where consumer buys less of goods as his income increases. Goods having negative income elasticity are known as inferior goods. As income of a consumer increases his demand for goods shifts from inferior to superior. The income elasticity for such goods are $E_y = 0$.

3. **Neutral goods:** when a change in income of a consumer brings no change in the quantity demanded of a commodity. For example, salt, rice, pulses etc. elasticity for such goods are $E_y = 0$.

2.13 CROSS ELASTICITY OF DEMAND

Sometimes we find two goods are inter-related to each other either they are substitute goods or commentary goods. Cross elasticity of demand measures the degree of responsiveness of demand for one good in responsive to the change in the price of another good.

$$E_c = \frac{\text{Percentage change in quantity demanded of commodity 'X'}}{\text{Percentage change in the price of commodity 'Y'}}$$

Classification of goods based on value of cross elasticity of demand:

a. **Substitution:** If the value of elasticity between two goods are positive the goods are said to be substitute to each other. For example, Tea and coffee, if the price of tea increases the demand for coffee increases.

b. **Complementary:** if the value of elasticity between two goods are negative the goods are said to be complementary. For example, car and petrol, if the price of petrol increases the demand for car decreases.

c. **Unrelated:** if the value of elasticity between two goods are zero then the goods are said to be unrelated to each other. For example, table and car, if the price of table increases there is no change in the demand for car.

2.14 PROMOTIONAL ELASTICITY OF DEMAND

It is also known as 'Advertisement elasticity'. In modern times an increase in expenditure on advertisement or promotion leads to an increase in the demand for a commodity Promotional elasticity of demand is the proportional change in quantity demand due to proportionate change in promotional expenditure. In other words, percentage change in the quantity of demand for a commodity divided by the percentage change in promotional expenditure shows the promotional elasticity of demand.

$$E_A = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in advertisement expenditure}}$$

The greater the elasticity of demand, its better for a firm to spend more on promotional activities. The promotional elasticity of demand is usually positive.

Check your Progress :

1) How income of a Consumer related to the demand of the commodity?

2) If the Consumer income increase. What will be the elasticity of demand for necessity goods?

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2.15 CONCEPTS OF REVENUE

The term revenue refers to the income obtained by a firm or a seller through the sale of commodity at different prices. The revenue is classified as:

1. **Total revenue:** The total revenue or income earned by a firm or producer from the sale of the output he produced is called the total revenue. Thus, the total revenue is the price multiply the quantity of output.

   $$TR = P \times Q$$

Where,

TR = Total Revenue.

P = Price of a commodity.

Q = Total Output sold.

Thus, Total revenue is the sum of all sales, receipts or income of a firm in the market.

2. **Average revenue:** The average revenue refers to the revenue obtained by the firm by selling the per unit of output of a commodity. It is obtained by dividing the total revenue by total unit of output sold in the market.

   $$AR = \frac{TR}{Q}$$
   Or
   $$AR = P$$

Where, AR= Average revenue.

The average revenue curve shows that the price of the firm's product is the same at each level of output. In other words, the average revenue curve of a firm is also the demand curve of the consumer.

3. **Marginal revenue:** Marginal revenue is the additional revenue earned by selling an additional unit of the commodity. In other words, Marginal revenue is the change in total revenue due to the sale of one additional unit of output. Thus, marginal revenue is the addition commodity made to the total revenue by selling one more unit of the commodity. In algebraic terms, marginal revenue is the net addition to the total revenue by selling n units of a commodity instead of n – 1.

Thus, $MR_n = TR_n - TR_{n-1}$
Or
$$MR = \frac{\Delta TR}{\Delta Q}$$

Relationship between price elasticity and total revenue:
Elasticities of demand can be divided into three broad categories: elastic, inelastic, and unitary. An elastic demand is one in which the elasticity is greater than one, indicating a high responsiveness to changes in price. Elasticities that are less than one indicates low responsiveness to price changes and correspond to inelastic demand. Unitary elasticities indicate proportional responsiveness of either demand or supply, as summarized in the following table:

Total revenue	Change in price	Elasticity	Reasons
Increase Decrease	Fall Rise	$E_p > 1$	Percentage change in quantity demanded is greater than the percentage change in price.
Decrease Increase	Fall Rise	$E_p < 1$	Percentage change in quantity demanded is smaller than percentage change in price.
Unchanged Unchanged	Fall Rise	$E_p = 1$	Percentage change in quantity demanded is equal to percentage change in price.

Table 2.3

The relationship between the price elasticity and total revenue shows the following analysis from the above table.

A. When demand is elastic, price and total revenue move in opposite directions.
B. When demand is inelastic, price and total revenue moves in same direction.
C. When demand is unitary elastic, total revenue remains unchanged with the price changes.

This relationship can be easily understood by the following diagram: 2.14

Relationship between price elasticity and Average revenue and Marginal revenue: The relationship between AR, MR and elasticity of demand is very useful to understand at any level of output.

This relationship is also very useful to understand the price-determination under different market conditions. It has been discussed that average revenue curve of a firm is the same thing as the demand curve of the consumer for the product of the firm under market.

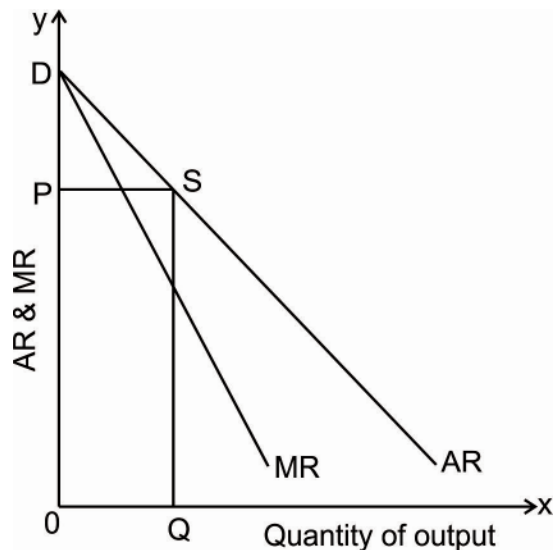This relationship can be explained with the following diagram: 2.14

Diagram 2.14

2.16 SUMMARY

In this unit we have analysed the demand concept and its various function along with the law of demand. In economics both demand and supply are the important forces through which market economy functions. But in this unit, we will focus more on demand side. The demand function shows the relationship between the quantity demanded and its various determinants. In this chapter we will explain the demand function in detail. Demand function is an arithmetic expression that shows the functional relationship between the demand for a commodity and the various factors affecting it. It has also explained he nature of demand curve under different market situation. We have also discussed the nature of demand curve under different market conditions with the various elasticity concepts and its measures in detail. Elasticity of demand helps us to estimate the level of change in demand with respect to a change in any of the determinants of demand. The concept of elasticity of demand helps the firm or manager in decision making with respect to pricing, promotion and production polices. The

elasticity of demand measures the elasticity of four important factors i.e. price, income, cross and promotional with three important measures of point, arc and geometric measures of elasticity. The unit also deals with the various revenue of the firm in business and their relationship in detail.

2.17 QUESTIONS

1. Explain the law of demand and the factors with determines the demand.
2. Explain the nature of demand curve under different markets.
3. What is demand function? Explain in detail.
4. What is elasticity? Explain price elasticity of demand in detail.
5. Explain the measurements of price elasticity of demand.
6. Discuss the different degrees of elasticity of demand.
7. What are the factors affecting price elasticity of demand?
8. Write a note on:
      a) Income elasticity of demand.
      b) Cross elasticity of demand.
      c) Promotional elasticity of demand.
9. Explain the concepts of revenue in detail.

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Unit – 2A

DEMAND ESTIMATION AND FORECASTING

Unit structure:

2A.0 OBJECTIVES

- To understand the meaning and significance of demand forecasting
- To learn the steps, involve in estimating demand forecasting
- To understand the methods of demand forecasting

2A.1 INTRODUCTION

Business is a serious job. Manager or the business firms has to take certain decision to run their business smoothly without any disturbance in his business. Demand forecasting play a vital role in business planning. Business enterprises need to plan their activities. Most of the business decisions of a firm under an organization are made under the conditions of risk and uncertainty. Demand forecasting is a systematic process that involves anticipating the demand for the product and services of an organization in future under a set of uncontrollable and competitive forces in the economy.

Demand forecasting helps the business firms to take appropriate decision about the production and the use of factors of production to fulfil the future demand of the commodity.

2A.2 MEANING

Demand forecasting means estimation of demand for the product for a future period. Demand forecasting enables an organization to take various decisions in business, such as planning about production process, purchasing of raw materials, managing funds in the business, and determining the price of the commodity. A business organization can forecast demand for his product by making own estimations called guess or by taking the help of specialized consultants or market research agencies.

2A.3 SIGNIFICANCE OF DEMAND FORECASTING

Demand forecasting plays an important function in the management of various business decision. Forecasting help the business firm to know what is likely to happened in future and to reduce the degree of risk and uncertainty in business and to make various business policy decision and action of the future. Thus, a demand forecasting is meant to guide business policy decision.

The significance of demand forecasting are as follows:

1) **Fulfils the sobjective:** Demand forecasting implies that every business unit starts with certain pre-determined objectives. Demand forecasting helps in fulfilling these objectives. An organization estimates the current demand for its products and services in the market and move forward to achieve the set goals.

   For example, an organization has set a target of selling 60, 000 units of its products. In such a case, the organization would make demand forecasting for its products. If the demand for the organization's products is low, the organization would take remedial actions, so that the set objective can be achieved.

2) **Production planning:** Demand forecasting is important to forecast the future production plan of business firm. There is a gestation period between production of goods and services and demand for it. Demand forecasting help to eliminate those gaps between demand and supply of goods preventing shortages and surplus.

3) **Distribution and avoidance of wastage of resources planning:** The business firm has to take decision regarding the distribution of capital, machinery, raw material in the production process. So that if there is any shortage of those resources can be arranged prior through estimation. Making a right and correct estimation of using resources reduces the usage of it.

4) Sales distribution policy: Sales of goods and service gives revenue to the firm's demand. Forecasting is nothing but estimating the sales of the product. To formulate realistic sales targets and to make arrangements for the movement of production for the movement of product region wise, demand forecasting is very essential. This can help to formulate an effective sales policy, and therefore, to increase sales revenue.

5) Price policy: The firm has to make decision regarding the price of goods and services which is a critical job. The firm has to make appropriate price policy so that there is no price fluctuation in the future.

6) Reduce business risk: Every business has certain risk. Demand forecasting help the business firm to make appropriate business decision to reduce such risk and uncertainty to a certain extent.

7) Inventory planning: Inventories are goods and raw materials held by the firm future sale. Demand forecasting helps in devising appropriate inventory management policies.

Check your Progress :
1) How demand forecasting health business firm in predicating future demand for his product?
2) List down the factors determining nature of demand forecasting.

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2A.4 STEPS IN DEMAND FORECASTING

The demand forecasting finds its significance during large-scale production of goods and services. During such period of time firms may often face difficulties in obtaining a fairly accurate estimation of future demand. Thus, it is essential for a firm to forecast demand systematically and scientifically to arrive at desired objective. Therefore, the following steps are to be taken to facilitate a systematic demand forecasting:

1. Determining the objective: The very first step in demand forecasting is to determine its objective of forecasting. The objective for which the demand forecasting is to be done must be clearly specified. The objective of forecasting may be defined in terms of; long-term or short-term demand, the whole or only

the segment of a market for a firm's product, overall demand for a product or only for a firm's own product, firm's overall market share in the industry, etc. The objective of the demand must be determined prior in the process of demand forecasting begins as it will give direction to the whole research.

2. **Nature of forecast:** After determining the objective of forecasting the second important step is to identified the nature of demand forecasting. Its based on the nature of forecasting.

3. **Nature of commodity:** While forecasting it is important to understand the nature of the product whether it is consumer goods or producer goods, perishable goods or durable goods. If the good is perishable the forecasting is to be done in a short period of time and for durable goods it may be done in long run.

4. **Determinants of demand:** Determinants of demand play an important role in determining the forecasting as different commodity have different factor determination of demand which depends upon the nature of commodity and nature of forecasting. The important determinants are price of the commodity, price of related goods, income of a consumer etc.

5. **Identifying the relevant data:** Necessary data for the forecasting are collected, then tabulated, analysed and cross-checked by the firm. The data are interpreted by applying various statistical or graphical techniques, and then to draw necessary deductions there from. The forecaster has to decide whether to choose primary or secondary data. The primary data are the first-hand data which has never been collected before. While the secondary data are the data already available. Often, data required is not available and hence the data are to be adjusted, even manipulated, if necessary, with a purpose to build a data consistent with the data required. Then after collecting the relevant data from different sources and proceed for the further step.

6. **Selecting the method:** After collecting the relevant data the firm choose the appropriate method of forecasting the demand. Appropriate method of sales forecasting is selected by the company considering the relevant information, purpose of forecasting and the degree of accuracy required. The choice of method has to be appropriate and logical. If the required data is not available toward the method, the forecaster may force to use less reliable method. The forecaster should use a method which should not be too time consuming and it should be reliable for long term.

7. **Testing accuracy:** After making a choice of method the forecaster needs to test the accuracy of it. There are various

methods choose to test the accuracy. This testing helps to reduce the margin of error and thereby helps to improve its validity for the purpose of decision making

8. **Evaluation and conclusion:** the last and final step are to evaluate the forecasting and to draw a conclusion from it.

2A.5 METHODS OF DEMAND FORECASTING

The main challenge to the forecaster while forecasting the demand is to select an effective technique or method. Broadly speaking methods of demand forecasting are classified into Qualitative methods and Quantitative methods. Which can also be classified as Survey method and Statistical method. The forecaster may choose any of the method depending upon the data which is available. Under these two broad categories, there are other specific methods which is been choose to analysis the data. These two methods will be discussed below:

A. **Survey method:** This method is also called as qualitative method of demand forecasting. This method is one of the most common and direct method of demand forecasting in the short run. In this method the future purchase plans of the consumers and their aims are included. An organization conducts these surveys with consumers to determine the demand of their existing products and services and forecast the future demand of their product accordingly.

The forecaster may undertake the following survey methods:

a) **Expert's opinion:** This method is based on the opinion of expert who predict the demand for a product based on his experiences and his knowledge in the particular specialised field. The expert may be from the same organisation or may be hired from outside. They may be salesman, sales manager, marketing expert, market consultant etc they act as experts who can assess the demand for the product in different areas, regions, or cities. This method involves the opinion of three or four experts. Each expert will be asked about his opinion regarding the demand for the product and the expert through his personal experience give his opinion for the product and forecast the demand. This method is very simple to use and it requires less statistical work. Due to expert's personal views the time for forecasting is short and the cost involve is also low. On the other side as its expert's personal opinion or guess where its likely to be biased.

b) **Delphi method:** Delphi method is a group decision-making technique of forecasting demand. In Delphi method, a group of

experts gives their opinion on the demand for the products of individual firm in future based on questions which have been asked by the firm. These questions are repeatedly asked until a result is obtained. In addition, each and every expert is provided information regarding the estimates made by other experts in the group, so that he/she can revise his/her estimations with respect to others' estimates. In this way, the forecasters cross check among experts to reach more accurate decision making. The main advantage of this method is that it is time and cost effective as a number of experts are approached in a short time without spending much time on other resources. However, this method may lead to appropriate decision making. This method allows the forecaster to solve the problem to the experts at once and have instant response. But the success of this method depends upon the skills, experience, knowledge, and aptitude of the expert.

c) **Consumer survey method:** In this method, the consumers are directly approached to unveil their future purchase plans. This method is the most direct method because forecasting is done by interviewing all consumers or a selected group of consumers out of the relevant population through various other methods of survey. The firm may choose for complete enumeration method, sample survey method and end use method for sample surveys depending upon the nature of forecasting. The following methods are described in brief below:

i. **Complete enumeration method:** Under the Complete Enumeration Survey, the forecaster undertakes the survey of the whole population who demand for the commodity. The firm may go for a door to door survey by making questionnaire to get the data requires. This method has an advantage of first hand data, unbiased information, yet it has its share of disadvantages also. The major limitation of this method is that it requires lot of resources, manpower and time period. There may be a chance where the consumer or the population may give false statement or may deliberately misguide the investigators due to which there may be chance of data error. In this method, consumers may be unwilling to reveal their purchase plans due to personal privacy or commercial secrecy.

ii. **Sample survey method:** This method is also known as test market. In this method the forecaster selects the samples of consumer from the relevant population instead of considering the whole population. If sample is the true representative of data, there is likely to be no significant difference in the results obtained by the survey. Apart from that, this method is less tedious and less costly then the complete enumeration method. A sample survey technique is a variant of test marketing.

Product testing basically involves employing the product with a number of users for a set of periods of time. Their reactions to the product are noted after a period of time and an estimate of likely demand is made from the result. These are suitable for new products or for completely modified old products for which there is no prior data available. It is a more scientific method of estimating like demand because it stimulates the national launch in a very closely defined geographical area. Their can be a sampling error in this method as the size of sample is small i.e. smaller the size of sample larger the sampling error.

iii. **End-use method:** This method is quite useful for industries which are mainly producer's goods and when a product is used for more than one use. In this method, the sale of the product is projected on the basis of demand survey of the industries which are using this product as an intermediate product, that is, the demand for the final product is the end user demand of the intermediate product which are used in the production of this final product is considered. The end use method of demand estimation of an intermediate product may involve many final good industries using this product at home and abroad. It helps us to understand inter-industry' relations. The major efforts required by this type of method are not in its operation but in the collection and presentation of data. This will help the forecaster to manipulate the future demand. This policy helps the government to frame many of its policies. Its major limitations are that it requires every firm to have a plan of production correctly for the future period.

d) **Market experiments:** This method involves collecting necessary information regarding the current and future demand for a product in the market. This method carries out the studies and experiments on consumer behaviour under actual market conditions. In this method, some areas of markets are selected with similar features, such as income level , population, cultural and political background, and tastes of consumers. The market experiments are carried out with the help of changing prices and expenditure, so that the resultant changes in the demand are recorded. These results help in forecasting future demand.

i. **Actual market experiment:** This method is conducted in the actual market place in several ways. One method is to select several market or stores with similar characteristics. This method is very useful in the process of introducing a product for which no other data exist.

ii. **Simulated market experiment:** This method is also called as consumer clinic or laboratory experiment. Under this method the firm make a set of consumers and give them a

sum of money and asked them to shop in a stimulated store. While shopping the consumer reaction towards the change in price of a product, packaging, advertisement etc are taken into consideration.

B. **Statistical methods:** This method is also called as quantitative method. Statistical method is most useful in demand forecasting. In order to key objectivity, that is, by consideration of all implications and viewing the problem from an external point of view, the statistical methods are used to forecast the demand of the product to get the accurate solution to the problems. The following are some statistical methods which are been used now a day:

I. **Trend method:** A firm existing for a long time will have its own data regarding sales for past years. Such data when arranged in a chronologically manner will yield what is referred to as 'time series. Time series method shows the past sales with effective demand for a particular product under normal conditions. Such data can be given in a tabular or graphic form for further analysis. This is the most popular method among business firms, partly because it is simple and cheap and partly because time series data often show a persistent growth trend. Time series has got four types of components namely, Secular Trend (T), Secular Variation (S), Cyclical Element (C), and an Irregular or Random Variation (I). These time elements are expressed by the equation O = TSCI. Secular trend refers to the long run changes that occur as a result of general tendency. Seasonal variations refer to the changes in the short run weather pattern or the social habits. Cyclical variations refer to the changes that occur in industry during a depression and boom period. Random variation refers to the factors which are generally able such as wars, strikes, natural calamities such as flood, famine and so on. When a prediction is made the seasonal, cyclical and random variations are removed from the observed data. Thus, only the secular trend is left. This trend is then projected. Trend projection fits a trend line into a mathematical equation. The trend can be estimated by using any one of the following methods:

(a) The Graphical Method: Graphical method is the simplest technique to determine the trend analysis. All values of output or sale of product for different years are plotted on a graph and a smooth free hand curve is drawn passing through as many points as possible on the graph.

The direction of this free hand curve is either upward or downward and shows the possible trend.

(b) The Least Square Method: Under the least square method of forecasting, a trend line can be fitted to the time series data with the help of statistical techniques such as least square method of regression. When the trend in sales over time is given by straight line, the equation of this line is in the form of: y = a + bx. Where 'a' is the intercept and 'b' shows the impact of the independent variable. We have taken two variables i.e. the independent variable x and the dependent variable y. The line of best fit establishes a kind of mathematical relationship between the two variables v and y. This is expressed by the regression y on x.

In order to solve the equation v = a + bx, we have to make use of the following normal equations:

Σ y = na + b ΣX

Σ xy =a Σ x+b Σ x2

II.   **Regression method:** regression methods attempts to assess the relationship between at least two variables (one or more independent and one dependent), the purpose is to predict the value of the dependent variable from the specific value of the independent variable. The foundation of this prediction generally is historical data. This method starts from the assumption that a basic relationship exists between two variables. An interactive statistical analysis computer package is used to formulate this mathematical relationship.

Check your Progress :

1) List down the steps of demand forecasting.
2) Define survey method of demand forecasting.
3) Define Delphi method of demand forecasting.

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2A.6 SUMMARY

This unit study the demand estimation and its forecasting. Demand forecasting play a vital role in business planning. Business enterprises need to plan their activities. Most of the business

decisions of a firm under an organization are made under the conditions of risk and uncertainty. Demand forecasting is a systematic process that involves anticipating the demand for the product and services of an organization in future under a set of uncontrollable and competitive forces in the economy. Demand forecasting helps the business firms to take appropriate decision about the production and the use of factors of production to fulfil the future demand of the commodity. It had studied the importance or significance of demand forecasting. Demand forecasting plays an important function in the management of various business decision. Forecasting help the business firm to know what is likely to happened in future and to reduce the degree of risk and uncertainty in business and to make various business policy decision and action of the future. The unit explains the various steps in forecasting demand. It has also explained the two major methods of demand forecasting in detail.

2A.7 QUESTIONS

1. What is demand forecasting? Explain its importance.
2. Discuss the steps to be taken to estimate demand forecasting.
3. Explain the survey methods of demand forecasting.
4. Examine the statistical methods of demand forecasting.

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UNIT- 3

Unit - 3

SUPPLY AND PRODUCTION DECISIONS

Unit Structure :

3.0 OBJECTIVES

- To study the meaning, functions and types of production function
- To understand the law of variable proportion and law of returns to scale
- To study the concept isoquants and its property and types
- To understand the producer's equilibrium and expansion path

3.1 MEANING OF PRODUCTION

The term 'production' is very important and broader concept in economics. To meet the daily demand of a consumer production is essential part. Production is a process by which various inputs are combined and transformed into output of goods and services, for which there is a demand in the market. In other words, Production is a process of combining various material inputs and immaterial inputs in order to make something for consumption. The essences of production are the creation of utilities and the

transformation of inputs or resources into output. Inputs are the resources used in the production of goods and services the important resources or input in production are land, labour, capital, and entrepreneur. Production process creates economic well-being into the nation. Thus, production is a process which creates utility and value in exchange.

The theory of production function is concern with the problem in the production process in a certain level of output. It analyses the relation between cost and output and help the firm to determine its profit. All firms that aims at maximising their profit must make their decision regarding production on the bases of the following three decision:

a. How much output to produce and supply in the market?
b. How to produce the product, i.e. which technique of production or combination of production to used have to be decided?
c. How much quantity of input is demanded to produce the output of the product?

Thus, the above three decisions are interrelated and have to be taken by the firm during the production process.

3.2 PRODUCTION FUNCTION

In economics, a production function is the functional relationship between physical output of a production process to physical inputs or factors of production. In other words, production function denotes an efficient combination of input and output. The factors which are used in the production of goods and services are also called as agents of production. Production function of a business firm is determined by the state of technology. More specifically, production function shows the maximum volume of physical output available from a given set of inputs, or the minimum set of inputs necessary to produce any given level of output.

Definition: With the above statements we can define the production function as: "A production function refers to the functional relationship, under the given technology, between physical rates of input and output of firm, per unit of time".

Mathematically, production function can be express as: $Q = f$ (N, L, K, E, T, etc.)

3.3 TYPES OF PRODUCTION FUNCTION

I. **The production function can be broadly categorised into two based on the time period** i.e. a) Short run production function and b) long run production function.

A) Short run production function: The short run is defined as the period during which at least one of the input is fixed. According to the following short-run production function, labour is the only variable factor input while the rest of the inputs are regarded as fixed. In other words, the short run is a period in which the firm can adjust production by changing variable factors such as materials and labour but cannot change fixed factors such as land, capital, etc. Thus, in short-run some factors are fixed and some are variable.

B) Long run production function: The long run production function is defined as the period of time in which all factors of production are variable. In the long run there is no distinction between the fixed or variable factor as all factors in the long run are variable.

II. **The production function can also be classified on the basis of factor proportion** i.e.
a) Fixed proportion production function and b) Variable proportion production function.

A. **Fixed proportion production function**: The fixed proportion production function, also known as a Leontief Production Function which implies the fixed factors of production function such as land, labour, raw materials are used to produce a fixed quantity of an output and these factors of production function cannot be substituted for the other factors. In other words, in such factors of production function fixed quantity of inputs is used to produce the fixed quantity of output. All factors of production are fixed and cannot be substituted for one another. The concept of fixed proportion production function can be further expained with the help of a **Diagram 5.1** as shown below:
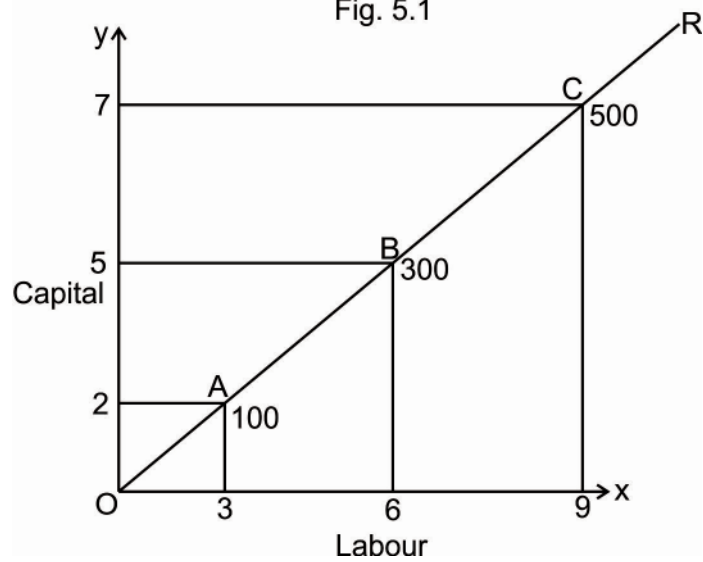
Fig. 5.1

Diagram 3.1

B. **Variable proportion production function**: The variable proportion production function supposes that the ratio in which the factors of production such as labour and capital are used in a variable proportion. Also, the different combinations of factors can be used to produce the given quantity, thus, one factor can be substituted for the other factor. In the case of variable proportion production function, the technical Coefficient of production function is variable, i.e. the important quantity of output can be achieved through the combination of different quantities of factors of production, such as these factors can be varied by substituting one factors to the other/ factors in its place.

The concept of variable proportion production function can be further explained from an isoquant curve, as shown in the **Diagram 5.2** below:
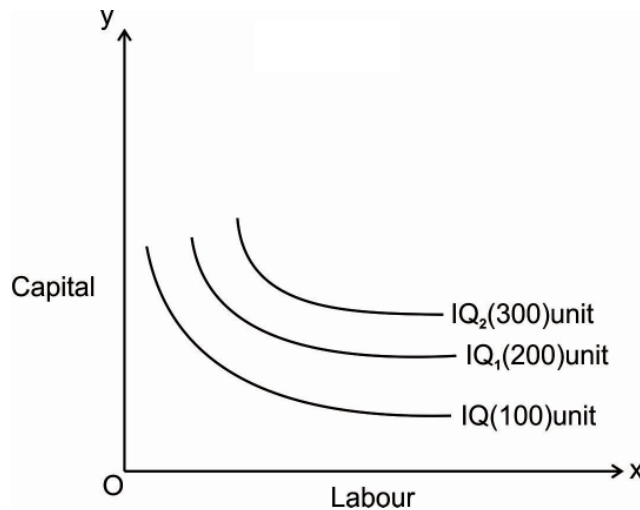

Diagram 3.2

In the above diagram, the isoquant curves show that the different combinations of factors of technical substitution shows that it can be employed to get the required amount of output in the production process. Thus, for the production of a given level of product, the input factors can be substituted from another factor input.

3.4 LAW OF VARIABLE PROPORTION

The law of variable proportion is a short run production function theory. This law plays a very important role in the economic theory, which examines the production function with which one variable factor keeping the other factors input fixed. This law is explained by the classical economists to explain the behaviour of agricultural output. In other words, it examines the behaviour of the production in the short-run when the quantity of one factor is varied, keeping the quantity of another factor's constant. Thus, the law of variable proportion is the new name for the famous theory "The Law of Diminishing Marginal Returns" of classical economist.

Alfred Marshall, had discussed the law in relation to agriculture, according to him, "an increase in the capital and labour applied in the cultivation of land causes in general a less than proportionate increase in the amount of product raised unless it happens to coincide with an improvement in the art of agriculture". Marginal productivity of labour in agriculture is zero.

Assumptions: The law of variable proportion is based on the following assumptions:

a. The state of technology is assumed to be given and constant.

b. There must be some inputs whose quantity must be kept as fixed or constant. Such input factors are called fixed factors.

c. All units of variable factors inputs are homogenous.

d. The law is based upon the possibility of varying the proportions in which the various factors can be combined to produce the level of output. Let us assume the labour is the variable factor in our explanation.

Change in output due to increase in variable factors can be explain with the table given below:

Units of Variable factor (LABOUR)	Total Product (TP)	Average Product (AP)	Marginal Product (MP)
0	0	0	-
1	5	5	5
2	12	6	7
3	27	9	15
4	48	12	21
5	75	15	27
6	80	13.33	15
7	91	13	11
8	98	12.5	7
9	98	10.8	0
10	92	9.2	-6

Table 3.1

Explanation of the table:

In the above table the labour is consider as a variable factor and all other factors are assumed to be constant according to the law. With the increase in the variable factor i.e. labour there is a change in the level of TP, AP, and MP.

Total product: The total product is the total amount of output produced by using all the variable input in a fixed proportion in production. The total product increases with the increase in the unit of labour and reaches to the maximum and they're after decline with further more increase in the variable factor.

Average product: The average product is the per unit of product produced by the firm with the per unit of variable factor inputs. It is obtained by dividing the total product by the unit of total variable factor. The average product increases initially and then declines.

Marginal product: Marginal product is the additional output produced by an additional unit of variable factor. Marginal product increases and thereafter falls when TU becomes maximum MU becomes zero and further becomes negative.

Diagram: the law of diminishing marginal returns can be explained with the following diagram:
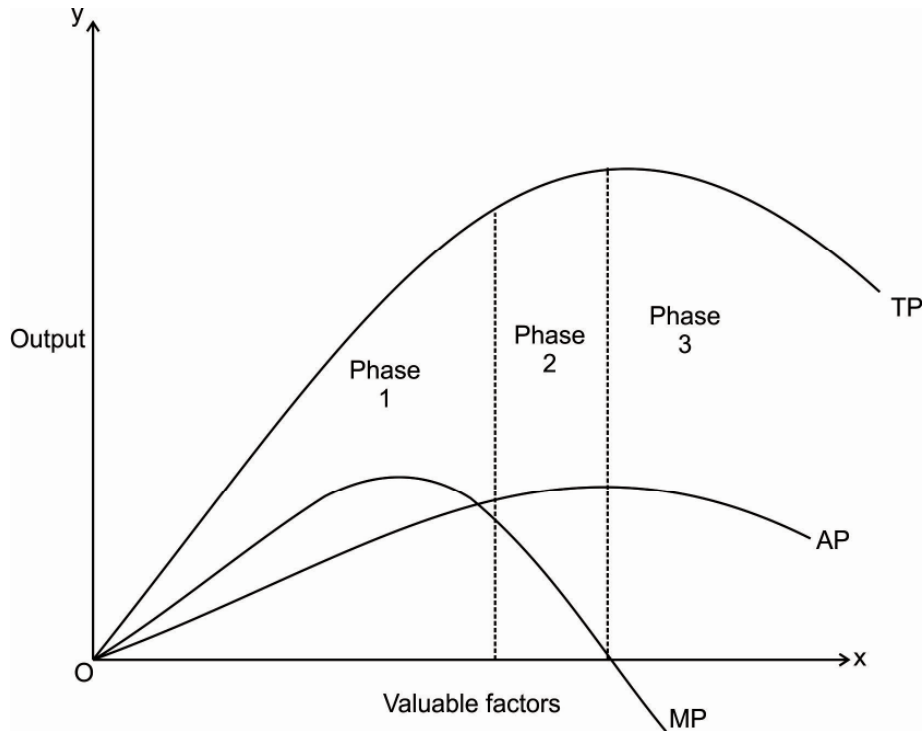
Diagram 3.3

The above diagrams show three phases with the changes in the output can be explained below:

Phase 1: In phase 1 the total product is increasing at increasing rate where average product is also increases at a diminishing rate and reaches at its maximum and marginal product increases initially and then decreases.

Phase 2: In phase 2 the total product increases at a diminishing rate and reaches its maximum point. Where the average product is starts declining and the marginal product diminishes and become zero.

Phase 3: In this phase total product starts declining. Where average product is continuously declining and marginal product becomes negative.

3.5 LAW OF RETURNS TO SCALE

As the law of variable proportion is a short run production function theory, law of returns to scale is a long run production function theory. In this theory all factors of production are variable no factors are fixed. With the change in the factors of production scale of production will change accordingly.

According to Koutsoyiannis "The term returns to scale refers to the changes in output as all factors change by the same proportion."

Types of return to scale:
The concept of returns to scale assumes only two factors of productions i.e. capital and labour this analysis enables us to understand the change or scale in production due to change in the factors of production in terms of isoquants or equal product curves.

Increasing returns to scale: Increasing returns to scale means an increase in a level of output more than the increase in the inputs. For example, if an output increases by 35% with an increase in all inputs by only 15% increasing returns to scale prevails. In other words, a proportionate change in output brings about less proportionate change in inputs it is called increasing returns to scale. Where, OA>AB>BC.
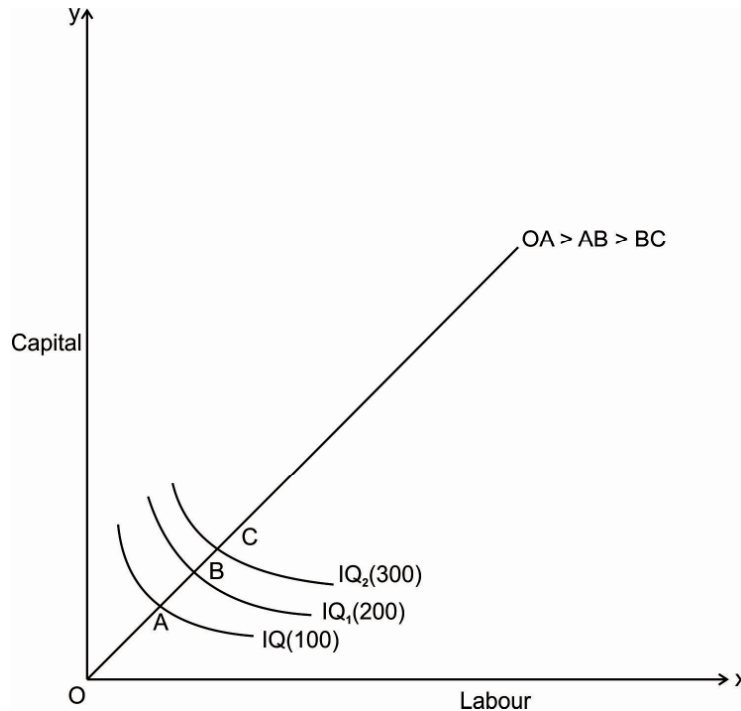
Diagram 3.4

Decreasing returns to scale: Decreasing returns to scale means an increase in a level of output less that the increase in the inputs. For example, if an output increase by 25% with an increase in all inputs by 35% decrease in returns to scale prevails. In other words, a proportionate change in output brings more proportionate change in inputs it is called decreasing returns to scale. Where OA<AB<BC.
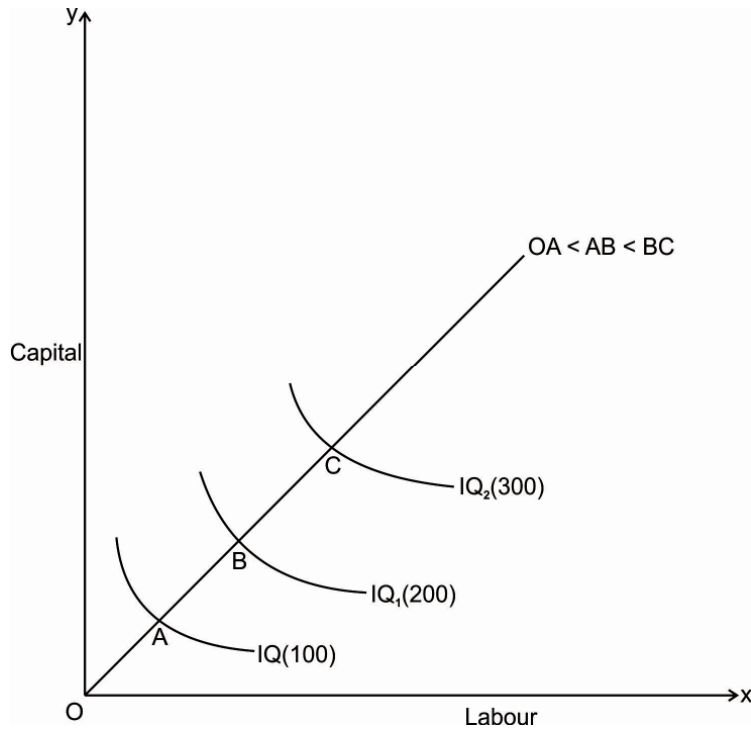
Diagram 3.5

Constant returns to scale: Constant returns to scale means an increase in a level of output is constant that the increase in the inputs. For example, if an output increase by 25% with an increase in all inputs by 25% constant in returns to scale prevails. In other words, a proportionate change in output brings constant change in inputs it is called constant returns to scale. Where OA=AB=BC.
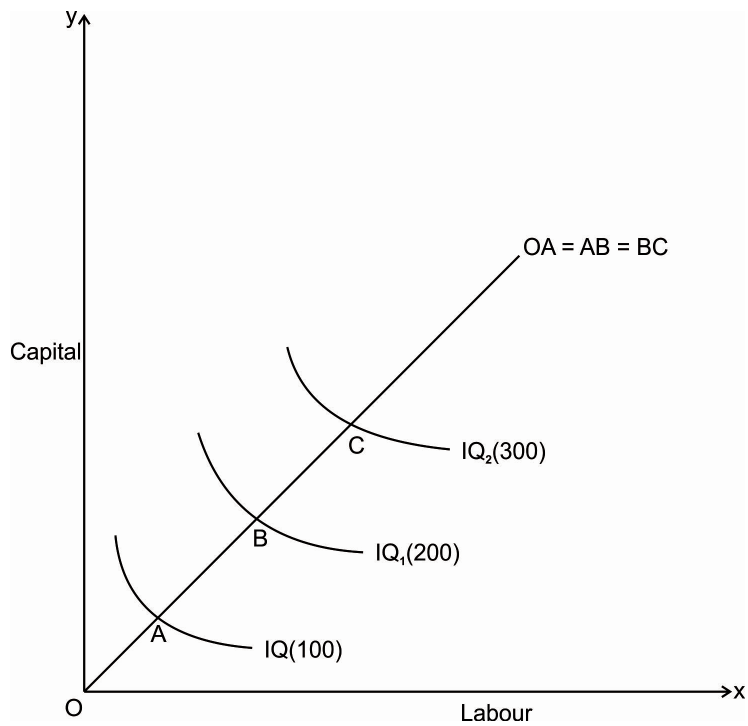

Diagram 3.6

Check your Progress :

1) Define Production Functions.
2) Define total product, average product & marginal product.
3) Explain constant returns to scale.

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3.6 ISOQUANTS

Meaning: The term "iso-quants" is derived from Greek word iso means "equal" and quants means "quantity". Thus, iso-quant means equal quantity. An iso-quant is also known as iso-production curve, iso-indifference, equal production curve by various economists. The isoquants have its properties which are similar to those generally assumed for indifference curve theory of the theory of consumer's behaviour analysis. Iso-quant is defined as "a locus of all the combination of two factors of production that yields that yield the same level of output."

Thus, an iso-quant is a combination of any two factor inputs that represents and produce the same level of output. Any two combinations of input factors e.g. Labour and capital are used in which one factor is increased by decreasing the other factor of input to maintain the same level of production.

Iso-quant can be explained with the schedule and graph given below:

Factor combinations to produce a given level of output.

Factor combination	Labour	Capital	Output
A	1	150	500
B	2	100	500
C	3	75	500
D	4	50	500
E	5	25	500

Table 3.2

The above table shows the five combination of inputs i.e. Labour and Factor unit which yield the same level of output of 500

units. Which says any point on the iso-quant will give the same level of output. To show this we draw the iso-quant drawn below:
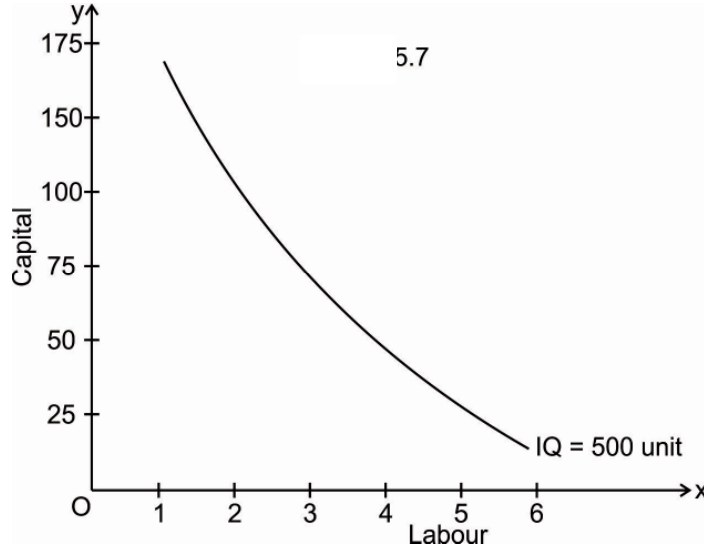

Diagram 3.7

Iso-quant map:

An iso-quant map represents a set of iso-quant curves shows the combination of input factor at the various level of output. A higher level of iso-quant represents the higher level of output. Thus, in simple word, iso-quant map is a family of iso-quant representing the various iso-quant curve at a particular level of output. The iso-quant map can be represented with the diagram given below:
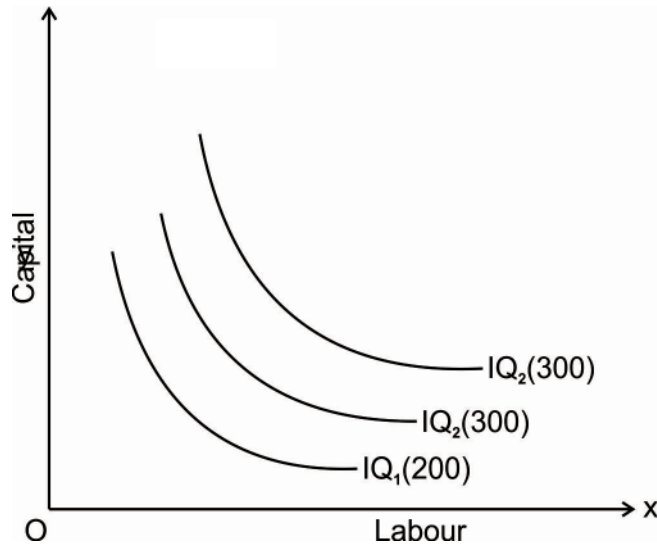

Diagram 3.8

The fig above shows the various iso-quants representing the various level of output at different combination of input factors. IQ_1, IQ_2 and IQ_3 shows the iso-quant which produces 100,200 and 300

units of output respectively with the various combination of input factors which provides the same level of output at different level of Iso-quant.as we had said higher the Iso-quant represents higher the value of output.

3.7 PROPERTIES OF ISO-QUANTS

1. **Iso-quant curve slopes downwards:** The iso-quant curve slopes downwards from left to right i.e. it has a negative slope. The slope is downward because it operates under law of MRTS, when we increase labour as a factor, we have to decrease capital factor to produce a same level of output. The downward sloping iso-quant curve can be explaining the help of following Diagram 3.9.
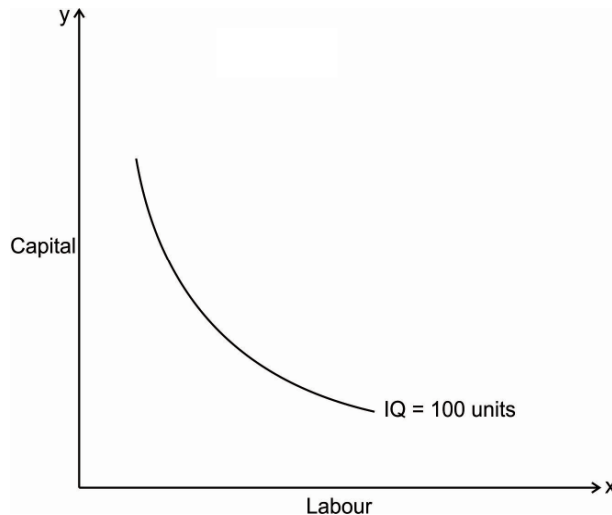

Diagram 3.9

Thus, the iso-quant can be downward sloping from left to right. There can't be an upward sloping iso-quant curve because it shows that a given product can be produce by using less of both the input factor. Similarly, an iso-quant cannot be horizontal or vertical because it also doesn't represent the equilibrium position of a firm. Only the downward sloping supply curve represents the characteristics of iso-quant.

2. **Iso-quant are convex to the origin:** As we had discussed in the above property that the iso-quant curve is downward sloping and it has a negative slope and it operates under law of Marginal rate of Technical Substitution (MRTS). It says that it equals the ratio of the marginal product if labour and marginal product of capital i.e. one factor is given up to get one additional unit of other factor to produce the same of output which creates a convexity of iso-quant curve.

Thus, the slope of iso-quant can be represented by,

$$\frac{\Delta K}{\Delta L} = MRTS_{LK} = \frac{MP_L}{MP_K}$$

The above equation represents ratio of change in capital and labour should be equal to the ratio of the marginal rate of technical substitution of labour and capital which is equal to the ratio of marginal product of labour and capital.

The convexity of iso-quant means that as we move down the curve less and less of capital given up for an additional unit of labour so to produce the same level of output. The convexity of iso-quant can be observed from the Diagram 5.10. Given below
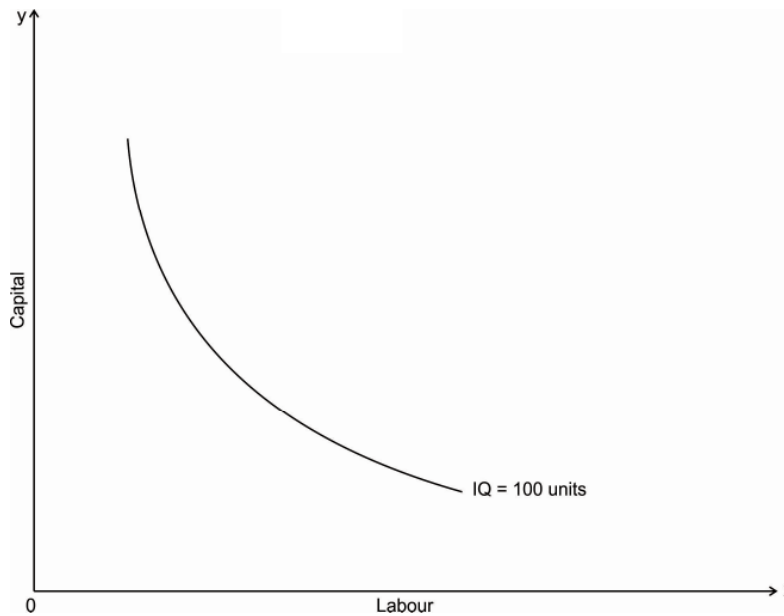

Fig 3.10

Thus, the iso-quant can be convex to the origin but not the concave because it would mean that MRTS will increase instead of decreasing i.e. labour will increase at a constant rate the amount of capital given up will goes on increasing.

3. Iso-quants do not intersect: The properties of iso-quants say that two iso-quant will never intersect each other. To explain this, we will take a help of following Diagram 3.11:
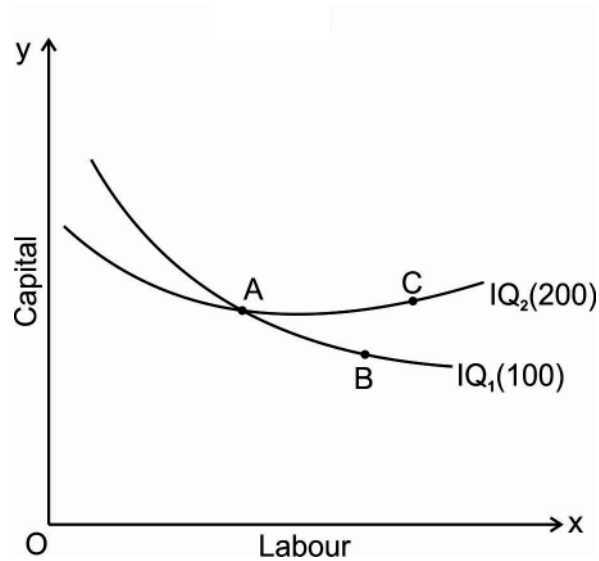
Diagram 3.11

The above fig represents two different iso-quant IQ_1 and IQ_2, where it represents the level of output 100 and 200 units respectively. Point a represents 100 units of output on IQ_1 and point c represents 200 units of output on IQ_2. The point b shows the intersection of both the iso-quants where is logically not possible to identify the level of output.

4. Iso-quant cannot touch either of the axis: an iso-quant cannot only touch x axis or y axis or any either axis because it will represent that the iso-quant only produce goods by using one factors of production either by using only capital or only labour which is practically not possible and which is unrealistic.
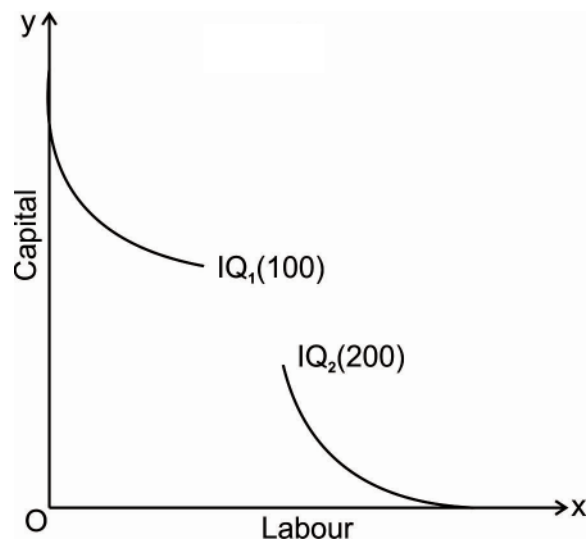

Diagram 3.12

5.   Higher the iso-quant higher the level of production: if there is a multiple iso-quant showing different level of production in one diagram. Where the higher the iso-quant i.e. the iso-quant far from the origin indicates higher level of output and the iso-quant close to the origin indicates lower level of output.
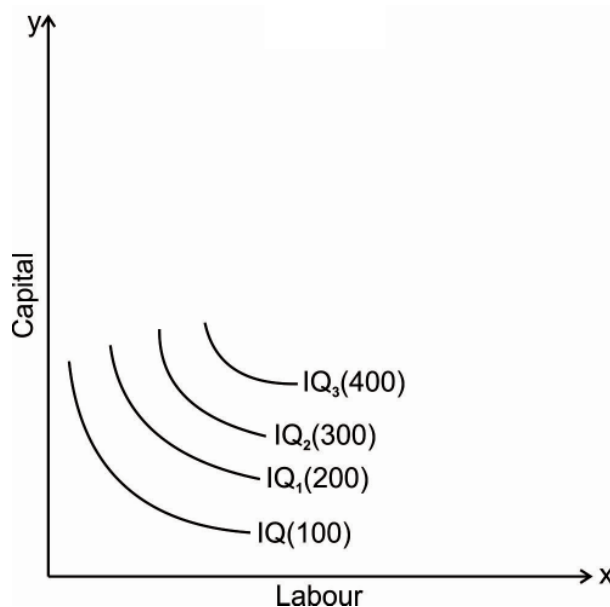

Diagram 3.13

3.8 TYPES OF ISO-QUANT

The iso-quant have various shapes which depends upon the degree of substitutability of factors in production. On the bases of that the types of iso-quant are derive. The following are the various types of iso-quant based on the degree of substitutability of substitution:

1. Liner iso-quant: if the iso-quant is liner one i.e. downward sloping straight line it assumes that there is a perfect substitutability of the factors of productions. It means that capital and labour can be easily substitute from each other. i.e. the rate at which labour can be substituted for capital in production (i.e. $MRTS_{LK}$) is constant. This can be seen from the following Diagram 3.14 given below:
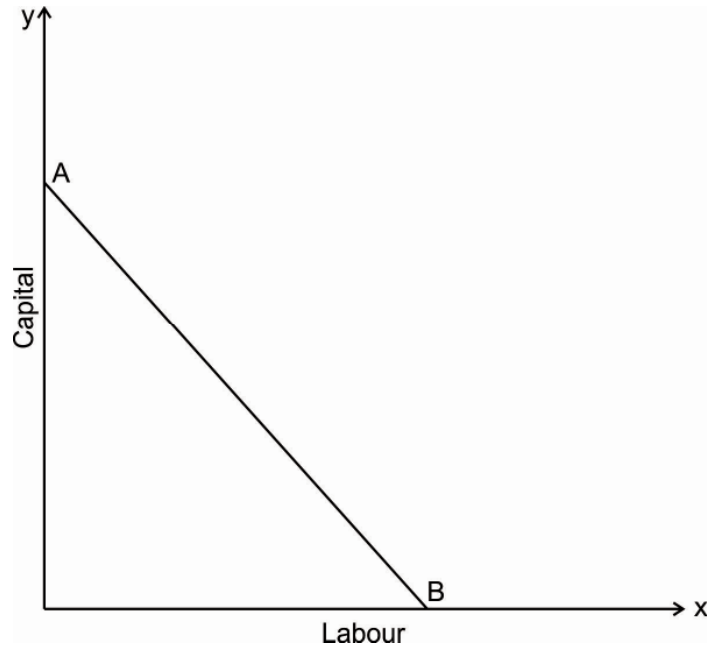
Diagram 3.14

The above diagram shows that there is a perfect substitutability of labour and capital at the points A & B where point A on iso-quant represents the level of output can be produce with capital alone i.e. without using any labour on the other hand point B represents the same level of output can be produce with labour alone i.e. without any use of capital. This in reality is not possible because no production can be done with using any of the factor alone.

2. Right angled iso-quant: if the iso-quant is right angled it assumes that there is a perfect complementarily i.e. it assumes that there is a perfect substitutability of factors of production. This shows that there is only one method is used for production of the commodity. In this type the iso-quant is formed as right angled as shown in the following fig. which shows labour and capital are used in a fixed proportion i.e. output can be increased by increasing labour and capital in fixed proportion. This type of iso-quant is known by many names such as input-output iso-quant and Leontief iso-quant.
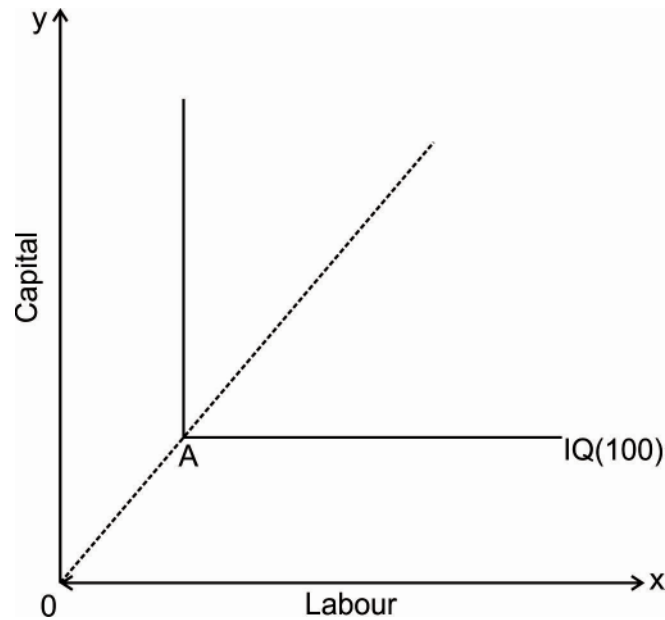
Diagram 3.15

3. Kinked iso-quant: This type of iso-quant assumes only limited substitutability only at the kinked of the iso-quant. That means the substitutability of labour and capital is only possible at the kinked of the iso-quant in the production. i.e. in the fig. the substitutability is possible at the point A, B, C and D. This type of iso-quant is also called as 'liner programming iso-quant" and it is used in liner programming.
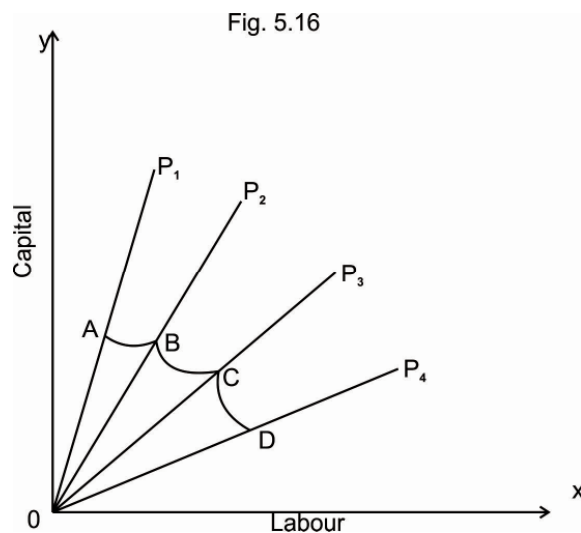

Fig. 5.16

Diagram 3.16

4. Smooth convex iso-quant: The classical economic theory has adopted this type of iso-quant for analysis as its simpler to understand. This iso-quant assumes the continuous substitutability of labour and capital over a certain range beyond which there is

zero substitutability of factors in production. This iso-quant fulfils all the criteria of iso-quant. The derivation of this smooth convex iso-quant is explained below:

To explain the derivation of iso-quant we assume that there is a various combination of factor inputs of labour and capital used to produce 100 units of output. The combination is a such where one factor is increased by reducing the other factor input to produce the same level of output in production. All this combination is technically efficient in production.

Various combinations of labour and capital to produce 100 units of output.

Factor combination	Labour	Capital
A	10	60
B	20	50
C	30	40
D	40	30

Table 3.3

If we plot all this combination on a graph, we obtain an IQ curve.
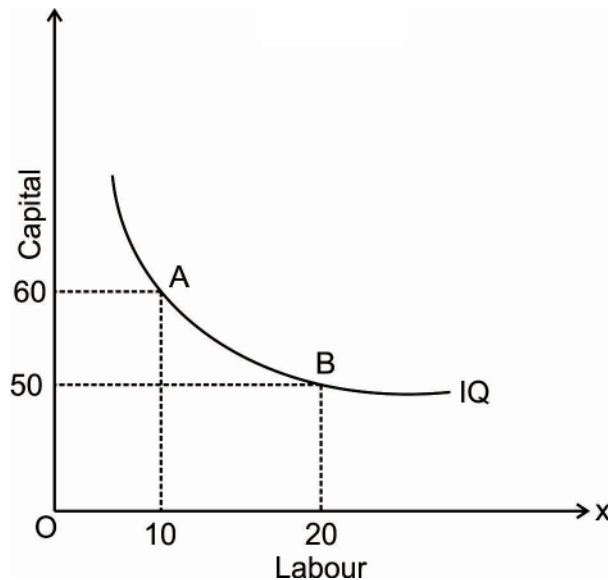

Diagram 3.17

3.9 RIDGE LINES

The ridge lines are the locus of points of an iso-quants where the marginal product of factors is zero. An isoquant is oval-

shaped as shown in diagram but its area of rational operation lies between the ridge lines. The firm will produce only in those segments of isoquants which are convex to the origin and lie between the ridge lines. The ridge lines are the locus of points of isoquants where the marginal products (MP) of factors are zero. The upper ridge line implies zero MP of capital and the lower ridge line implies zero MP of labour. Production techniques are only efficient inside the ridge lines. The marginal products of factors are negative and the methods of production are inefficient outside the ridge lines. The ridge lines can be explained through the help of following diagram:
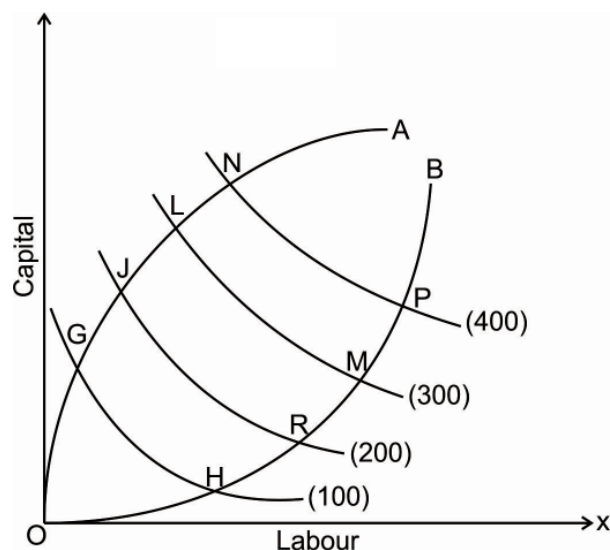

Diagram 3.18

In the above Diagram curves OA and OB are the ridge lines on the oval-shaped iso-quants and in between these lines on points G, J, L and N and H, K, M and P economically feasible units of capital and labour can be employed to produce 100, 200, 300 and 400 units of the product.

For example, OT units of labour and ST units of the capital can produce 100 units of the prod-uct, but the same output can be obtained by using the same quantity of labour OT and less quantity of capital VT. Thus, only an unwise producer will produce in the dotted region of the iso-quant 100.

The dotted segments of isoquants form the uneconomic regions of production because they require an increase in the use of both factors with no corresponding in-crease in output. If points G, J, L, N, H, K, M and P are connected with the lines OA and OB, they are the ridge lines. On both sides of the ridge lines, it is uneconomic for the firm to produce while it is economically feasible to produce inside the ridge lines.

Check your Progress :

1) Define isoquant.
2) Why isoquant cannot intersect each other.
3) Define ridge lines.

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3.10 PRODUCER'S EQUILIBRIUM

Producer's equilibrium is also known as least cost combination of inputs and optimal combination of inputs. The main aim of any firm or a producer is to maximise his profit either by increasing the level of output or sale or by producing the output at lower cost. A firm by analysing its production function can choose the combination of factors inputs which cost him least in his production which is technically efficient. In this way a firm can maximise its profit. There are two ways to determine the least cost combination of factors to produce the given output. i.e.

a) Finding the Total cost of Factor combinations.
b) Geometrical method.

a) Finding the Total cost of factor combination: This method helps the producer to choose the combination by finding the total cost of production. The cost of each factor combination is found by multiplying the price of each factor by its quantity and then summing it for all inputs. The firm will choose those combination of inputs of which total cost is least. To explain this in detail we will explain it with the help of following illustration.

Least cost production technique

Method	Labour (units)	Capital (units)	Labour cost (100 per unit)	Capital cost (200 per unit)	Total cost
A	8	10	8×100 = 800	10×200 = 2000	2800
B	6	15	6×100 = 600	15×200 = 3000	3600

Table 3.4

The above table shows two methods of production A and B. There are two factors of production labour and capital. The producer has to choose any to the combination or method where the cost of labour per unit is 100 Rs and cost of capital per is 200

Rs. If the firm choose method A where he can use 8 units of labour and 10 units of capital where the total cost of production is 2800 Rs. And if he chooses method B where he can 6 units of labour and 15 units of capita to produce the same level of output and where the cost of production is 3600 Rs. It is efficient for the firm to choose method A then B because the same level of output can be produced at a leaser cost with method A.

b) Geometrical method: Another important method to determine the least cost combination of factors is geometrical method. It is the easiest method to explain with the help of iso-quant map and iso-cost line. We explain both this method in detail below:

Iso-quant map: As we have already explained what iso-quant map is. It shows all the possible combination of factors that can be produce at different level of output. This is shown in fig. higher the iso-quant represents higher the level of output. In other words, iso-quant closer to the origin denotes a lower level of output.
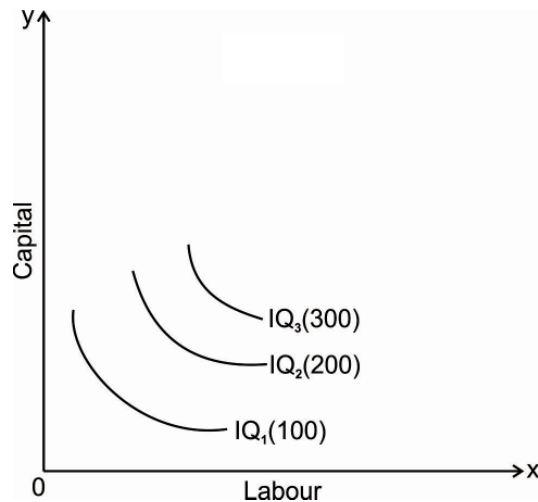

Diagram 3.19

Iso-cost line: The iso-cost line is similar to as budget line or price line of consumer theory. Iso-cost line may be defined as the line which shows different possible combinations of labour and capital that a producer can afford to buy given his total expenditure to be incurred on these factors and price of the factors. In other, it is the line which shows the various combinations of factors that will result in the same level of total cost. It refers to those different combinations of two factors that a firm can obtain at the same cost. Iso-cost line can be explained with following Diagram 5.20
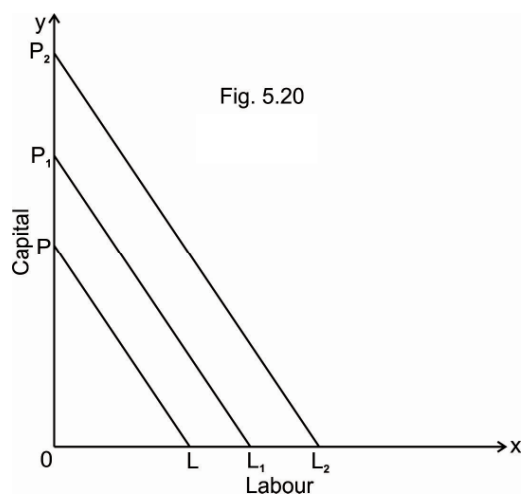
Fig. 5.20

Diagram 3.20

In the above fig the line AB is the iso-cost line which shows a firm can hire OA of capital OB of labour or any combination of capital and labour on AB curve. Thus, iso-cost line is the locus of all those combinations of labour and capital which, given the prices of labour and capital, could be brought for a given amount of money. The slope of the iso-cost line is equal to the ratio of the factor prices, that is, the slope of the iso-cost line $\dfrac{P_K}{P_L}$.

Where, P_L is the price of labour and P_k is the price of capital.

If the money to be spend on the factors increases the iso-cost line will shift to the right and it denotes that, with the given factor prices, the firm could buy more of the factors. The iso-cost lines closer to the origin show a lower total cost outlay.

Optimal input combination for minimising cost:

If the firm has to produce a product with the given output by the minimum cost, he will choose optimal minimising cost method. In this method the firm will minimise its cost at the point where the iso quant is tangent to the iso cost line. To explain this, we will take a help of the following Diagram 3.21 given below:
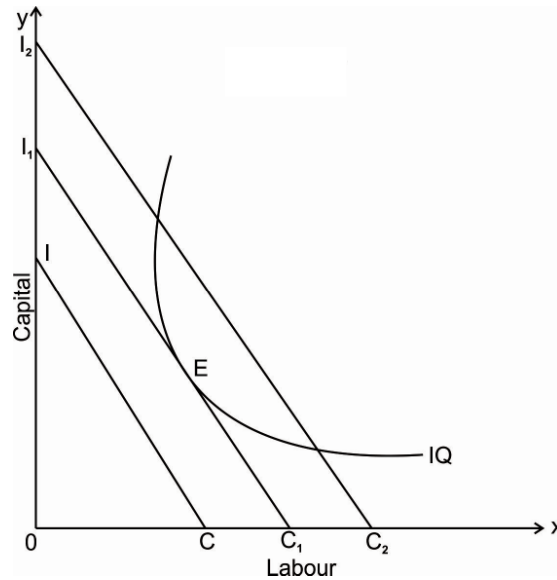
Diagram 3.21

Explanation of the diagram:
Labour is taken on X axis where the capital on Y IC, I1C1, and I2C2 are the family of Iso-cost lines. IQ denotes the single iso-quant which produces the desired level of output. The iso cost line having a same slope because the factor price is assumed to be constant. The firm minimises its cost at the point 'E' where the iso-quant IQ and Iso cost I1C1 are tangent. It shows the producer can produce the given output by using minimum quantity of input at minimum or least cost.

Thus, at the point 'E 'at the point of tangency the ratio of the marginal product of two factors i.e. labour and capital is equal to the ratio of their factor prices. To illustrate,

$$\frac{MPL}{MPK} = \text{Slope of isoquant.}$$

$$\frac{PL}{PK} = \text{Slope of iso-cost line}$$

Optimal input combination for maximisation of output:
In this method the firm has to maximise its output for a given cost. The equilibrium condition is this method is a s same as the minimisation method of output. But the maximisation of output method is conceptually different then the minimisation method. The following concept can be explained by the given diagram below:
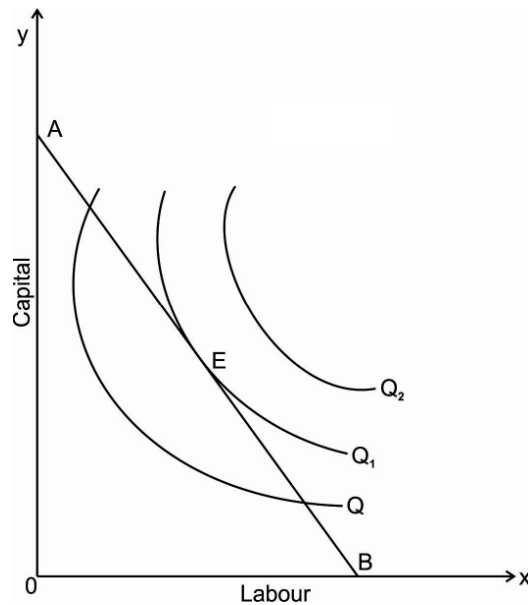
Diagram 3.22

Explanation of the diagram:
Labour is taken on the X axis and capital on Y axis. AB is the firms Iso-cost line. Q, Q1, Q2 is the iso-quant.

The maximum level of output a firm can produce is at the point 'E' where the isoquant Q1 is tangent to the iso-cost line AB. The point above the 'E' will be on the Iso-quant Q2 which is higher but nit attainable for the firm and iso-quant Below the point 'E' is less productive.

Thus, the above two analysis minimisation output and maximisation of output helps the firm to maximise their profits according to the factor cost or factor prices.

3.11 EXPANSION PATH

Expansion path is also called scale line. The expansion path is so called because if the firm decides to expand its operations, it would have to move along this path. The expansion path in simple word is defined as the locus of the points of tangency between the isoquants and iso-cost lines. The expansion paths show how a business firm tries to expand his output in the long run with the given factor prices and the given various factor combinations. This can be explained with the following diagram given below:
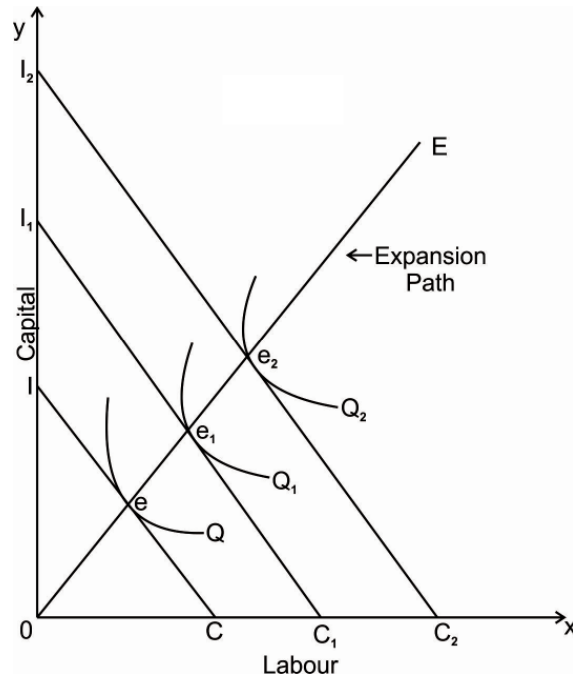
Diagram 3.23

Explanation of the diagram:

X axis examines Labour and Y axis Capital. IC, I1C1 and I2C2 are the iso-cost line parallel to each other which shows factor prices are assumed to be constant. Q, Q1 and Q2 are the Iso-quant. 'e' is the point of tangency which shows a firm can produce Q level quantity of output with least cost and least combination of factors of production. Similarly, if firms want to increase his level of output, he will be on point e1 and point e2 for the maximum level of output at minimum cost and minimum level of factor inputs. If we join all this tangency point E, E1 and E2 we will get a line OE called as expansion path or scale line. It is important to note that at the tangency point e, e1 and e2 the marginal rate of technical substitution of labour for capital is equal to the ratio of factor prices. Expansion path helps the business firm to find the cheapest way to produce each level of output with given factor price. It helps the firm to produce those level of output with the least cost and by using the least factor combination of input.

3.12 SUMMARY

The current unit had studied the production function and various concepts of production decision which helps the firm to take the appropriate production and supply decision. The term 'production' is very important and broader concept in economics. To meet the daily demand of a consumer production is essential part. Production is a process by which various inputs are combined and transformed into output of goods and services, for which there is a demand in the market. It has discussed two very important theory of production function. The law of variable proportion is a

short run production function theory. This law plays a very important role in the economic theory, which examines the production function with one variable factor keeping the other factors input fixed. Law of returns to scale is a long run production function theory. In this theory all factors of production are variable no factors are fixed. With the change in the factors of production scale of production will change accordingly. The unit has also discussed the concept of iso-quant and its properties in detail and concluded with producer's equilibrium and expansion path.

3.13 QUESTIONS

1) Explain the law of variable proportion in detail.
2) Explain the law of returns to scale.
3) What is isoquant? Discuss its properties in detail.
4) Define isoquant. Explain the different types of isoquants.
5) Write a short note on:
   a. Ridge lines
   b. Expansion path
   c. Producers behaviour

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Unit – 3A

ECONOMIES OF SCALE AND DISECONOMIES OF SCALE

Unit Structure :

3A.0 OBJECTIVES

- To study the internal and external economies and diseconomies of scale
- To understand the economies of scope

3A.1 INTRODUCTION

Adam smith in his famous book 'Wealth of the Nation' 1776 analyse the advantages of Division of labour which is capable of generating economies of scale in static as well as in dynamic sense. Economies of scale is a real phenomenon to the real-world situation which helps to understand the real situation in the world economy. In microeconomics, economies of scale is a cost advantage method of production where the firm operates its level of output by producing the scale of operation with cost per unit of output decreases with the increasing scale of output. Where the diseconomies of scale are the opposite of economies of scale.

3A.2 ECONOMIES OF SCALE

According to Alfred Marshall Economies of scale are broadly classified into Internal economies of scale and external economies of scale. In the large-scale production, the cost of production should be low which is called as economies of scale. A firm enjoy internal economies of scale when he expands his size or scale of

production in economy by making changes in the internal factors of production. Where on the other hand a firm enjoy internal economies of scale when he expands his size of production in economy by making changes in the external factors of production. So now we will explain both internal and external economies of scale in details.

3A.3 INTERNAL ECONOMIES OF SCALE

Internal economies of scale are an increase in the scale or size of production or output of a firm these are solely enjoyable by firm independently by making changes in the input factors of production into his business. The internal economies of scale have various different types which are as follows:

1) Labour economies: Adam smith in this book "An inquiry into the nature and causes of the wealth of the nation" 1776 emphasised on the division of labour. Economies of labour also implies the benefit which is arising in the scale of economy due to division of labour. Division of labour increases the efficiency in production which leads to increase in the size of output. Division of labour bring specialisation in labour skills and also saves time which in turn increases the level or scale of output. Thus, with the specialisation of division of labour the firm produces large scale of production.

2) Technical economies: technique of production also increases the scale of production. In other words, technical economies refer to increase in the scale of production due to change in technical or methods of production which reduces the cost of production. Technical economies increase the dimension of firms where the average cost of production decreases and average revenue will be high.

3) Managerial economies: Manager plays an important role in managing business activities. Managerial economies refer to the specialisation of managerial function which increases the level of output. It is a mangers duty to carry out all the managerial decision efficiently and effectively in the business organisation. Division of managerial activities increases the management of the business efficiently.

4) Financial economies: finance plays and important role in process of production. It is one of the important and essential factors of production. It is always observed that the large firms enjoy the benefit of better credit facility from banks then the small-scale firm. They also get the credit quickly and easily then the small firm or producer.

5) Marketing economies: marketing economies deals with the process of buying raw materials and selling of finished goods. A large firm have a great bargaining power. By using firm raw material at cheaper cost because it buys in bulk then the small firm. This in turn helps him to produce more at less cost and sell large amount of output in the market than the small firm.

6) Transport and storage: The large-scale firm have its own transport and storage facility which reduces his transportation and storage cost. This reduces the average cost of large-scale firm and increase the scale of output or revenue. Where the small-scale firms hire or pay rent for the use of transport and storage facility.

3A.4 INTERNAL DISECONOMIES OF SCALE

If the firm is unable to manage the level of output or the scale of operation diseconomies of scale occurs. If firm do not understand the importance of the specialisation of division of labour and specialisation of division management activities the level of output or scale of operation decreases leads to diseconomies of scale in economy. Suppose a firm take huge amount of loan from a financial institution or banks to expand his level of output. Such loan increases the burden on firm to prove their credit leads to financial diseconomies of scale.

Check your Progress :

1) What are Internal Economies of Scale?
2) What are Internal Diseconomies of Scale?

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3A.5 EXTERNAL ECONOMIES OF SCALE

External economies of scale refer to those economies which provides benefits and facilities to all firms of given industry. It is an economy which is enjoyed by all firms of industry irrespective of their size of operation. External economies of scale are also of various types which are follows:

1) Localisation economies: when a number of firms are located on one place with an objective of deriving the mutual benefits of training of skilled labour, provision of better transport facility etc. all these advantage helps the firm to reduce cost of production. Thus,

localisation economies refer to concentration of a particular industry in one area which results in the development of conditions of industry which will reap the mutual benefits of all firms in the economy.

2) Disintegration economies: disintegration means firms splitting up its operation and the process of manufacture and handing over the specialised agency and institution is called economies of disintegration. There are two types of disintegration such as vertical and horizontal disintegration of economies. The firm which operates on disintegration of economies of scale will be able to get economies of scale when it operates on a large scale.

3) Information economies: proper information in economy plays an important role for the producer to grow his economy. Networking with each other enables firms to make marketing and technical information easily.

4) By-product economies: to manufacture by-products a large-scale firm make use of waste material. This will help all the firm in the industry to reduce the waste in the economy and make efficient use of resources. This will ultimately reduce the cost of production and increase the level of output.

3A.6 EXTERNAL DISECONOMIES OF SCALE

External diseconomies of scale results when there is an increasing in the total cost of production beyond the control of a company and it reduces the level of output. The increase in costs can be due to increase in the market price of factors of production. The external diseconomies are not suffered by a single firm but by whole firms operating in a given industry. These diseconomies arise due to much concentration and localization of industries beyond a certain stage. For example, Localization may lead to increase in the demand for transport and, therefore, transport costs rise and it leads to diseconomies of scale in the economy.

3A.7 ECONOMIES OF SCOPE

Economies of scope refer to a situation where in the long-run a firm tries to reduce average and marginal cost of production by producing large varieties of output. In other words, economies of means a firm produces multiple products instead of producing one single product to increases his scope of output by using the same equipment's and machine as a result of this average cost decreases.

Economies of scope is different from economies of scale, in that where the former means producing a variety of different products or multiple of product together to reduce costs while the latter means producing more of the same product in order to reduce the costs by increasing the efficiency in production.

Economies of scope can arise from the co-production relationships between the final products or the actual products. In economic terms these goods are complements in production. This is when the production of one good automatically produces another good as a by-product or a kind of side-effect in the production process. Sometimes one product might be a by-product of another, but have value for use by the producer or for sale. Finding a productive use or market for the co-products can reduce costs or increase revenue.

For example, dairy farmers separate milk into whey and curds, with the curds going on to become cheese. In the process they also end up with a lot of whey, which they can use as a high protein feed for livestock to reduce their feed costs or sell as a nutritional product to fitness enthusiasts and weightlifters for additional revenue. Another example of this is the black liquor produced by the processing of wood into paper pulp. Instead of being just a waste product that might be costly to dispose of, black liquor is burned as an energy source to fuel and heat the plant, saving money on other fuels, or can even be processed into more advanced bio-fuels for use on-site or for sale. Producing and using the black liquor saves costs on producing the paper.

Check your Progress :

1) What do you mean by Economies of scope?
2) What is by product economies?

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3A.8 SUMMARY

The current unit studied the concept of economies and diseconomies of scale in detail. According to Alfred Marshall Economies of scale are broadly classified into Internal economies of scale and external economies of scale. In the large-scale production, the cost of production should be low which is called as

economies of scale. Internal economies of scale are an increase in the scale or size of production or output of a firm these are solely enjoyable by firm independently by making changes in the input factors of production into his business.

External economies of scale refer to those economies which provides benefits and facilities to all firms of given industry. It is an economy which is enjoyed by all firms of industry irrespective of their size of operation. It also discuss the internal factors and external factors of scale in details.

3A.9 QUESTIONS

1) Explain the internal and external economies of scale.
2) Explain in brief external economies and diseconomies of scale.
3) Write a short note on: Economies of scope.

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UNIT- 4

Unit - 4

COST CONCEPTS

Unit Structure :

4.0 OBJECTIVES

- To study various concepts of cost
- To understand the relationship between short run and long run cost curves
- To study the concept of break-even analysis and understand its application in   business

4.1 CONCEPTS OF COST

A firm who wants to maximize their profit concentrates on revenue and cost of the firm. Profit of the firm can be increased either by increasing revenue or by reducing cost. Firm generally cannot influence revenue because it is determined by the market forces but it is possible for the firm to reduce cost by producing maximum output or by increasing efficiency of the organization.

For managerial decision-making, cost is very important because it helps to decide price for the commodity. It also helps to decide whether to increase the production or not. Therefore, understanding of cost concepts is very important.

a. Private cost and Social cost:
Costs which are directly incurred by the individual or firm producing good or service is called private cost. This cost gives private benefit to an individual or firm engaged in relevant activity. Some of the examples of private cost are firm's expenditure on purchase of raw material, payment of rent, wages and salaries, interest, insurance, depreciation etc. Similarly company's

expenditure for its labor, advertising cost for the promotion of goods, transportation cost to carry goods from company to the market are also considered as private cost.

Social cost on the other hand is bared by the society as a result of production of commodity. Even though social cost occurs due to production of a commodity it is not bared by the producer. It consists of external cost. E.g.: If a factory is located in a residential area causes air pollution. Due to pollution as the health of the people living in that area affects, they have to spend money on medical facilities. Even though this cost occurs due to the factory, it is passed on to the society at large.

Externalities are included in the social cost.

b. Historical cost and Replacement cost:

The original money value spent at the time of purchasing of an asset is called historical cost. Most of the assets in the balance sheet are at the historical cost. One of the advantages of historical cost is that records maintained on the basis of historical cost are considered to be reliable, consistent, comparable and verifiable. Historical cost does not reflect current market valuation.

The amount which has to be spent at the time of replacing of the existing asset is called the replacement cost. This cost reflects the current market prices. If we consider an increase in prices over the years, replacement cost will be greater than historical cost. If we consider fall in prices over the years, replacement cost will be less than historical cost and if we consider prices to be constant over the years, replacement cost and historical costs are the same.

c. Fixed cost and Variable cost:

Fixed cost refers to the firm's expenditure on fixed factors of production. Even if no output is produced, fixed cost needs to be paid. Even if output increases in the short run, fixed cost remains constant. E.g.: If a businessman borrows money from a bank to start his business. Initially even if his output is zero, he has to pay the interest on borrowed capital. Rent on land, insurance premium, tax payment are some of the examples of fixed cost. Addition of all fixed cost gives Total Fixed Cost.

Variable cost on the other hand refers to the firm's expenditure on variable factors of production. When no output is produced, variable cost is zero. As output increases, variable cost also increases. Payment for raw material, wages and salaries of the workers are some of the examples of variable cost. Addition of all variable costs gives the Total Variable Cost.

d. Total cost, Average cost and Marginal cost:

Total cost (TC) – Firms total expenditure on all fixed and variable factors for producing a commodity is called the Total cost of production.

Therefore TC= TFC+TVC
For zero level of output there is some total cost. It increases with an increase in the level of output.

Average Cost (AC) or Average Total Cost (ATC) – It refers to the per unit cost of producing a commodity. It is calculated by the following formula

AC = TC/Q

Where AC = Average cost   TC = Total cost   Q = Number of units produced
Average cost can also be calculated by using following formula-

AC or ATC = AFC+AVC

Where AC- Average Cost   AFC- Average Fixed Cost
AVC- Average Variable Cost

Average Fixed Cost (AFC)- It is the per unit fixed cost of production. It can be calculated by the following formula

AFC= TFC/Q
Where TFC= Total Fixed Cost   Q = Number of units produced

Average Variable Cost (AVC) - It is the per unit variable cost of production. It can be calculated by the following formula

AVC= TVC/Q
Where TVC= Total Variable Cost   Q= Number of units produced

Marginal Cost (MC) - It is the addition made to the total cost. Or cost of producing an additional unit of output is called as the marginal cost. It can be calculated by using following formula

MC = Change in total cost/ change in output $\dfrac{\Delta TC}{\Delta Q}$

Where, ΔTC = Change in Total Cost
        ΔQ = Change in Output

OR
MC= TCn- TCn-1

Eg: If total cost of producing 2 cars is Rs. 3, 00,000 and the total cost of producing 3 cars is Rs. 4, 50,000. Then the marginal cost is Rs. 1, 50,000 i.e. the cost of producing an additional unit of output.

e. Sunk Cost and Incremental Cost:

In order to enter in to the market certain costs are incurred by the firm. These costs are known as Sunk cost. It includes the cost by the firm for setting up the business, advertisement etc. These costs cannot be recovered by the firm if they decide to exit the market.

Incremental cost refers to a change in total coat as a result of policy change or a change in managerial decision. The concept of incremental cost is broader as compared to marginal cost.

Marginal cost considers a change in total cost due to a unit change in output whereas incremental cost considers a change in total cost due to an introduction of new product, change in advertising strategy, additional batch of output etc. The concept of incremental cost is more relevant as compared to marginal cost because the firm increases its output in batches and not by unit only.

f. Implicit Cost and Explicit Cost:

Implicit cost refers to the cost of all own factors which the entrepreneur employs in the business. It includes salary and wages for the service of entrepreneur, interest on capital invested by the entrepreneur etc. Implicit costs are also called indirect cost because direct cash payment is not made to own factors of production.

If entrepreneur sold these services to others, he would have earned money. Therefore, implicit cost is also the opportunity cost of factors owned by him.

Explicit cost on the other hand is the direct cash payment made by the firm for purchasing or hiring of various factors of production. E.g. rent paid for hiring of land, money spent for purchasing for raw material, wages and salaries paid to the employees, expenditure on transport, power, advertising etc.

g. Accounting and Economic Cost:

Accounting cost includes only explicit cost i.e. the firm's expenditure on purchasing of various factors of production. For financial purpose and tax purpose, accounting cost is important.

Economic cost on the other hand includes both explicit and implicit cost. This cost is important for managerial decision making.

Therefore an economist who wants to take any decision considers both explicit and implicit cost.

Check your Progress :

1) Give two examples of Private Cost & Social Cost.
2) Explain concepts of total fixed cost & total variable cost.
3) Consider a firm who is producing a truck. What are the various fixed and variable factors of production it require? Make a list of all those factors.
4) The total cost of producing 5 TV Sets is Rs. 1,00,000 if the firm produces 6 TV sets its total costs increases to Rs. 1,35,000. What is the marginal cost for 6th TV Sets.

4.2 COST AND OUTPUT RELATIONSHIP IN THE SHORT RUN AND IN THE LONG RUN

Relationship between TFC, TVC and TC in the short run

TFC is the firm's total expenditure on fixed factors of production. For zero level of output TFC is zero. It remains constant for all the levels of output.

TVC on the other hand is the firm's total expenditure on variable factors of production. For zero level output TVC is zero. It increases with an increase in the level of output.

Total cost is the additional of Total Fixed Cost and Total Variable Cost. In the following table relationship between TFC, TVC and TC is discussed for different units of output

Table 4.1			
Output	**TFC**	**TVC**	**TC**
0	50	0	50
1	50	20	70
2	50	35	85
3	50	45	95
4	50	65	115
5	50	95	145
6	50	140	190
7	50	200	250
8	50	280	330
(All Costs in Rupees)			

Explanation – In table 4.1 First column shows various levels of output starting from zero units to 8 units. Second column shows TFC. As fixed factors of production are constant for certain level of output TFC is also constant for all level of output. For zero level of output also TFC is Rs. 50. Third column shows TVC which is zero for zero level of output. With an increase level of output TVC initially increases at decreasing rate then increases at an increasing rate. This is because of the law of variable proportions. Forth column shows TC which is the addition of TFC and TVC. TC increases with an increase level in the output. TC increases in the same proportions as increased in TVC.

This relation between TFC, TVC and TC can be explained with the help of following diagram.
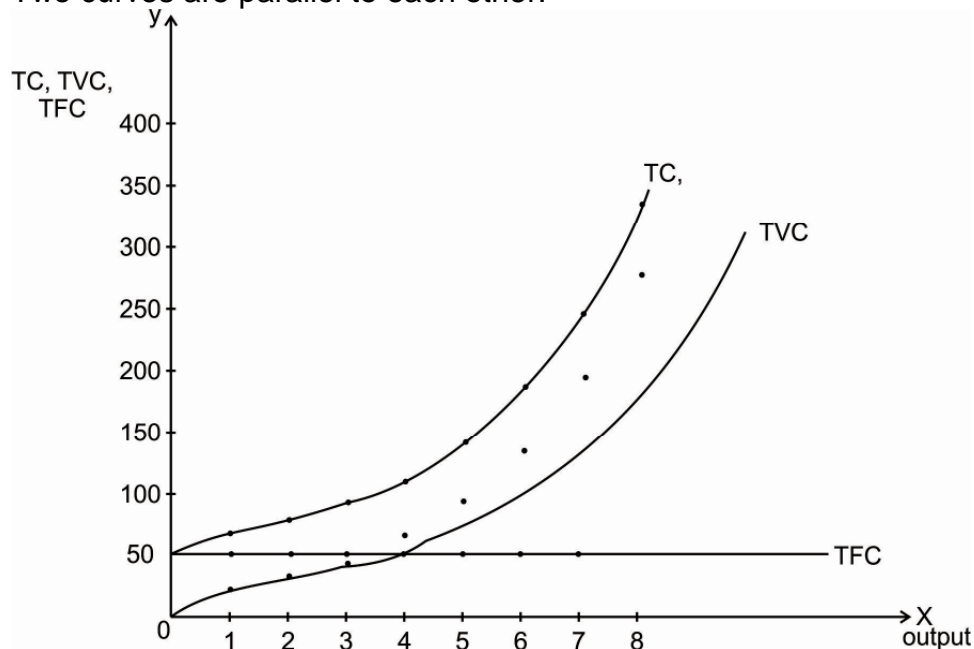
Two curves are parallel to each other.

Diagram 4.1

By plotting different combinations of output and TFC, TVC and TC, we have TFC curve, TVC curve and TC curves.

Diagram shows that TFC curve is a straight-line curve parallel to X axis. This is because when output is zero, some fixed cost has to be paid and this cost remains constant for all the levels of output. TFC curve is horizontal.

TVC curve starts at the point of origin because when output is zero, TVC is also zero. TVC curve initially increases at a diminishing rate with an increase in the level of output and then increases at an increasing rate.

As TC is the addition of TFC and TVC, TC curve is above TFC and TVC curves. The shape of TC curve is same as the TVC curve. The gap between TC and TVC curve measures TFC.

- **Cost and output relationship:**

Cost Function

Production function gives the functional relationship between the level of output and the various factor inputs (land, labor, capital and entrepreneur). The cost of production depends on the level of output produced, nature of technology used, prices of factors of production. Thus, the cost function is derived from the production function. The cost function is given as-

$$C = f (Q, T, Pf)$$

Where C = total cost Q = Level of output produced T = Technology Pf = Prices of factors   f = Functional relationship

If we assume that technology, prices of factors are constant, total cost increases with an increase in the level of output i.e. C = f(Q).

Any change in production function will shift cost function either up or down. E.g. Use of better techniques of production, use of better-quality raw material, use of efficient labors etc. will improve the production function and thus reduce the cost function. Similarly use of poor-quality raw material, inefficient techniques of production, unskilled labor will shift the production function up.

The relationship between cost and output needs to be studied in the short run and in the long run.

4.3 SHORT RUN COST- OUTPUT RELATIONSHIP

As the name suggests short run is a very short period where the firm produces its   output by changing only variable factors of production. This is because in the short run fixed factors of production remain constant for all the levels of output. Following table shows the behavior of output and various costs in the short run.

(Table 4.2)							
Output	TFC	TVC	TC	AFC	AVC	AC	MC
0	50	0	50	-	-	-	-
1	50	20	70	50	20	70	20
2	50	35	85	25	17.5	42.5	15
3	50	45	95	16.66	15	31.66	10
4	50	65	115	12.5	16.25	28.75	20
5	50	95	145	10	19	29	30
6	50	140	190	8.33	23.33	31.66	45
7	50	200	250	7.14	28.57	35.71	60
8	50	280	330	6.25	35	41.25	80

(All costs in Rupees)

In the above table output is shown in the (1st) column, which increases from 0 units to 8units. For all the levels of output TFC in column (2) remain constant i.e. Rs. 50. TVC in the (3rd) column is zero for zero level of output. And then increases with an increase in the level of output. In column (4) TC is calculated by adding TFC and TVC.

AFC in column (5) is calculated by using the formula TFC/Q. As TFC remain constant for all the levels of output, AFC continuously declines with an increase in the level of output.

AVC in column (6) is calculated by using formula TVC/Q. Initially AVC declines. At third level of output it reaches to the minimum and then increases with an increase with an increase in the level of output.

AC in column (7) is calculated by using the formula TC/Q. AC also declines initially reaches to the minimum point at 4th unit of output and then increases with an increase in the level of output.

MC in column (8) is the cost of producing an additional unit of output. It is calculated by the formula $\frac{\Delta TC}{\Delta Q}$ or $\frac{\Delta TVC}{\Delta Q}$. This is because TC increases by the same amount as increase in TVC. MC initially declines, reaches to minimum and increases thereafter. Diagrammatic relationship between AFC, AVC, AC and MC is as follows-
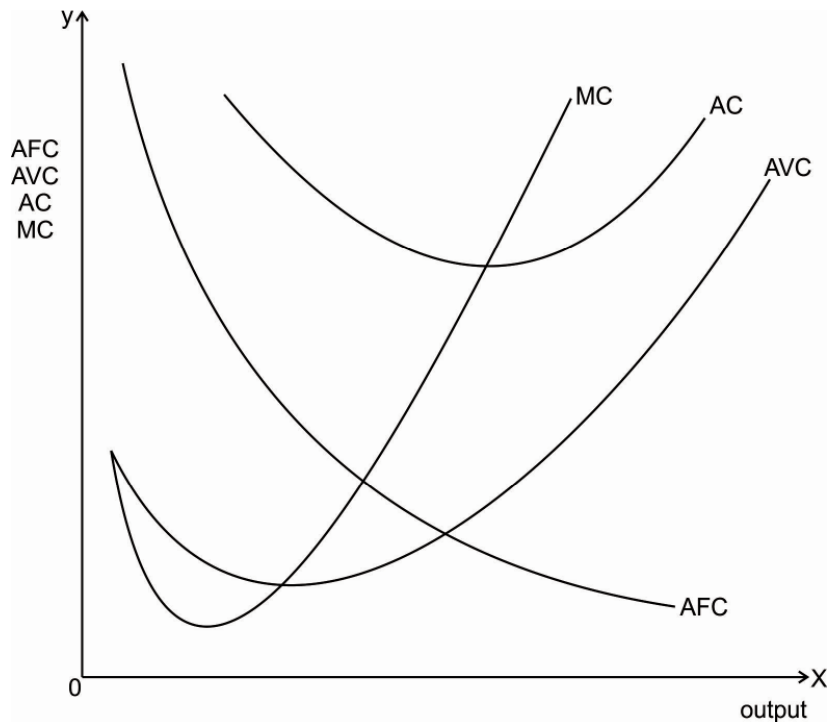
Diagram 4.2

Explanation:

1. As AFC is continuously declining. AFC curve slopes downward from left to right.

2. Initially AVC curve is declining, reaches to a minimum and then increases with an increase in the level of output. AVC curve starts increasing after a normal capacity level of output is produced. More intensive use of various factors of production leads to an increase in AVC.

3. AC curve lies above AFC and AVC curves because AC is the addition of AFC and AVC. AC curve initially declines due to fall in AFC curve. AC curve reaches to minimum point and then increases due to an increase in AVC curve. AC curve is a U-shaped curve.

4. MC curve is also a U-shaped curve. MC curve also falls in the beginning, reaches to the minimum and then increases. When MC curve starts rising, it intersects the AVC curve and AC curve at their minimum point.

Relationship between AC and MC:

AC is the per unit cost of production and marginal cost is the cost of producing an additional unit of output. Relationship between AC and MC can be discussed with the help of following diagram.
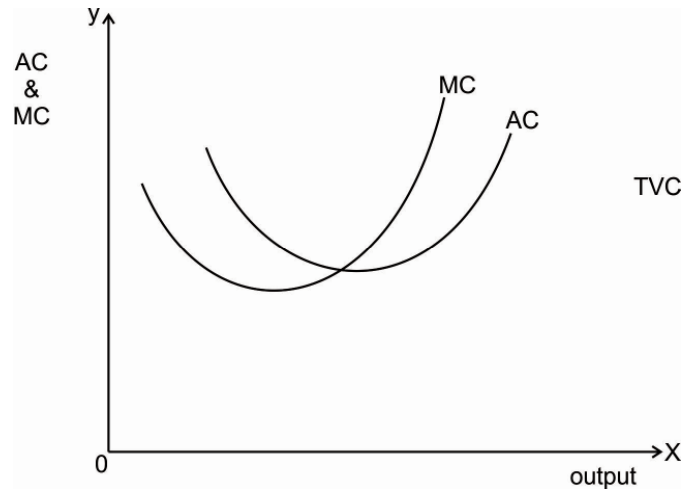
Diagram 4.3

- For initial levels of output AC and MC both curves are declining, but MC is less than AC. When MC is less than AC it means that cost of producing an additional unit of output is less than per unit cost of production. As MC<AC, new AC must be less than old AC. Therefore, AC curve is declining.

- At a certain level of output (optimum level of output) AC is minimum. At this point MC curve intersects AC curve. Thus AC=MC. It means that cost of producing an additional unit of output is exactly equal to the average cost of production. As AC=MC, new AC must be equal to the old average cost.

- At higher levels of output AC and MC both are increasing but MC>AC. It means that the cost of producing an additional unit of output is greater than the average cost of production. As MC>AC, new average cost must be greater than old average cost. Therefore, AC curve is rising.
  From the above explanation we can conclude that when
- MC<AC, MC pulls the AC curve down.
- MC=AC, AC curve is flat as MC pulls AC horizontally.
- MC>AC, MC pulls the AC curve up.
- Long run cost and output relationship

As the name suggests long run refers to a sufficiently long period. As the long period is available, firm can make necessary change in all factors of production as per the changes in demand. Thus, in long run all factors of production are variable. Hence there are no fixed cost in the long run. Depending on the type of industry the length of long run can differ. For a firm producing a particular product, long run may be years.

In the long run firm can make proper planning and build that size of plant which will minimize the cost of production for producing optimum level of output. Once the particular plant has been built, the firm operates in the short run. This means that even though firm operates in the short run, it plans in the long run.

Check your Progress :

1) Is it possible to have a straight line TVC and TC curves? Justify.
2) On the basis of following data calculate TVC, AVC and MC

Output	0	1	2	3	4
TC	70	100	150	220	300

3) Discuss Relationship between AC & MC.

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4.4 LONG RUN AVERAGE COST CURVE

Different plant sizes are available to the firm to operate in the long run. For a specific level of output, the plant of specific size is more suitable. For every size of plant there will be a specific average cost and thus a specific average cost curve. In the long run different short run average cost curves are available for different sizes of plant. The firm has to choose the specific size of plant for its operation.

Derivation of Long run average cost curve with a number of short run average cost curves can be discussed with the help of following diagrams-
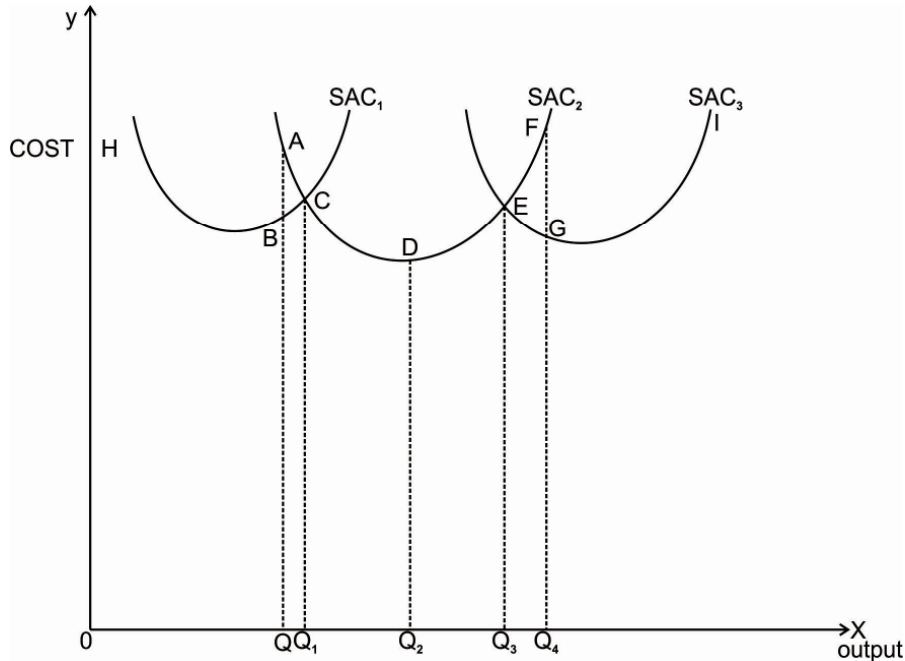

Diagram 4.4

Here we assume that there are three sizes of plant.

Above figure shows that there are three plants available to the firm and are shown by three different cost curves- SAC1, SAC2 and SAC3. For a particular level of output, a specific plant is most suited.

Above diagram shows that for producing OQ level of output on plant SAC1, cost is BQ and on plant SAC2 cost is AQ. This shows that OQ level of output can be produced with lower cost QB with SAC1 as compared to plant SAC2.

If the firm wants to produce OQ1 level of output, it can be produced either with plant SAC1 or SAC2. But it is better for the firm to go with plant SAC2 because as shown in the diagram higher level of output OQ2 can be produced with much lower cost on SAC2. With plant SAC2, output greater than OQ1 and less than OQ3 can be produced at lower average cost.

For output greater than OQ3 firm will use plant SAC3 because the average cost with SAC2 will be greater as compared to average cost with SAC3.
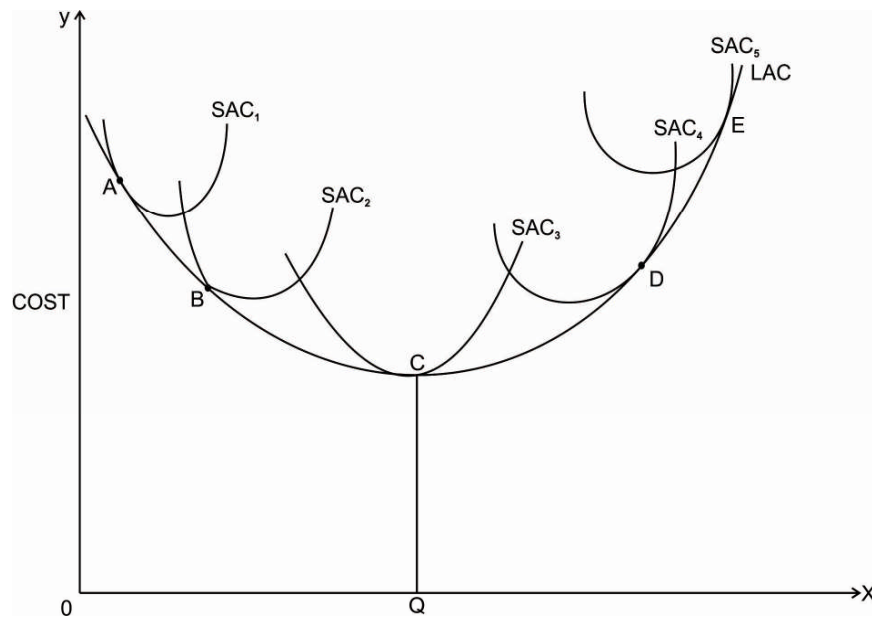
Derivation of LAC

Diagram 4.5

From the above explanation it is clear that in the long run the firm has alternative plant sizes available for the production and the firm will choose that plant size which gives minimum average cost for producing a given level of output. Accordingly (Fig 4.4) with three short run average cost curves the Long run Average Cost curve is HBCEGI.

If we assume that there are infinite plant sizes available, there are number of short run average cost curves corresponding to

each plant size. Therefore, the LAC will be a smooth U-shaped curve as shown in (Diagram 4.5) above.

As LAC curve is a locus of points of the lowest average cost of producing different levels of output. Every point of LAC will have a tangency point with SAC curve. It can be seen from the above diagram that LAC curve is tangent to the minimum point of SAC3 curve only at the optimum level of output OQ. Plant SAC3 is considered as the optimum size of plant because it produces optimum level of output OQ with minimum cost CQ.

For any output less than OQ, LAC curve is tangent to SAC curve on its declining part ie. at point A and B on SAC1 and SAC2. For any output greater than OQ, LAC curve is tangent to SAC curve on its increasing part i.e. At point D and E on SAC4 and SAC5.

It can be seen from (Diagram 4.5) that LAC curve initially declines, reaches to minimum and again increases with an increase in the level of output. LAC curve is much flatter than SAC curves. LAC curve declines due to economies of scale and increases due to diseconomies of scale.

As the LAC curve includes the family of short run average cost curves, it is called an **Envelop curve.** In the long run firm can also plan to increase its scale of production and therefore LAC curve is also called the **Planning Curve.**

Learning curve:

The learning curve shows an inverse relationship between an average cost of production and the level of output. This means that as firm produces more and more output, its average cost of production declines. Therefore, the learning curve slopes downward from left to right. Following diagram explains the learning curve effect.
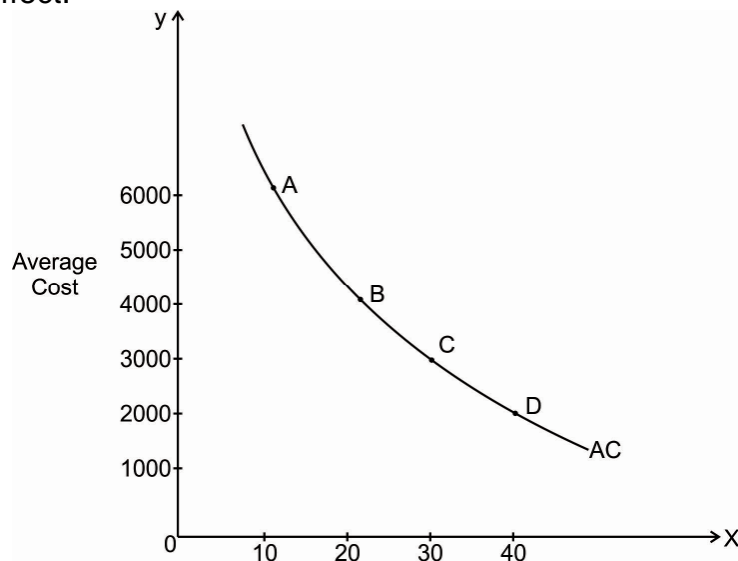

Diagram 4.6

In the above diagram X axis represents total output and Y axis represents the average cost. It shows that average cost is RS.6000 for producing 10 units of output. As output increases to 20, 30 and 40 units, average cost declines to 4000, Rs. 3000 and Rs. 2000 respectively. Points P, Q, R and S shows different combinations of output and average cost.

Learning curve effect is a result of an experience which the firm gains during the process of production. When the firm is new, it takes time for the firm to produce the output. Thus, the costs are high. As firm becomes older, it learns to use new techniques of production, efficient way of using raw material and skills. Workers also become efficient over a period of time. All this will help to reduce the average cost of production. Firm learn to reduce cost through experience. Therefore, learning curve is also called an **Experience curve**. The effect of learning curve applies to the manufacturing and service sector.

As shown in the diagram learning curve initially declines faster and then declines at a slower rate. This means that when the production process is new, average cost declines much faster as compared to the old production process.

Check your Progress :

1) What do you mean by Envelope Curve?
2) What do you mean by Learning Curve?

4.5 SUMMARY

This unit studies the cost function which is being derived from the production function. It discusses different concepts of costs with examples and explains the behaviour of cost curves in the short run and long run. It also includes calculations of various costs like TFC, TVC, TC, AFC, AVC, AC and MC.

This unit explains how firm learns to reduce their average cost of production through experience over a period of time through the concept of learning curve or experience curve.

4.5 QUESTIONS

Q.1 Explain the following concepts-

    a) Implicit cost and Explicit cost

    b) Private cost and Social cost

    c) Historical cost and Replacement cost

    d) Total cost, Average cost and Marginal cost

    e) Fixed cost and Variable cost

    f) Opportunity cost

Q.2 Explain the relationship between TFC, TVC and TC with the help of diagram.

Q.3 Define AC,AFC, AVC and MC and also discuss the relationship between them.

Q.4 Bring out the relationship between AC and MC.

Q.5 Explain the derivation of Long run Average Cost curve.

Q.6 Discuss the Learning curve effect.
Q.7 If the Total fixed cost of production is rs.75, with the help of following data, calculates TC, AC, AFC, AVC, MC.

Output	0	1	2	3	4	5
TVC	0	35	50	70	100	160

Q.8 With the help of following information, complete the table given below.

Output	TFC	TVC	TC	AFC	AVC	AC	MC
0	80	0					
1	80	40					
2	80	70					
3	80	120					
4	80	190					
5	80	290					
6	80	420					

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Unit – 4A

EXTENSION OF COST ANALYSIS

Unit Structure :

4A.0   Objectives
4A.1   Concept of break- even point
4A.2   Changes in break- even point due to price, fixed cost and variable cost
4A.3   Application of break- even analysis
4A.4   Limitations
4A.5   Case study
4A.6   Summary
4A.7   Questions

4A.0 OBJECTIVES

- To understand the concept of break- even point

- To understand the effects of change in price, fixed cost and variable cost on break- even point

- To study the actual application of break-even analysis in business

- To study the limitations of break-even analysis

4A.1 CONCEPT OF BREAK-EVEN POINT

Break-even analysis studies the relationship between total cost, total revenue, total profits and losses over a range of output. Break-even point is a point where the total revenue of the firm is equal to total cost. Therefore, at break-even point there is no profit, no loss.

Break-even analysis technique is used in the business to determine the level of production or sales volume which is necessary for the business to cover its cost of doing a business. In financial analysis the concept of break-even point is most commonly used. The concept of break-even point can be explained with the help of following table-8.1

Output	TR	TC	Profit/ Loss
0	0	1200	-1200
1	1000	1500	-500
2	1400	1800	-400
3	2000	2000	0
4	2600	2200	400
5	3500	3000	500

Table 4A.1

Above table shows that break-even level of output is 3 units because, firms TR and TC are equal at 3 units of output and therefore there is no profit, no loss.

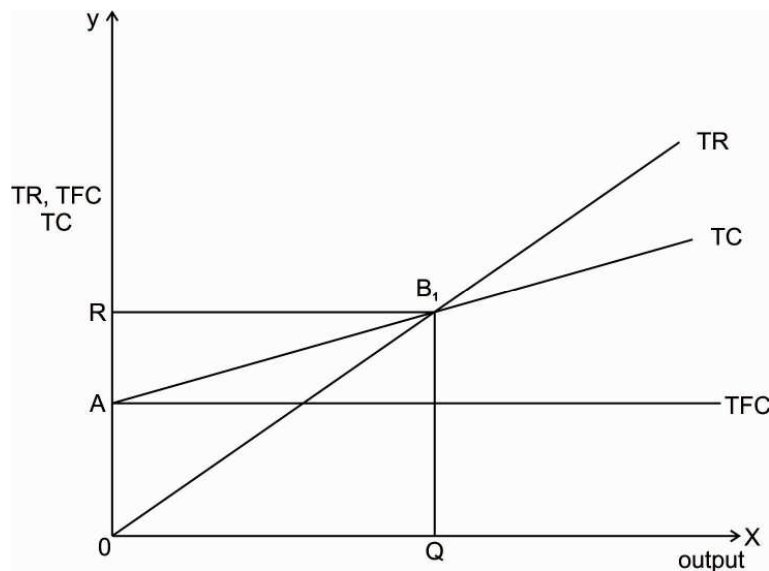Break-even point can also be explained with the help of following diagram

Diagram 4A.1

Above diagram is drawn on the basis of the assumption that TR and TC curves are linear i.e. TR and TC increases at a constant rate with an increase in the level of output. Therefore, TR and TC curves are straight lines.

For initial levels of output total cost is greater than total revenue therefore the firm is making loss. At output OQ, firm stops making loss, TR=TC therefore there is no profit no loss. Thus, OQ is the break-even output and B1 is the break-even point. After OQ

level of output total revenue is greater than total cost and thus firm starts making profit.

When TR and TC curves are linear, there is only one break-even point. According to above diagram entire output after break-even output gives profit. However, this may not be true because of changes in price and cost.

If we do not consider constant change in TR and TC, TR and TC curves are non-linear. In this case we have more than one break-even point as shown in the following diagram-
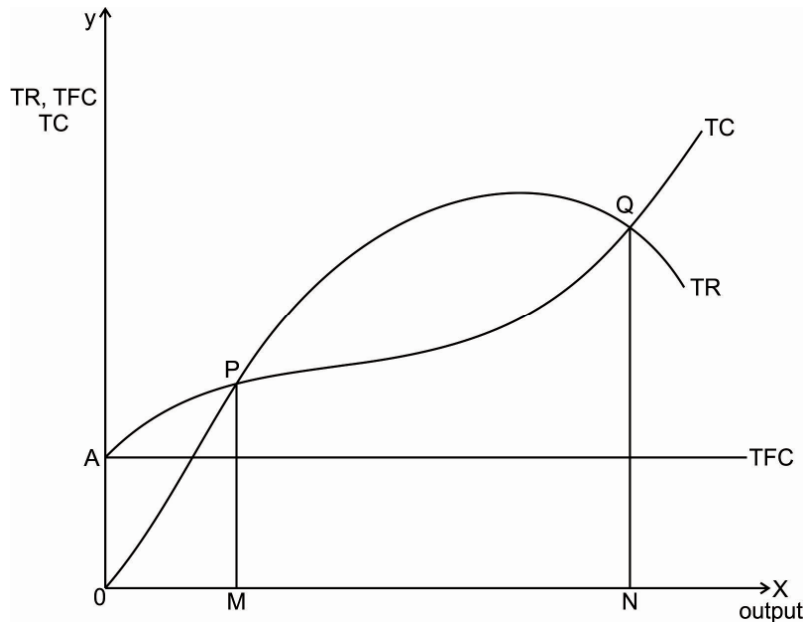

Diagram 4A.2

In the above diagram on the Y axis we measure cost and revenue and on the X axis we measure output.

In case of non-linear TR and TC curves there two break-even points P and Q, indicating lower level of output OM and higher level of output ON respectively. For any output less than OM and greater than ON, firm makes losses because TC>TR. Between the range of output M and N, TR>TC and thus firm makes profit.

4A.2 CHANGES IN BREAK- EVEN POINT DUE TO PRICE, FIXED COST AND VARIABLE COST

Break-even point or break-even quantity changes due to change in following factors-
- Changes in price
- Changes in fixed cost
- Changes in variable cost

Changes in break-even quantity and break-even point due to above factors can be discussed with the help of following example-

- Changes in price

Any change in price will have an effect on total revenue and therefore also on break-even point.

If we consider the same example 1 and consider an increase in price to Rs.17, and keep fixed cost and average variable cost constant, break-even quantity is-

QB = FC/ P-AVC
= 4000/17-7
= 4000/10
= 400 units.

If we consider fall in price to Rs. 12, keeping fixed cost and average variable cost constant, break-even quantity is-

QB = FC/P-AVC
= 4000/12-7
= 4000/5
= 800 units.

This shows that with an increase in price, break-even quantity falls and with a fall in price, break-even quantity increases.

Effect of changes in price on break-even point and break-even quantity can be explained with the help of following diagram.
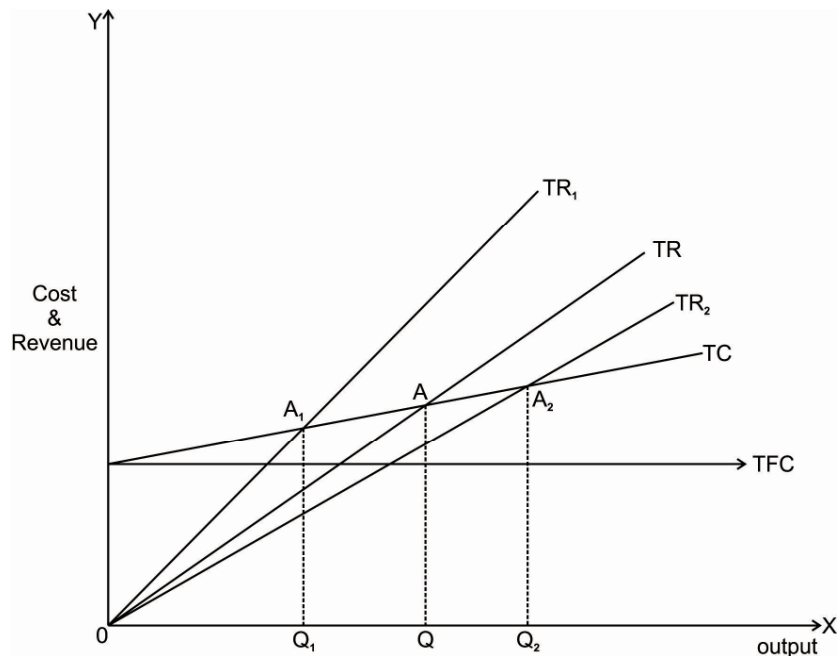

Diagram 4A.3

In the above diagram X axis measures output and Y axis measures cost and revenue. With an initial TR and TC curves A is the break-even point, where TR and TC curves intersects. If price increases, TR curve shifts upward from TR to TR1. This will bring down the break-even point from A to A1. Similarly, with a fall in price, TR curve shifts downward to TR_2 and thus break-even point also shifts to A_2.

- Changes in fixed cost

For the same mathematical example 1 if we change the fixed cost and keep price and average variable cost constant, we have changes in breakeven quantity.

Suppose fixed cost increases to Rs. 5000, break-even quantity is-

QB = FC/P-AVC
= 5000/15-7
= 5000/8
= 625 units.

If fixed cost falls to Rs. 3600, break-even quantity is-

QB = FC/P-AVC
= 3600/15-7
= 3600/8
= 450 units.

This shows that with an increase in fixed cost, break-even quantity increases and with a fall in fixed cost, break-even quantity falls.

Changes in break-even point due to changes in fixed cost can be explained with the help of following diagram-
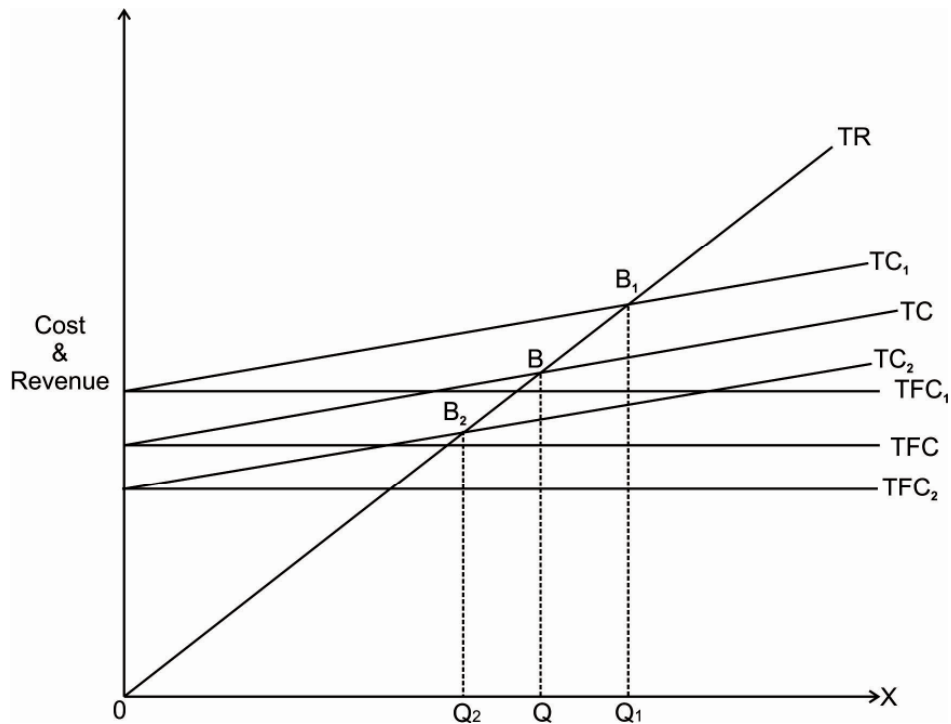
Diagram 4A.4

On the X axis we measure output and on the Y axis we measure cost and revenue. With an initial TR and TC curves initial break-even point is B initial break even quantity is OQ if fixed cost increases, TFC curve shifts upward to TFC1. As total cost is the addition of TFC and TVC, TC curve will also shift upward to TC1. This shifts the break-even point at higher level to B1. Break even quantity has also increased from OQ to OQ_1.

On the other hand, if TFC falls, TFC curve will shift downward to TFC_2. This will shift the TC curve down to TC_2. Therefore, new break-even point is B_2 & new break even quantity falls from OQ to OQ_2.

- Changes in variable cost per unit

Using the same mathematical problem if we keep price and fixed cost constant and change the variable cost per unit, we have a change in break-even quantity.

Suppose the average variable cost per unit increases to Rs. 10, break-even quantity is
QB = FC/P-AVC
= 4000/15-10
= 4000/5
= 800 units.

If variable cost per unit falls to Rs. 5, break-even quantity is

QB = FC/P-AVC

    = 4000/15-5

    = 4000/10

    = 400 units.

This shows that with an increase in per unit variable cost, break-even quantity increases and with a fall in average variable cost, break-even quantity falls.

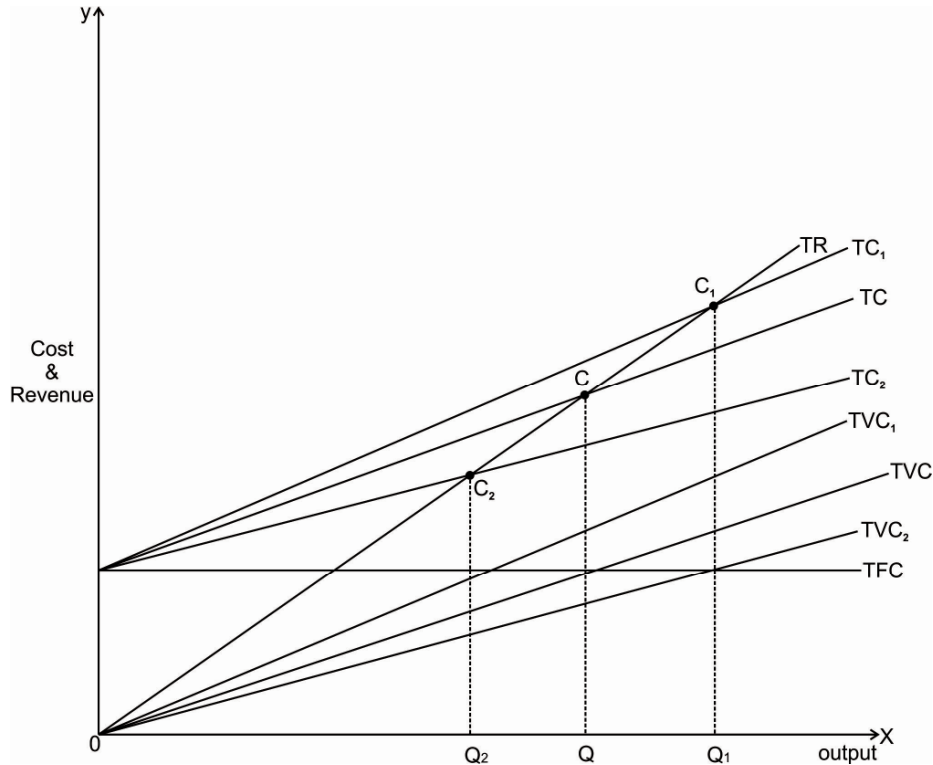This can be discussed with the help of following diagram-

Diagram 4A.5

In the above diagram X axis measures output and Y axis measures cost and revenue. Initial break-even point is C where TR and TC curves intersect. Initial break even quantity is OQ. With an increase in TVC, TVC curve shifts to TVC1. This also shifts TC curve to TC1. TVC1 and TC are parallel to each other. Thus, the new break-even point shifts upward to C_1 & break even quantity increases from OQ to OQ_1.

With a fall in TVC, TVC curve shifts to TVC_2, shifting down TC curve to TC_2. Thus, the new break-even point also shifts down to C_2. Again, TVC2 and TC2 are parallel to each other. New break even quantity falls from OQ to OQ_2.

Check your Progress :

1) What is the important of Break-Even Point?
2) If FC = 2000, Price per unit = Rs. 12 & AVC = Rs. 8 Calculate Break-even Quantity.
3) Find out the Break-even Point for the firms having following data.

Output	0	1	2	3	4	5	6
TR	0	150	180	270	350	400	560
TC	120	150	170	250	340	390	500

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4A.3 APPLICATION OF BREAK-EVEN ANALYSIS

Business firms are interested in understanding break-even analysis because it helps to determine that level of output which will help the firm to cover its entire cost and thus to make profit. Break-even point is the point where the firm starts making profit. Break-even analysis is used in the business for following purposes.

- **Targeting profits-** Firm has to target the level of profit for short run and long run. Break-even point gives the level of output where the firm starts making profit. Thus, for setting profit targets, break-even analysis is important.

- **Recovery of cost-** At break-even point firm covers its entire cost of production (including fixed and variable cost). Understanding of break-even can help the firm to manage its costs in a better manner ie. the firm can try to reduce cost in order to have early break-even.

- **Helps in deciding techniques of production-** different techniques of production are available to the firm. Each technique differs in efficiency and cost. Break-even analysis helps in deciding a proper technique of production.

- **Effects of changes-** in order to be competitive, firm needs to make changes in their pricing, marketing and other policies. Any change in this policy will have an effect on revenue and cost of the firm and thereby on break-even point. Any change in break-even point will finally have an effect on profitability of the firm.

- **Deciding sales and marketing policies-** it is possible for the firm to lower break-even point by using new marketing

strategies. But an increase in marketing cost will increase the cost of production and thus will increase the break-even point. Therefore, it is necessary for the firm to find proper sales and marketing policies to achieve its break-even point.

- **Utilization of capacity-** it is possible for the firm to reduce its average cost when it uses its full capacity and thereby reduces wastages and improves efficiency of resources. This will help to reach break-even point quickly.

- **Capital raising capacity-** once the break-even point is reached, it is possible for the firm to raise capital for its future expansion. Possibility of making profit for those firms is high who have reached their break-even and therefore financial institutions are also ready to give loans to these firms. On the other hand, firms who have not reached their break-even finds it difficult to raise loans from the financial institutions.

4A.4 LIMITATIONS OF BREAK-EVEN ANALYSIS

Various limitations of break-even are as follows-

- Linear TR and TC curves gives wrong impression that the entire output after break-even point is profitable. But this is not always true.

- In case of single product unit, break-even analysis can be applied. But in case of multiple or joint products it is difficult to apply break-even analysis as long as cost cannot be determined for each of the product.

- The data required for break-even analysis including costs, price etc. is generally historical. If historical data is not proper for estimating future costs and prices, break-even analysis cannot be usefully applied.

- If it is possible to clearly classify costs as fixed and variable costs, break-even analysis is more useful. But sometimes it is not possible to have such classification of costs.

  Even though there are various limitations of break-even analysis, it is useful in production planning if proper data is obtained.

4A.5 CASE STUDY

Break-even level of output can be algebraically determined by using following formula

BQ = FC/Fixed cost/ Price- Average variable cost i.e.   BQ = FC/ P-AVC

Where BQ = Break-even quantity P= Price per unit   AVC= Average Variable Cost

Example 1-

Suppose fixed cost for the firm is Rs. 4000, price per unit of output is Rs. 15 and the Average Variable Cost is Rs. 7, its break-even quantity is-

BQ = FC/ P-AVC

4000/15-7

4000/8

BQ= 500 units

Break-even sales volume can be calculated by multiplying break-even quantity by the price per unit of output.

BS = BQ*P

Where BS= Break-even sales volume

BQ= Break even quantity   P= Price per unit

BS= 500*15

= Rs.7500

4A.6 SUMMARY

Extension of cost analysis introduce the concept of break-even point. Here the concept of break-even point is studied with the help of linear and nonlinear TR and TC curves. The calculation of break-even sales volume in units and break even sales volume in amount is also studied with the help of numerical examples this unit also explains changes in break-even point due to change in TFC or TVC for price per unit of a commodity.

In the last part of this unit application of break-even analysis and limitations of break-even analysis are studied

4A.7 QUESTIONS

1. Explain the concept of break-even point with the help of diagram.

2. Discuss with the help of diagram how break-even point changes due to change in price and fixed cost.

3. Explain changes in break-even point due to change in total variable cost.

4. Discuss the implications and limitations of break-even analysis.

5. Suppose the TFC of the firm is rs.5000, AVC is rs.25 and price per unit is rs.40, calculate break-even quantity and break-even sales volume.

i. If TFC increases to rs.6000, what will happen to break-even quantity and sales volume?

ii. If price per unit reduces to rs.35, what will happen to break-even quantity and sales volume?

6. With the help of following data find out lower and upper level of break-even quantity.

Output	TR	TC
0	2500	3500
1	2200	3000
2	2000	2000
3	1800	1500
4	1500	1300
5	1000	1000

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Question Paper Pattern
(Business Economics Paper I & II)

Maximum Marks: 100
Questions to be set: 06
Duration: 03Hrs.

Question No	Particular	Marks
Q-1	Objective Questions A) Sub Questions to be asked 07 and to be answered any 05 B) Sub Questions to be asked 12 and to be answered any 10 (*Multiple choice / True or False / Match the columns/Fill in the blanks)	20
Q-2 Q-2	Full Length Question OR Full Length Question	15
Q-3 Q-3	Full Length Question OR Full Length Question	15
Q-4 Q-4	Full Length Question OR Full Length Question	15
Q-5 Q-5	Full Length Question OR Full Length Question	15
Q-6	Short Notes To be asked 06 To be answered 04	20

Note- Theory questions of 15 marks may be divided into two sub questions of 7/8 and 10/5.