MICRO ECONOMICS

CHAPTER-1 - INTRODUCTION

I. Choose the correct answer (each question carries 1 mark)

1. The scarce resources of an economy have
   (a) Competing usages   (b) Single usages
   (c) Unlimited usages   (d) Limited usage
Ans: (a) Competing usages

2. Which of the following in an example of micro economic study?
(a) National income   (b) Consumer Behaviour
(c) Unemployment   (d) Foreign trade
Ans: (b) Consumer behaviour

4. Central problems of an economy includes
   (a) What to produce   (b) How to produce
   (c) For whom to produce   (d) All the above
Ans: (d) All the above

5. Traditionally, the subject matter of economics has been studied under the following broad branches.
   (a) Micro and macro Economics   (b) Positive and Normative
   (c) Deductive and Inductive   (d) Market & Mixed economy
Ans: (a) Micro and Macro Economics.

II. Fill in the blanks (each questions carries 1 marks)
1. Scarcity of resources gives raise to.....................
   Ans: Problem of choice
2. In a centrally planned economy all important decisions are made by ………………
   Ans: Government
3. _____is a set of arrangements where economic agents can freely exchange.
   Ans: Market
4. In reality all economies are …………………..
   Ans: Mixed Economies.

III. Match the following (each question carries 1 mark)

1. Market economy   a. Government
2. Service of Teachers   b. Private ownership
3. Centrally planned economy   c. Skill
4. Positive economics   d. Evaluation of Mechanism
5. Normative economics   e. Functioning of Mechanism
     Ans: 1-b; 2-c; 3-a; 4-e; 5-d;

IV. Answer the following questions in a sentence/word. (each question carries 1 mark)

1. **Why does the problem of choice arise?**
   Ans: An economic problem arises because of limited resources, unlimited wants and alternative uses of resources.

2. **What is market economy?**
   Ans: A market economy is that economy where economic decisions are undertaken on the basis of market mechanism by the private entrepreneurs. It is also known as capitalistic economy.

3. **What do you mean by production possibility Set?**
   Ans: The collection of all possible combinations of the goods and services that can be produced from a given resources and technological knowledge is called the production possibility set

4. **What does a combination below the Production Possibility Frontier indicate?**
   Ans: The combinations below the Production Possibility Frontier indicates that all or some of the resources are either underemployed or are utilised in a wasteful fashion.

5. **Give the meaning of micro economics.**
   Micro economics studies small units of an economy.

V. Answer the following in 4 sentences. (each question carries 2 marks)

1. Mention the central problems of an economy.
   Ans: The central problems of an economy are as follows:
   a) What goods are to be produced and in what quantities?
   b) How the goods are to be produced?
   c) For whom the goods are to be produced?

2. List out the basic economic activities.
   Ans: Production, consumption, Distribution and exchange of goods and services are the basic economic activities.

3. **What is production possibility frontier?**
   Ans: The production possibility frontier gives the combinations of two commodities that can be produced when the resources of the economy are fully utilized. It is also called as Production possibility curve (PPC).

4. **What do you mean by mixed economy? Give an example.**
   Ans: Mixed economies are those where some important decisions are taken by the government and the economic activities are by and large conducted through the market. That means, it is the economy where both public and private sectors co-exist. Example India, Pakistan etc.

5. **Distinguish between positive and normative economics.**

Positive Economics	Normative Economics
• Here we study how the different mechanisms function. • It deals with the scientific explanation of the working of the economy. • Focus on functioning of mechanism	• Here we study whether the different mechanisms are desirable or not. • It explains about 'what should be and should not be done'. • Focus on evaluation of mechanisms.

2. State the differences between Micro and Macroeconomics.

Micro Economics	Macro Economics
- It studies small/individual units - Its scope is narrow - Follows slicing method	- It studies in large/aggregates. - Its scope is wider - Follows lumping method

VI. Answer the following question in 12 sentences. (each question carries 4 mark)

1. **Briefly explain how the family farm, weaver and Teacher can use their resources to fulfill their needs in a simple economy.**

Ans: People in the society need many goods and services in their everyday life including food, clothing, shelter, transport facilities, postal services and various other services like that of teachers and doctors. In fact, the list of goods and services that any individual needs is so large that no individual in society has all the things he needs.

Every individual has some amount of only a few of the goods and services that he would like to use. A family farm may own a plot of land, some grains, farming implements, may be a pair of bullocks and also the labour services of the family members.

A weaver may have some yarn, some cotton and other instruments required for weaving cloth.

The teacher in the local school has the skills required to impart education to the students.

Each of these decision making units can produce some goods or services by using the resources that it has and use part of the produce to obtain the many other goods and services which it needs.

For instance, the family farm can produce corn, use part of the produce for consumption purposes and procure clothing, housing and various services in exchange for the rest of the produce.

Similarly, the weaver can get the goods and services that he wants in exchange for the cloth he produces in his yarn. The teacher can earn some money by teaching students in the school and use the money for obtaining the goods and services that he wants.

Thus, each individual can use his resources o fulfill his needs. It is said that no individual has unlimited resources compared to his needs. The quantity of corn that the family farm can produce is limited by the quantity of resources it has and hence the amount of different goods and services that it can procure in exchange of corn is also limited. As a result, the family is forced to make a choice between the different goods and services that are available. It can have more of a good or service only by giving up some amounts of other goods or services.

2. **What are the central problems of an economy? Explain.**

Ans: An economic system or economy is a mechanism where the scarce resources are channelized on priority to produce goods and services. These goods and services produced by all the sectors of the economy determine the national income.

Generally, human wants are unlimited and resources to satisfy them are limited. If there was a perfect match between human wants and availability of resources there would have been no scarcity, no problem of choice and no economic problems at all. So, one has to select the most essential want to be satisfied with limited resources. In economics, this problem is called 'Problem of Choice'.

The problem of choice arising out of limited resources and unlimited wants is called economic problem. Every economy whether developed or underdeveloped, Capitalistic or socialistic or mixed economy, there will be three basic economic problems viz., What to produce, How to produce and For whom to produce. Let us discuss in detail.

a) **What to Produce i.e., what is to be produced and in what quantities::** Every country has to decide which goods are to be produced and in what quantities. Whether more guns should be produced or more food grains should be grown or whether more capital goods like machines, tools, etc., should be produced or more consumer goods (electrical goods, daily usable products etc.) will be produced. What goods to be produced and in what quantity depends on the economic system of the country. In socialistic economy, the Government decides and in Capitalistic economy market forces decide and in mixed economy both the Government and market forces provide solutions to this problem.

b) **How to Produce i.e., how are goods produced?:** There are various alternative techniques of producing a product. For example, cotton cloth can be produced with either handloom or power looms. Production of cloth with handloom requires more labour and production with power loom use of more machines. It involves selection of technology to produce goods and services. There are two types of techniques of production viz., (a) Labour intensive technology and (b) capital intensive technology.

The firm has to decide whether production be based on labour intensive or capital intensive techniques. Obviously, the choice of technology would depend on the availability of different factors of production (land, labour, capital) and their relative prices (rent, wages, interest).

c) **For whom to produce i.e., for whom are the goods to be produced:** Another important decision which an economy has to take is for whom to produce. The economy cannot satisfy all wants of all the people. Therefore, it has to decide who should get how much of the total output of goods and services. The society has to decide about the shares of different groups of people- poor, middle class and the rich, in the national output.

Thus, every economy faces the problem of allocating the scarce resources to the production of different possible goods and services and of distributing the produced goods and services among the individuals within the economy. The allocation of scarce resources and the distribution of the final goods and services are the central problems of any economy.

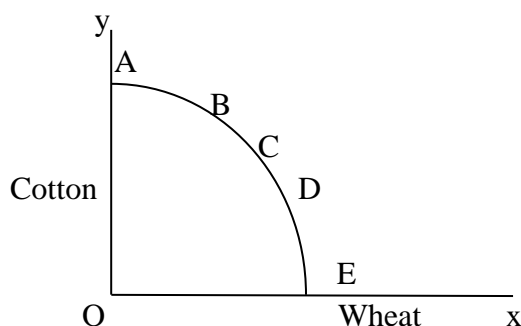3. **Explain the production possibility frontier.**

Ans: The production possibility frontier is a graphical representation of the combinations of two commodities (cotton and wheat) that can be produced when the resources of the economy are fully utilized. It is also called as Production possibility curve (PPC) also known as transformation curve.

It gives the combinations of cotton and wheat that can be produced when the resources of the economy are fully utilized. The production possibility frontier can be explained with the help of following table.

Possibilities	Cotton	Wheat
A	10	0
B	8	1
C	5	2
D	2	3
E	0	4

As per the above table, if a country uses all its resources to grow cotton, it can grow a maximum of 10 units, which is shown in combination A. Similarly, if all the resources are used to grow wheat, it can grow a maximum of 4 units of wheat. If the resources are to be used to grow both the commodities, the combinations of B, C or D can be chosen.

This can be graphically represented as follows:

In the above diagram, the combinations A to E, lying on the production possibility curve represent that a country can produce both the commodities with the help of available resources and technology. If the points lying strictly below the production possibility curve, it represents a combination of cotton and wheat, that will be produced when all or some of the resources are either underemployed or are utilized in a wasteful fashion.

4. **Write a short note on a centrally planned economy.**

Ans: A planned economy also called as socialistic economy is that economy where the economic activities are controlled by the central Government. Here, the Government takes decisions about the allocation of resources in accordance with objectives to attain economic and social welfare. Example, Russia, China, North Korea etc.

In a centrally planned economy, the basic economic problems are solved as follows:
In centrally planned economy, the Government takes decisions about the allocation of resources in accordance with the predetermined goals and objectives to attain maximum social welfare. Government decides what to produce, how to produce and what prices are to be fixed.

- Regarding what to produce, the Government may produce those goods and services which are most useful for its society.
- Regarding how to produce, the most suitable technique in production is adopted whether labour intensive or capital intensive in accordance with the situation in the economy.
- Regarding whom to produce, the goods and services are produced to those people who are suffering from hunger though there is a loss.

- It gives importance to the quality of life rather than quantity of production.
- It focuses the resources on rapid economic development.

5. How does the market economy work?

   Ans: A market economy also known as capitalistic economy is that economy in which the economic decisions are undertaken on the basis of market mechanism by the private entrepreneurs. It functions on demand and supply conditions. In USA, Japan, Autralia, UK and other countries we can see Market Economic systems.

   In market economy, private individuals own the factors of production. Here, the profit is the main goal of business. There is least intervention of Government.

   Price mechanism plays a major role in market economy. It is a balancing wheel of the market mechanism. Prices coordinate decisions of the producers and consumers. The price is determined by demand and supply in the market. No individual organization or Government is responsible for the production and distribution or pricing of goods. All depend on market mechanism.

   Regarding basic problems of an economy, the problem of what to produce is solved on the basis of demand and profit. The producers produce those products which bring more income.

   The problem - how the goods are to be produced is determined by the competition among different entrepreneurs. The select least cost combination of technology so that they can get more returns with less cost.

   In market economy, the problem of whom to produce is decided on the basis of purchasing power of consumers. The producers produce commodities to the rich as they can afford to pay more but poorer sections of the society are neglected.

   In Market economy, profits and losses play a predominant role in growth and development of every producer.

******

CHAPTER-2

CONSUMER BEHAVIOUR

I Choose the correct answer

1. Utility is
   a) Objective
   c) Active
   b) Subjective
   d) Passive
   Ans: (b) Subjective

2. When TU is constant MU becomes
   a) Zero   b) Maximum   c) Negative   d) Positive
   Ans: Zero

3. Ordinal utility analysis expresses utility in
   a) Numbers
   c) Ranks
   b) Returns
   d) awards
   Ans: (c) Ranks

4. The shape of an Indifference curve is normally
   a) Convex to the origin
   c) Horizontal
   b) Concave to the origin
   d) Vertical
   Ans: (a) Convex to the origin

5. The consumption bundle that are available to the consumer's income depend on
   a) Colour and shape c) Income and quality
   b) Price and income d) Price and Income
   Ans: (b) Price and income

6. The equation of Budget line is
   a) $Px+p_1x_1=M$
   c) $P_1X_1+P_2X_2=M$
   b) $M=P_0X_0+Px$
   d) $Y=Mx+C$
   Ans: c) $P_1X_1+P_2X_2=M$

7. The demand for these goods increases as income of the consumer increases
   a) Inferior goods
   c) Normal goods
   b) Giffen goods
   d) None of the above
   Ans: (c) Normal goods

8. A vertical demand curve represents
   a) Perfectly elastic
   c) Unitary elastic
   b) Perfectly inelastic
   d) None of the above
   Ans: (b) Perfectly inelastic

9. At the midpoint of the demand curve, the elasticity is
   a) Equal to one   b) Less than one   c) More than one   d) Equal to zero
   Ans: a) Equal to one

10. The value of Elasticity of demand at different points on a linear demand curve lies between
    a) 0 and ∞ b) 1 and 10   c) 10 and 100   d) 5 and 10
        Ans: a) 0 and ∞

II Fill in the blanks

1. Wants satisfying capacity of a commodity is ……………….
   Ans: Utility
2. Two indifference curves never ……………….. each other.
   Ans: Intersect
3. As the consumer's income increases, the demand curve for inferior goods shifts
   towards…………………
   Ans: Leftwards
4. The demand for a good moves in the …………direction of its price.
   Ans: Opposite
5. Method of adding two individual demand curves is called as……………………
   Ans: Horizontal summation

III Match the following

A	B
1. Demand curve 2. Linear Demand curve 3. Unitary elasticity of demand 4. Complementary goods 5. Indifference map	a) D(p)=a-bp b) Downward sloping c) Pen and ink d) A family of Indifference curve e) $|ed|=1$

Ans: 1-b; 2-a; 3-e; 4-c; 5-d;

IV Answer the following questions in a sentence or a word
1. **Give the meaning of marginal utility.**
   Ans: It is the additional utility derived by the consumer by consuming additional unit of a commodity. It represents the utility of single unit.

2. **Suppose, to a consumer- 4 oranges give 28 units of Total utility and   5 oranges give 30 units of total utility, calculate the Marginal Utility?**
   Ans: MU = ΔTU/ΔQ , ΔTU = 30-28 = 2; ΔQ = 5-4=1; then,
   Marginal Utility is MU = 2/1 = 2.
3. **What is budget line?**
   Ans: The line which consists of all bundles of goods cost exactly equal to the money income of consumer is called budget line.
4. **MRS**- Expand
   Ans: Marginal Rate of Substitution.

5. **What do you mean by indifference curve?**
   Ans: Indifference curve shows the different combinations of two goods in which the consumer gets equal level of satisfaction.
6. **What is demand?**
   Ans: The concept 'demand' refers to the quantity of a good or service that a consumer is willing and able to purchase at various prices, during a period of time.
7. **Give the meaning of Demand Function.**
   Ans: The relation between the consumer's optimal choice of the quantity of a good and its price is called the demand function.
8. If the demand curves of two consumers are d_1 (p) =10-p and d_2 (p) =15-p respectively, Find out the Market demand.
   Ans: The Market Demand is obtained by adding the two individual demand equations i.e., d_1 (p) + d_2 (p) = 10-p + 15-p = 25 – 2p, therefore dm=25-2p.

V Answer the following in 4 sentences
1. **Mention two different approaches which explain consumer behavior.**
   Ans:
   a) Cardinal Utility Analysis
   b) Ordinal Utility Analysis
2. **What is monotonic preference?**
   Ans: Monotonic preferences imply that between any two indifference curves, the bundles on the one which lies above are preferred to the bundles on the one which lies below.
   Here the consumer will not remain indifferent between two combinations of commodities when he has an opportunity to have more quantity in one combination than the other.
3. **What are the differences between budget line and budget set?**

Budget Line	Budget Set
• It represents different combinations of two goods which the consumer consumes and whose prices are exactly equal to his income. • It is also known as Price line.	• It is a collection of all bundles available to a consumer at the existing price at his given level of income. • It is also known as opportunity set

4. **List out the factors that determine the optimal choice of a consumer.**
   Ans: The factors which determine the optimal choice of a consumer are :
   a) The price of the goods itself,
   b) The prices of other goods,
   c) The consumer's income and
   d) The tastes and preferences of consumer.

5. **Name the two effects that explain the negative slope of the demand curve.**
   Ans:
   a) Income Effect   b) Substitution Effect

6. **State the law of demand?**
   Ans: The law of demand states that, when price of the commodity increases, demand for it falls and when price of the commodity decreases, demand for it rises, other factors remaining the constant.
   There is inverse or opposite relationship between Price and quantities demanded.

7. **What do you mean by inferior goods? Give example.**
   Ans: The inferior goods are those goods for which the demand falls with the increase in income of consumer. Here demand for such goods move in the opposite direction of the income of the consumer. That is, there will be a negative relationship between income of consumer and demand for inferior goods. Example: Low quality goods.

8. **What do you mean by price elasticity of demand? Write its formula.**
   Ans: Price elasticity of demand is a measure of the responsiveness of the demand for a good to changes in its price.
   It is measured by using the following formula.
   PED = Percentage change in demand for the good
   Percentage change in price of the good
   $PED = \Delta Q/ \Delta P \times P/Q$

9. **Mention any two types of Price Elasticity of Demand.**
   Ans:
   a) Perfectly Elastic Demand, b) Perfectly inelastic Demand,
   b) Unitary Elastic Demand.

10. **Write any two factors that determine Price Elasticity of Demand for a good.**
    Ans: a) Nature of goods   b) Availability of substitutes

11. **Suppose the Price Elasticity of Demand for a good is -0.2, how will the expenditure on the good be affected if there is a 10% increase in the price of the good?**
    Ans:
    Price Elasticity of Demand for a good : -0.2
    Percentage change in price   :   10%
    Now the expenditure on the good will be
    PED = Percentage change in quantity demanded (Qd)
    Percentage change in price
    -0.2 = Percentage change in quantity demanded
    10
    Now the percentage change in Qd = -0.2x10 = -2. (cross multiply). Here the elasticity of demand is less than the change in price i.e., |Ed|<1 and it is less elastic. So the expenditure on the good increases.
    (Total Expenditure = Price x Quantity = 10 x 2 = 20. The total Expenditure will increase by 20%)

VI Answer the following questions in 12 sentences

1. Write the differences between total utility and marginal utility.

Total Utility	Marginal Utility
• It is the aggregate utility derived by the consumer by consuming all the units. • It represents utility of all the units consumed. • It may be symbolically written as $TUn=U_1+U_2+U_3+U_4\ldots\ldots\ldots Un$. • The slope of TU curve increases in the beginning, reaches maximum and later decreases..	• It is the additional utility derived by the consumer by consuming additional unit • It represents the utility of single unit. • It may be written as $MU_n=TU_n-TU_{n-1}$ or $MU = \Delta TU/\Delta Q$ • The slope of MU decreases from the beginning, reaches zero and becomes negative later.

2. Explain the indifference map with the diagram.

Ans: A family of indifference curves is called as indifference map. It refers to a set of indifference curves for two commodities showing different levels of satisfaction. The higher indifference curves show higher level of satisfaction and lower Indifference Curve represent lower satisfaction. A rational consumer always chooses more of that product that offers him a higher level of satisfaction which is represented in higher Indifference Curve. It is also called 'Monotonic preferences'.

The consumer's preferences over all the bundles can be represented by a family of indifference curves as shown in the following diagram.
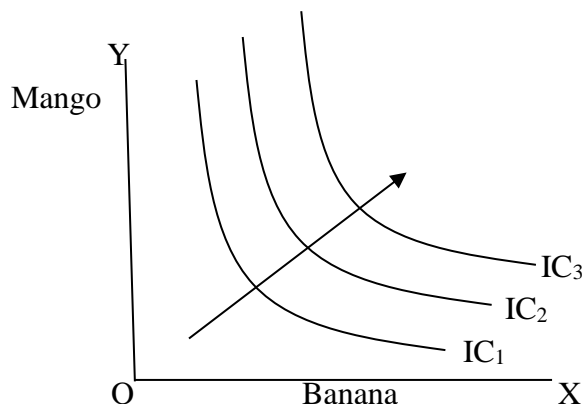
In the above diagram, we see the group of three indifference curves IC_1, IC_2 and IC_3, showing different levels of satisfaction to the consumer. The IC_1 shows lower level of satisfaction and IC_3 represents Higher level of satisfaction and the arrow indicates that the bundles on higher indifference curves are preferred by the consumer to the bundles on lower indifference curves.

3. Briefly explain the budget set with the help of a diagram.

Ans: The budget set is the collection of products that the consumer can buy with his income at the prevailing market prices. The Budget set is also known as opportunity set. It includes all the bundles (all possible combination of two goods) which the consumer can purchase with his given level of income.

The budget equation can be written as follows:

$$P_1X_1 + P_2X_2 \leq M.$$

Consider, for example, a consumer who has Rs.20 and suppose, both the goods are priced at Rs.5 and are available only in integral units. The bundles that this consumer can afford to buy are; (0,0), (0,1), (0,2), (0,3), (0,4), (1,0), (1,1), (1,2), (1,3), (2,0), (2,1), (2,2), (3,0), (3,1) and (4,0).

Among these bundles, (0,4), (1,3), (2,0), (2,2), (3,1) and (4,0) cost exactly Rs.20 and all the other bundles cost less than Rs.20.

If both the goods are perfectly divisible, the consumer's budget set would cosist of all bundles (x_1,x_2) such that x1 and x2 are any numbers greater than or equal to 0 and $P_1X_1 + P_2X_2 \leq M$.

The budget set can be represented in a diagram as follows:

Y

Mangoes

M/P_2

$P_1X_1 + P_2X_2 = M.$

O   Banana M/P_1 X
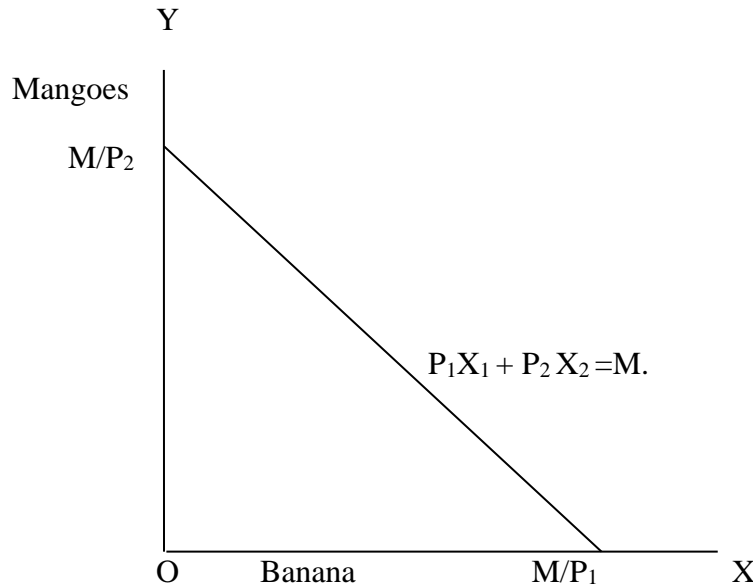
Quantity of bananas is measured along the horizontal axis and quantity of mangoes is measured along the vertical axis. Any point in the diagram represents a bundle of the two goods. The budget set consists of all points on or below the straight line having the equation $P_1X_1 + P_2X_2 = M$.

4. Present the derivation of slope of the budget line.

Ans: The slope of the budget line measures the quantity of change in one product required per unit of change in another product along the budget line.

For example, the amount of change in mangoes required per unit of change in bananas along the budget line is the derivation of slope of the budget line. It can be represented in diagram as follows:

Y

M/P$_2$

Mangoes

Δx$_2$

(x$_1$,x$_2$)

(x$_1$ + Δx$_1$, x$_2$+Δx$_2$)

Δx$_1$

O   Banana   M/P$_1$ X
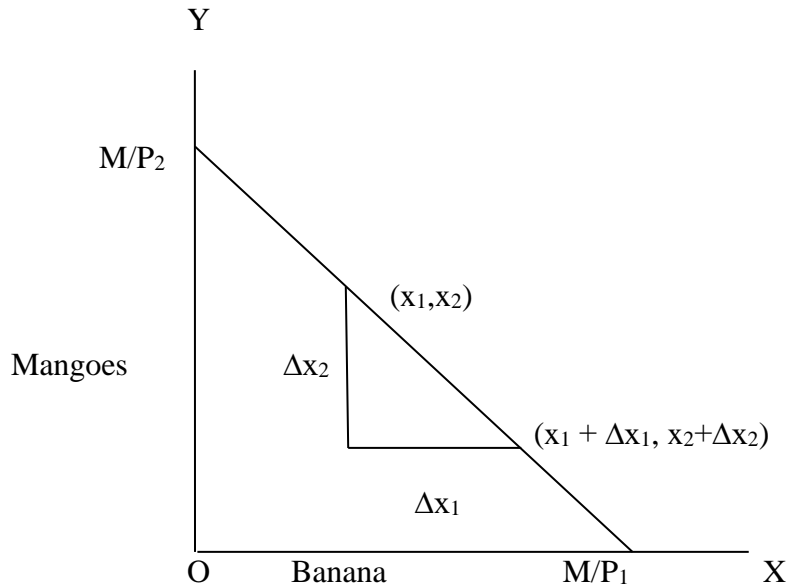
The absolute value of the slope of the budget line measures the rate at which the consumer is able to substitute bananas for mangoes when she spends her entire budget.

Let us consider two points (x$_1$,x$_2$) and (x$_1$ + Δx$_1$, x$_2$+Δx$_2$) on the budget line. It will be as follows:

$$P_1X_1 + P_2 X_2 = M \ldots\ldots\ldots\ldots..(1)$$
$$P_1 (x_1 + \Delta x_1) + P_2(x_2+\Delta x_2) = M$$
$$P_1 x_1 + P_1\Delta x_1 + P_2 x_2 + P_2\Delta x_2 = M \ldots\ldots\ldots(2)$$

Now subtracting (1) from (2), we get

$$P_1\Delta x_1 + P_2\Delta x_2 = 0$$
$$P_2\Delta x_2 = - P_1\Delta x_1 \ldots\ldots\ldots\ldots(3)$$

By rearranging terms in (3) we get

$$\Delta x_2/\Delta x_1 = -P_1/P_2 \ldots\ldots\ldots\ldots\ldots..(4).$$

Therefore, the slope of the budget line is -P$_1$/P$_2$. That means, the Indifference curve is negatively sloped i.e., it slopes downwards. An increase in the amount of bananas along the indifference curve is associated with a decrease in the amount of mangoes.

5. **List out the differences between normal and inferior goods with examples.**
   Ans:

Normal goods	Inferior goods
• These are the goods for which the demand increases with the increase in the income of consumer.	• These are the goods for which the demand decreases with the increase in the income of consumer.
• Example for normal goods are food, cloths, electronic goods, luxury goods etc.	• Example for inferior goods are low quality of goods like unbranded products.
• There is positive relationship between income and demand.	• There is inverse relationship between income and demand.
• Here the demand curve shifts towards right if the income of consumer increases.	• Here the demand curve shifts towards left if the income of consumer increases.

6. **Write the differences between substitutes and complements.**
   Ans:

Substitute goods	Complementary goods
• These are alternative goods available to satisfy our wants.	• These are the goods which are consumed together.
• If the price of a product increases, the demand for its substitute also increases.	• If the price of a product increases, the demand for its complementary good decreases.
• Example for substitute goods are Tea and Coffee, Colgate and Pepsodant, etc.	• Example for complementary goods are Pen and Ink, Shoes and socks etc
• Here the demand curve shifts to the right in case of price rise.	• Here the demand curve shifts to left in case of price rise.
• Price and demand move in same direction.	• Price and demand move in opposite directions.

7. **Suppose an individual buys 15 Apples at the price Rs.5 per Apple and if the price increases to Rs.7 per apple, she reduces her demand to 12 apples. Find out the Price elasticity of demand.**
   Ans:

$$PED = \frac{\text{Percentage change in quantity demanded } (\Delta Q/Q \times 100)}{\text{Percentage change in price } (\Delta P/P \times 100)}$$

Price per Apple	Quantity Demanded
Old Price $P_1 = 5$	Old quantity $Q_1 = 15$
New Price $P_2 = 7$	New Demand $Q_2 = 12$

Percentage change in Quantity Demanded:

$\Delta Q/Q$ x $100 = \dfrac{Q_2 - Q_1}{Q_1}$ X $100 = \dfrac{12 - 15}{15}$ X $100 = -3/15$ x100 = -0.2x100 = -20

Percentage change in Price:

$\Delta P/P$ x $100 = \dfrac{P_2 - P_1}{P_1}$ X $100 = \dfrac{7 - 5}{5}$ X $100 = 2/5$ x100 = 0.4x100 = 40

Now the Price Elasticity of Demand (PED) will be

PED = -20/40 = - 0.5

The demand for apple is not very responsive to its change in price.

8. **Consider a market where there are just two consumers and their demand for the goods at different price levels is given as follows: Calculate the market demand for the good.**

P	D_1	D_2	Market Demand
1	9	24	
2	8	20	
3	7	18	
4	6	16	
5	5	14	
6	4	12	
7	3	10	
8	2	8	

Ans: We get Market Demand by adding D_1 and D_2

P	D_1	D_2	Market Demand
1	9	24	33
2	8	20	28
3	7	18	25
4	6	16	22
5	5	14	19
6	4	12	16
7	3	10	13
8	2	8	10

VII Answer the following questions in 20 sentences
1. **Explain the law of diminishing marginal utility with the help of a table and diagram.**

Introduction: One of the most important propositions of the cardinal utility approach to demand was the Law of Diminishing Marginal Utility. German Economist Gossen was the first to explain it. Therefore, it is called Gossen's First Law. But it was popularized by Prof.Alfred Marshall.

Definition: According to Alfred Marshall, "The additional benefit which a person derives from a given increase of a stock of a thing diminishes, other things being equal, with every increase in the stock that he already has". It means that, if the consumer consumes additional units of a commodity continuously, the marginal utility or additional satisfaction derived from the additional unit decreases.

This law simply tells us that, we obtain less and less utility from the successive units of a commodity as we consume more and more of it.

This law has few assumptions like, size of the commodity should be uniform, consumption should be continuous, no change in price, consumer behaves rationally, no change in tastes and preferences of consumer and the utility is measured in cardinal numbers.

Explanation: The basis of this law is that every want needs to be satisfied only upto a limit. After this limit is reached the intensity of our want becomes zero. It is called complete satisfaction of the want. Therefore, as we consume more and more units of a commodity to satisfy our need, the intensity of our want for it becomes less and less. Therefore, the utility obtained from the consumption of every unit of the commodity is less than that of the units consumed earlier. This can be explained with the help of the following table. TU- Total Utility, MU- Marginal Utility.

Units	TU	MU
1	40	40
2	70	30
3	90	20
4	100	10
5	100	0
6	90	-10

Suppose a man wants to consume apples and is hungry. In this condition, if he gets one apple, he has high utility for it. Let us say that the measurement of this utility is equal to 40 utils. Having eaten the first he will not remain so hungry as before. Therefore, if he consumes the second apple he will have a lesser amount of utility from the second apple even if it was exactly like first one. The utility he got from the second apple equals 30 units, the third and fourth apples give him utility equal to 20 and 10 respectively. Now, if he is given the 5th apple he has no use for it. That means the utility of the 5th apple to the consumer is zero. It is just possible that if he is given the 6th apple for consumption, it may harm him. Here the utility will be

negative i.e., -10. Therefore, we are clear that the additional utility of the successive apples to the consumer goes on diminishing as he consumes more and more of it.

The Law of Diminishing Marginal Utility can be explained with the help of the following diagram.
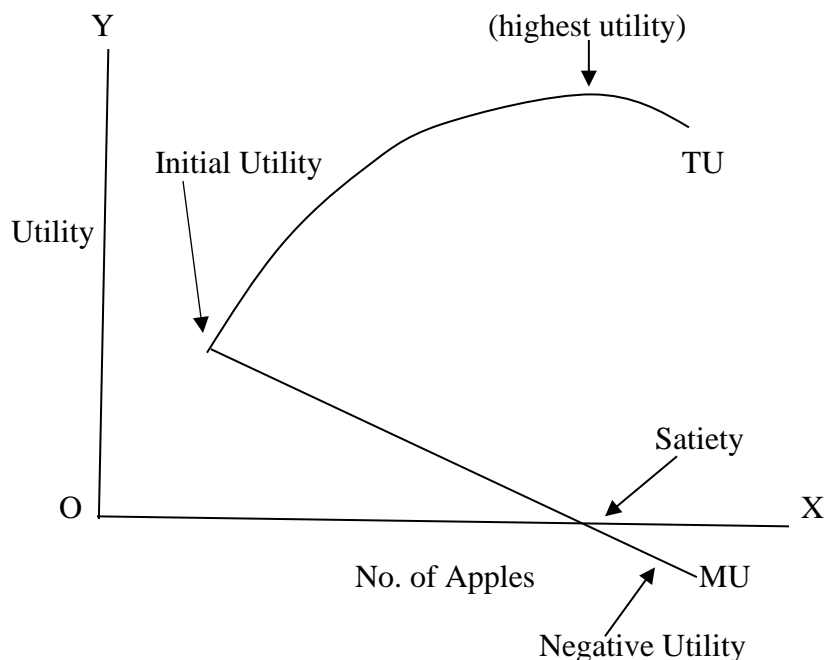

In the diagram the horizontal axis shows the units of apples and the vertical axis measures the MU and TU obtained from the apple units. The total utility Curve will be increasing in the beginning and later falls. The Marginal Utility curve is falling from left down to the right, clearly tells us that the satisfaction derived from the successive consumption of apples is falling.

The Marginal Utility of the first apple is known as initial utility. It is 40 utils. The Marginal utility of the 5th apple is Zero. Therefore, this point is called the satiety point. The Marginal Utility of the 6th apple is -10. So, it is called Negative utility and lies below the X axis. When TU is increasing, MU falls, when TU reaches maximum, MU becomes zero and when TU starts falling, MU becomes negative.

2.   Illustrate the features of Indifference curves with the help of diagrams.
Ans: The main features of Indifference curves are as follows:
a) **Indifference curve slopes downwards from left to right:** An indifference curve slopes downwards from left to right because, the consumer, in order to have more of units of one commodity, he has to forego some units of other commodity. This can be explained with the help of diagram.
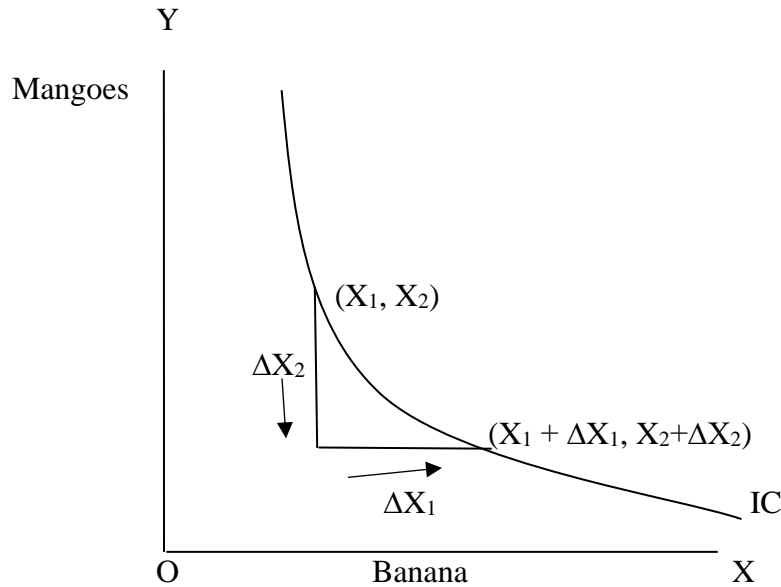
Thus, according to above diagram, as long as the consumer is on the same indifference curve, an increase in bananas (ΔX_1) must be compensated by a fall in quantity of mangoes (ΔX_2). That means, an increase in the amount of bananas along the indifference curve is always associated with a decrease in the amount of mangoes.

b) **Higher indifference curve gives greater level of utility:** As long as marginal utility of a commodity is positive, a consumer always prefers more of that commodity to increase his level of satisfaction. This can be explained with the help of table and a diagram:

Combination	Banana	Mango
A	1	10
B	2	10
C	3	10
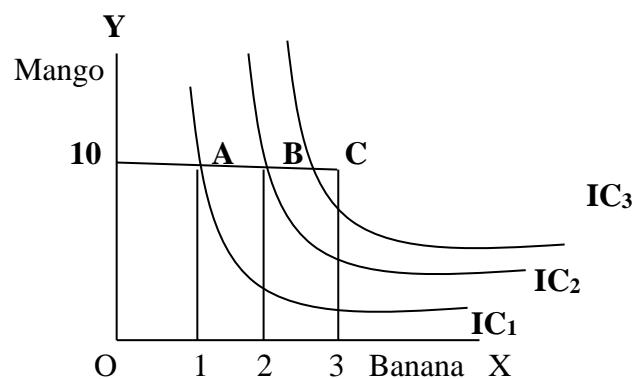
Let us consider the different combinations of two goods- bananas and mangoes- A, B and C in the above table and diagram. All the three combinations consist of same quantity of mangoes but different quantities of bananas. As combination B has more bananas than A, B will provide the consumer higher level of satisfaction than A. Therefore, B will lie on higher indifference curve. Similarly, C has more bananas than B and therefore C will provide higher level of satisfaction than B and it also lies on higher indifference curve than B.

Thus higher indifference curves give greater level of utility.

c) **Two indifference curves never intersect each other:** The two indifference curves never intersect with each other. This is because, if the two indifference curves intersect each other, they will give conflicting results. This can be explained with the help of diagram.
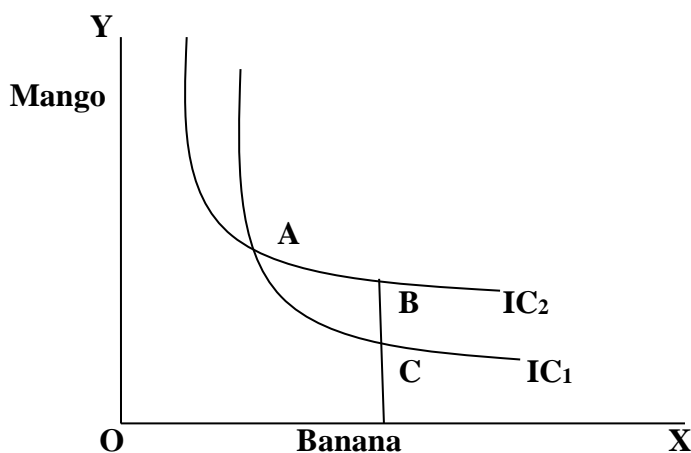
In the above diagram the two indifference curves have intersected with each other at point A. As points A and B lie on IC_2, utilities derived from A and B are same. Similarly, as points A and C lie on the same indifference curve IC_1, the utilities are same. From this, it follows that utility from points B and C are same. But this is clearly an absurd result as on B, the consumer gets a greater number of mangoes with the same quantity of bananas. So the consumer is better off at point B than at Point C. Thus, it is clear that intersecting indifference curves will lead to conflicting results. Thus, two indifference curves cannot intersect each other.

3. Elucidate the changes in Budget set with the help of diagrams.

The availability of combination of goods to the consumer depends on the prices of the two goods and the income of the consumer. If the consumer's income changes, the set of available bundles is also likely to change. When the price of either of the goods change, the availability of goods to the consumer also gets changed.

I Change in the income of consumer:

Suppose the consumer's income changes from M to M′ but the prices of the two goods remain unchanged. With the new income, the consumer can afford to buy all bundles (X_1, X_2) such that $P1\ X_1 + P_2\ X_2 \le M'$.

With the change in income, the new equation of the budget line is $P_1\ X_1 + P_2\ X_2 = M'$. The slope of the new budget line will be same as the slope of the budget line prior to the change in the consumer's income. However, the vertical intercept will be changed after the change in income. If the income increases, i.e., M' > M the consumer can buy more of the goods at the prevailing market prices and there will be outward shift in Budget line. Similarly, if the income goes down, i.e. if M' < M, both intercepts decrease, and hence, there is a parallel inward shift of the budget line. This can be represented in the following diagrams:
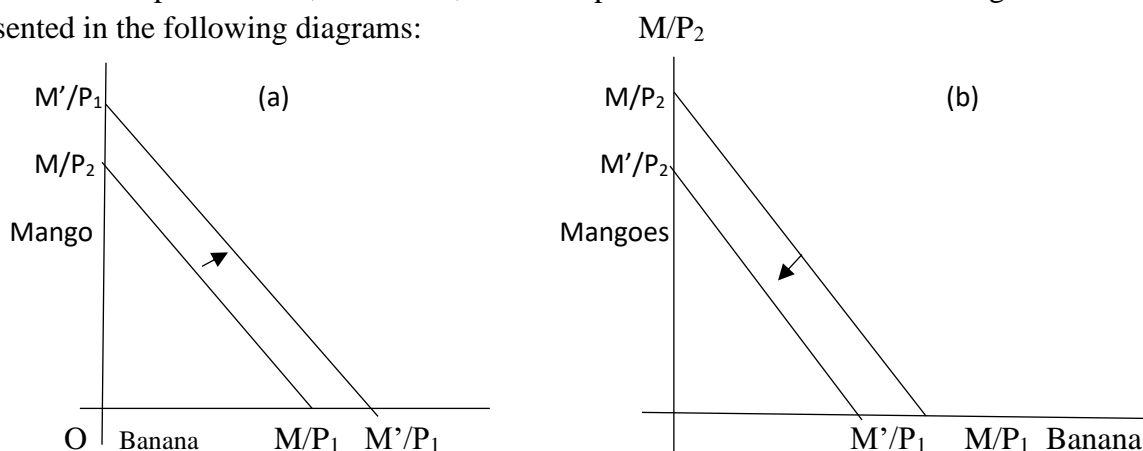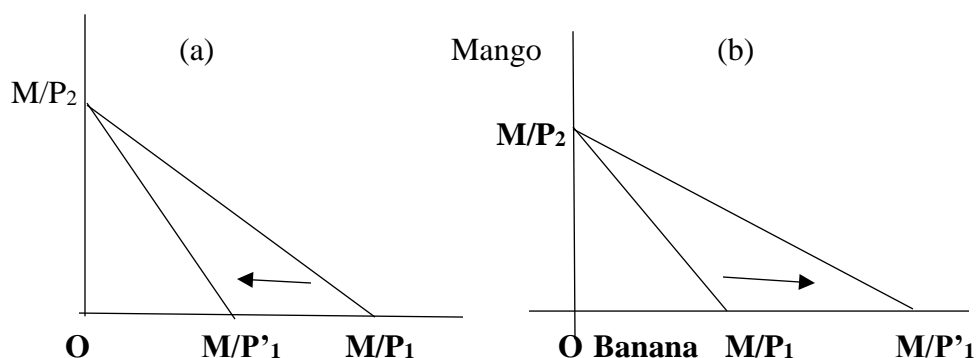

The above diagrams show the changes in the set of available bundles of goods resulting from changes in the consumer's income. An increase in income causes a parallel outward shift of the budget line as in diagram (a) and a decrease in income causes a parallel inward shift of the budget line as in diagram (b).

II Change in the price of goods:

If the price of bananas changes from P_1 to P'_1 but the price of mangoes and the consumer's income remain same, at the new price of bananas, the consumer can afford to buy all bundles (X_1, X_2) such that $P'_1\ X_1 + P_2\ X_2 \le M$. The equation of the budget line is $P'_1\ X_1 + P_2\ X_2 = M$

Suppose, the price of bananas decreases, i.e $P'_1 < P_1$, the absolute value of the slope of the budget line decreases and hence, the budget line becomes flatter. The following diagrams show the change in the budget set when the price of only one commodity changes while the price of the other commodity as well as income of the consumer are constant

The above diagrams show the changes in the set of available bundles of goods resulting from changes in the price of bananas. An increase in the price of bananas makes the budget line steeper as in diagram (a) and a decrease in the price of bananas makes the budget line flatter as in diagram (b).

**4. Explain the optimal choice of consumer with the help of diagram.**

It is assumed that the consumer chooses her consumption bundle on the basis of her taste and preferences over the bundles in the budget set. It is generally assumed that the consumer has well defined preferences over the set of all possible bundles. She can compare any two bundles. In other words, between any two bundles, she either prefers one to the other or she is indifferent between the two goods.

It is further assumed that the consumer is a rational individual. A rational individual clearly knows what is good or what is bad for her and in any given situation, she always tries to achieve the best for herself. From the bundles which are available to her, a rational consumer always chooses the one which gives her maximum satisfaction. The consumer always tries to move to a point on the highest possible indifference curve given her budget set.

Thus, the optimum point would be located on the budget line. A point below the budget line cannot be the optimum. Compared to a point below the budget line, there is always some point on the budget line which contains more of at least one of the goods and no less of the other. Thus, the consumer's preferences are monotonic.

The point at which the budget line is tangent to one of the indifference curves would be the optimum choice of consumer. This is because, the budget line other than the point at which it touches the indifference curves lies on a lower indifference curve is considered as inferior. So such a point cannot be the consumer's optimum. The optimum bundle is located on the budget line at the point where the budget line is tangent to an indifference curve.

This can be explained with the help of the following diagram.
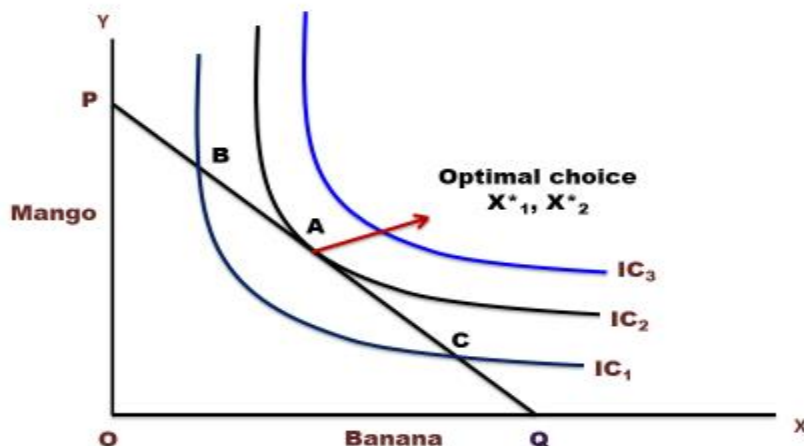
In the above diagram, PQ is budget line, IC_1, IC_2 and IC_3 are indifference curves showing different levels of satisfaction. Banana is measured on horizontal axis and Mango is measured on Vertical axis.

The above diagram illustrates the consumer's optimal choice also known as consumer's equilibrium. At (X_1, X_2), the budget line PQ is tangent to the indifference curve IC_2. The indifference curve just touching the budget line is the highest possible indifference curve given the consumer's budget set. Bundles on the indifference curve above IC_2 are not affordable. Points on the indifference curve IC_1 are certainly inferior to the points on the IC_2. Therefore, (X_1, X_2) is the consumer's optimum bundle of choice.

Therefore, the Optimal choice of consumer, also known as consumer's equilibrium is reached at that point where Budget is equal to the indifference curve and Budget line is tangent to the Indifference curve.

5. **Demonstrate the derivation of demand curve from Indifference curve and budget constraints.**

Ans: The consumer is indifferent on the different bundles because each point of the bundles gives the consumer equal utility. Such a curve joining all points representing bundles among which the consumer is indifferent is called an indifference curve. An indifference curve joins all points representing bundles which are considered indifferent by the consumer.

The graphical representation of the demand function is called the demand curve. The relation between the consumer's demand for a good and the price of the good is likely to be negative in general. Therefore the demand curve slopes downwards from left to right. The derivation of demand curve from Indifference curve and budget constraints can be explained with the help of following diagrams.

Let us consider an individual consuming bananas (X_1) and mangoes (X_2), whose income is M and market prices of X_1 and X_2 are P'1 and P '2 respectively. The diagram(a) depicts her consumption

equilibrium at point C, where she buys X'_1 and X'_2 quantities of bananas and mangoes respectively. In diagram (b), we plot P'_1 against X'_1 which is the first point on the demand curve for X_1.
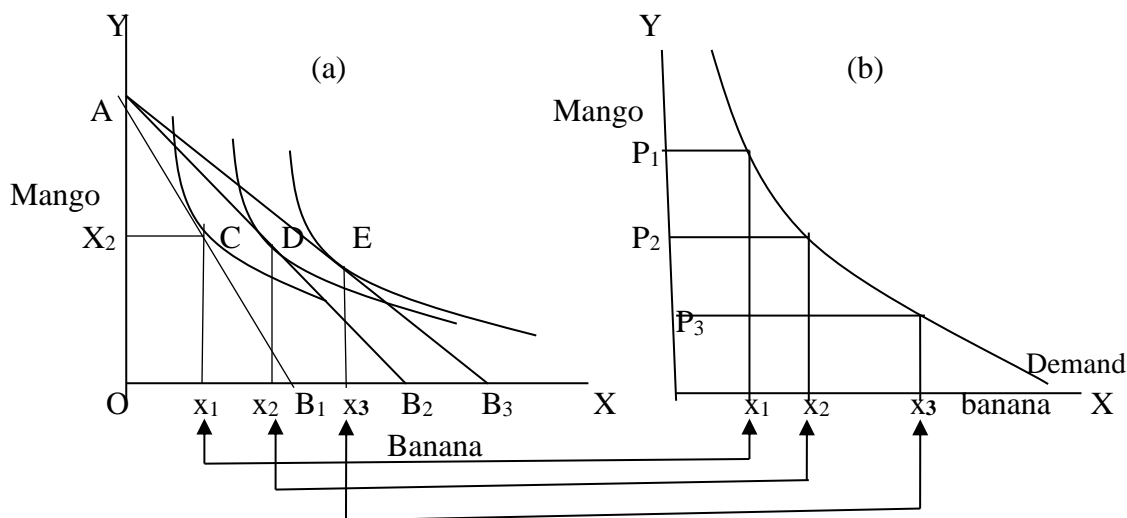

Suppose the price of X_1 (Banana) falls from P_1 to P_2, keeping price of X_2 (Mango) and income of consumer constant, the budget set in diagram (a) expands and new consumption equilibrium is on higher indifference curve at point D where she buys more of bananas. Thus, demand for bananas increases as its price decreases. We can plot P_2 against X_2 in diagram (b) to get the second point on the demand curve for X_2. Similarly, the price of bananas may fall further to P_3, resulting in further increase in consumption of bananas to X_3 and the consumer moves from point D to E on an higher indifference curve in diagram (a). So, P_3 is plotted against X_3 which gives us third point on the demand curve.

Therefore, we observe that a decrease in price of bananas results in an increase in quantity of bananas purchased by a consumer who maximizes his utility. Thus, the demand curve is negatively sloped.

6. **Explain the movement along the demand curve and shift in demand curve with the help of two diagrams.**

It is important to note that the amount of a good that the consumer chooses depends on the price of the good, the prices of other goods, income of the consumer and her tastes and preferences. The demand function is a relation between the amount of the good and its price when other things remain constant. **Movements along the Demand Curve:** The demand curve is a graphical representation of the demand function. At higher prices, the demand is less and at lower prices, the demand is more. Thus, any change in the price leads to movements along the demand curve. This can be shown in diagram as follows:
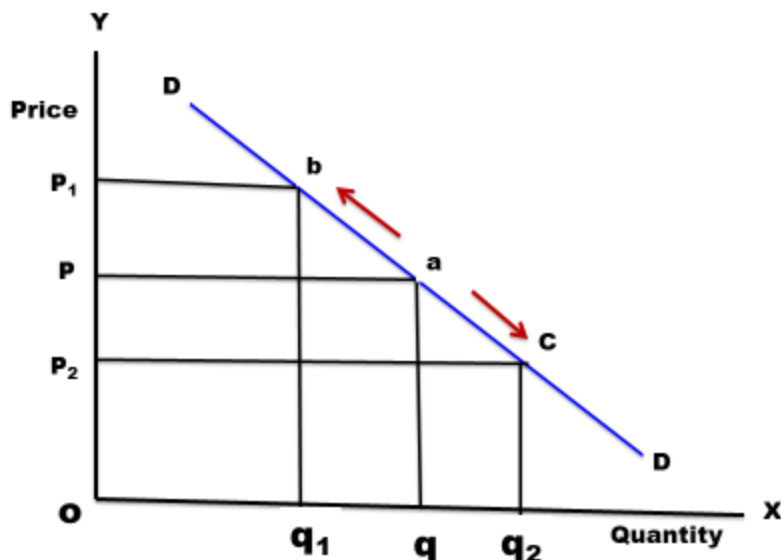
On the other hand, changes in any of the other things like, income of consumer, price of related goods (substitutes and complementary goods) and tastes and preferences, lead to a shift in the demand curve. It happens when there is change in income, price of other goods and the preferences of consumer change.

- Given the price of other goods and preferences of consumer, if income increases, there will be shift in demand curve.
- For normal goods- shifts right and for inferior goods shift leftwards.
- Given the consumer's income and his preferences, if the price of a related goods changes, there will be shift in demand curve.
- If there is increase in price of a substitute good, the demand curve shift to the right.
- If there is increase in price of complementary good, the demand curve shifts leftward

The following diagram depicts the shift in the demand curve towards right
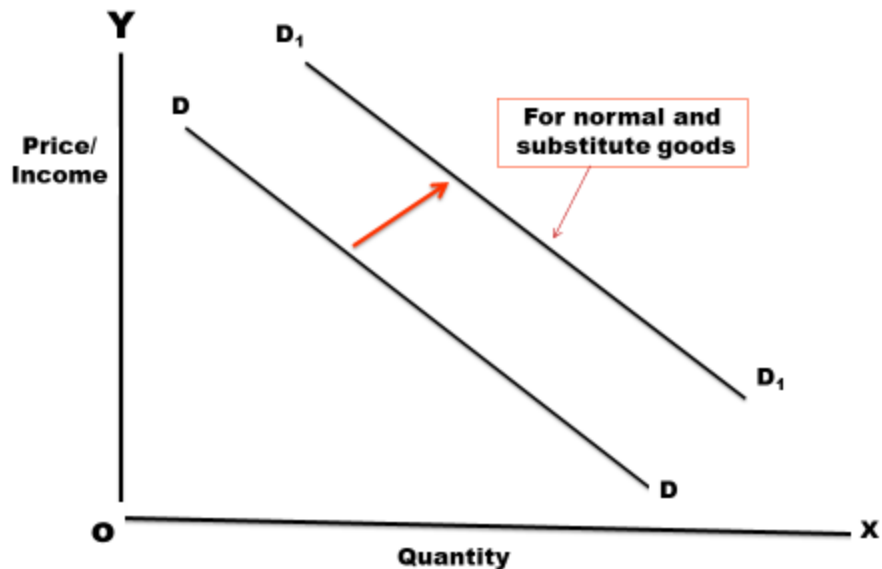
In the above diagram DD is the original Demand Curve and D_1D_1 is the new Demand curve. If the income of consumer increases the demand for normal goods increases and the demand curve shifts towards right. Similarly, a rise in the price of a product, the demand for its substitute increases. This leads to shift in demand curve towards right., .

7. Present the market demand with the help of diagrams.

Ans: The market demand for a good at a particular price is the total demand for all consumers taken together. The market demand for a good can be derived from the individual demand curves. Suppose there are two consumers in the market. The market demand curve can be explained in with the help of following diagrams:
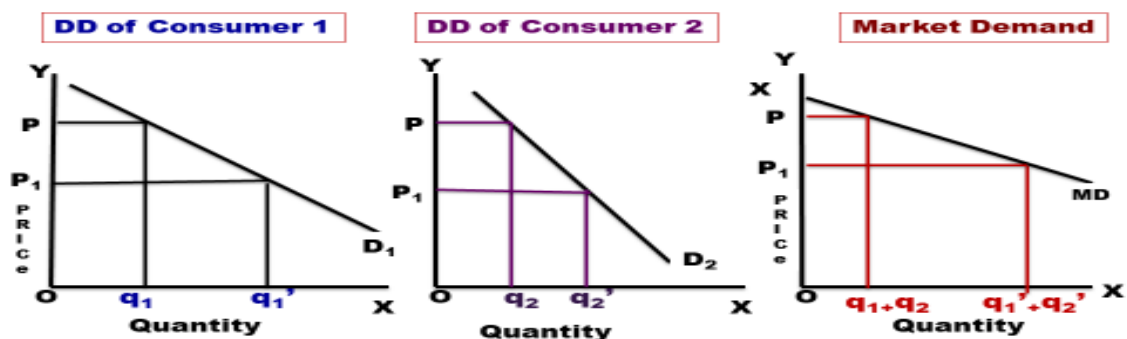
In the above diagrams, D_1 is demand curve of consumer 1 and D_2 is the demand curve of Consumer 2. Suppose at price P the demand of consumer 1 is 'q$_1$' and that of consumer 2 is 'q$_2$' then the market demand of the good at P is q$_1$+q$_2$.

Suppose at price P$_1$, the demand of consumer is 1 is q$_1$' and that of consumer 2 is q$_2$'. Then the market demand at P$_1$ will be q$_1$'+q$_2$'.So the market demand curve can be derived as a horizontal summation of the individual demand curves.

Thus, the market demand for the good at each price can be derived by adding up the demands of the two consumers at that price. If there are more than two consumers in the market for a good, the market demand can be derived similarly.

8. Analyse the points of elasticity along the linear demand curve.

Ans: Price elasticity of demand is a measure of the responsiveness of the demand for a good to changes in its price. Price elasticity of demand for a good is defined as the percentage change in demand for the good divided by the percentage change in its price. Price elasticity of demand for a good is measured with the help of following formula

$$PED = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}} = \frac{\Delta Q/Q \ x \ 100}{\Delta P/P \ x \ 100}$$

$$PED = \frac{\Delta Q}{\Delta P} \ x \ \frac{P}{Q}$$

Here, ΔQ stands for change in quantity, ΔP is change in price, 'p' is initial price and 'Q' is initial quantity.

Elasticity along a Linear Demand curve:

The linear demand curve is q = a - bp. Note that at any point on the demand curve, the change in demand per unit change in the price $\frac{\Delta q}{\Delta P} = -b$

Substituting the value of $\Delta q/\Delta p$ we obtain, ED = – bp/q putting the value of q, ED = – bp/ a – bp. So, it is clear that the elasticity of demand is different at different points on a linear demand.

The price elasticity of demand is different at different points on the linear demand curve which is shown in the following diagram:
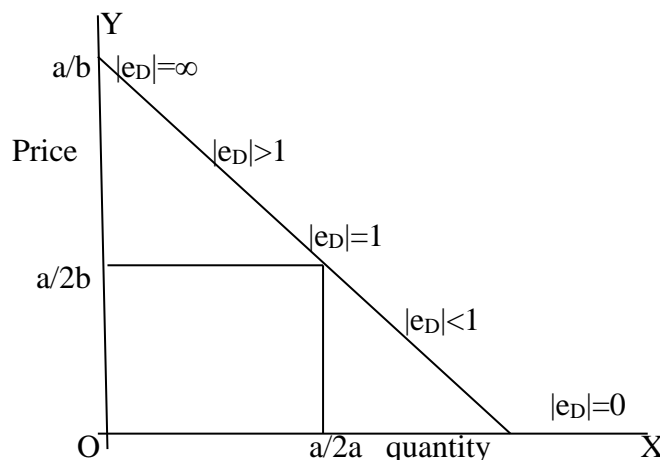
At p = 0, the elasticity is 0, at q = 0, elasticity is ∞. At p = a/2 b , the elasticity is 1, at any price greater than 0 and less than a/2b , elasticity is less than 1, and at any price greater than a/2b , elasticity is greater than 1.

In the above diagram, $|e_D|=∞$ depicts price elasticity is perfectly elastic, $|e_D| < 1$ depicts the demand is less responsive to a price change; $|e_D|=1$ depicts that the change in demand is equal to a change in price, $|e_D|>1$ shows that the demand is more responsive to a price change and $|e_D|=0$ depicts that there is no change in quantity demanded due to a change in price. So, price elasticity of demand is different at different points on the linear demand curve.

VIII Assignment and project oriented question

1. A consumer wants to consume two goods the price of X_1 is Rs10 and the price of X_2 is Rs.20. the consumer's income is Rs.100. Answer the following:

    a) How *many* X_1 goods *a consumer* can consume if *the entire* income *is spent on that* good?
    b) How *many* X_2 goods *a consumer* can consume if *the entire* income *is spent on that* good?
    c) Is the slope of budget line down ward or upward?
    d) Are the bundles on the budget line equal to the consumer income or not?
    e) If the consumer wants to have more of X_1, good X_2 good *has to be given up*. Is it true?

    Ans: (a) 10 units of X_1 good (100/10)

    (b) 5 units of X_2 good (100/20)

    (c) Slope of budget line is downward.

    (d) Yes, the bundles on the budget line are equal to the consumer's income.

    (e) True. If the consumer wants to have more of X_1 he has to give up X_2.

******

CHAPTER 3

PRODUCTION AND COST

I Choose the correct answer

1. The functional relationship between inputs and output is called as
   a) Consumption function   b) Production function   c) Savings function   d) Investment function
   Ans: b) Production function

2. The formula of production function is
   a) $q=f(L,K)$ c) $Y=f(x)$
   b) $q=d(p)$ d) $q=a-bp$.
   Ans: (a) $q=f(L,K)$

3. In the short run, a firm
   a) Can change all the inputs   c) Cannot vary any inputs
   b) Can change any one input   d) All inputs remain constant
   Ans: (b) Can change any one input

4. The change in output per unit of the change in the input is called
   a) Marginal product   c) Total product
   b) Average Product   d) Maximum Product
   Ans: (a) Marginal product

5. The long run production analysis is explained by
   a) Law of Demand   b) Law of Supply
    c) Law of Returns to scale   d) The law of variable proportions
   Ans: Law of Returns to Scale

6. Cobb-Douglas production function is
   a) $q=(x, x)$ c) $q= (x_1^{\alpha}, x_2^{\beta})$
   b) $q=(x_1, x_2)$ d) $q=(0)$
   Ans: c) $q= (x_1^{\alpha}, x_2^{\beta})$

7. Find the Total Cost where TFC is 100 and TVC is 125
   a) 25 b) 125 c) 175 d) 225
   Ans: d) 225 (100+125)

8. The shape of the Average Fixed Cost curve is
   a) Rectangular hyperbola b) 'U' shaped c) Inversely 'U' shaped d) Horizontal
   Ans: a) Rectangular hyperbola

II Fill the blanks

1. ……………is the set of all possible combinations of the two inputs that yield the same maximum possible level of output.
   Ans: Isoquant

2. In the long run, all inputs are ……………
   Ans: Variable

3. …………..is defined as the output per unit of variable input.

   Ans: Average Product

4. Marginal product and average product curves are …………in shape.

   Ans: Inverse U

5. SMC curve cuts the AVC curve at the …………point of AVC curve from below.

   Ans: Minimum

III Match the following

A	B
1. CRS	a) $\Delta TC/\Delta Q$
2. SAC	b) $TP_L - TP_{L-1}$
3. MP$_L$	c) Short run Average cost
4. TFC+TVC=	d) Constant returns to scale
5. SMC	e) TC

Ans: 1 - (d); 2 - (c); 3 - (b); 4 – (e); 5 – (a)

IV Answer the following questions in a sentence or word

1. **What do you meant by total product?**

   Ans: Total product is the relationship between a variable input and output when all other inputs are held constant.

2. **State the law that explains the short run production analysis.**

   Ans: Law of variable proportions.

3. **Name the returns to scale when the output increases by more than 10%, for a 10% increase in the inputs?**

   Ans: Increasing Returns to scale

4. **Write the meaning of cost function of the firm.**

   Ans: The cost function of the firm refers to the least cost of producing each level of output, given prices of factors of production and technology.

5. **What is total fixed cost?**

   Ans: The cost that a firm incurs to employ fixed factors of production (inputs) is called as Total Fixed Cost.

6. **Write the formula of Average Variable Cost.**

   AVC = TVC/Q, where TVC – Total variable cost, Q – Quantity of output produced.

V Answer the following questions in four sentences.

1. **Give the meaning of the concepts of short run and long run.**

   Ans: The concepts of short run and long run are defined as a period simply by looking at whether all the inputs can be varied or not. It is not advisable to define short run and long run in terms of days, months or years.

   In the short run, at least one of the factor – labour or capital cannot be varied and therefore, remains fixed. In order to vary the output level, the firm can vary only the other factor.

The factor that remains fixed is called the fixed factor and the other factor which the firm can vary is called the variable factor.

In the long run, all factors of production can be varied. A firm in order to produce different levels of output in the long run may vary both the inputs simultaneously. So, in the long there is no fixed factor.

2. **Mention the types of returns to scale.**

   Ans: The types of returns to scale are

   (a) Constant Returns to Scale b) Increasing Returns to Scale   c) Decreasing Returns to Scale

3. **Name any two short run costs.**

   Ans: The short run costs are: Total Fixed cost, Total Variable cost, Average Fixed Cost, Average Variable Cost,

4. **What are long costs?**

   Ans: There are two long run costs namely, (a) Long run Average Cost (b) Long run Marginal Cost.

5. **What is Long Run Average Cost? Write its formula.**

   The long run Average Cost is the total cost per unit of output. Its formula is TC/q

VI Answer the following questions in 12 sentences.

1. **Explain isoquant with the help of a diagram.**

   Ans: An isoquant is the set of all possible combinations of the two inputs that yield the same maximum possible level of output. Each isoquant represents a particular level of output and is labelled with that amount of output. It is just an alternative way of representing the production function.

   The concept of isoquant can be explained with the help of following diagram:
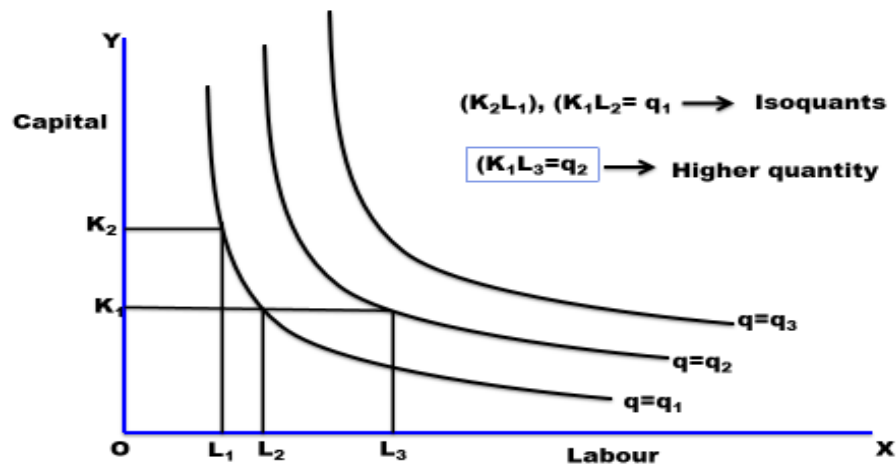
The above diagram generalizes the concept of isoquant. In the above diagram, labour is measured in OX axis and Capital is measured in OY axis. There are 3 isoquants for the three output levels viz., q=q_1, q=q_2 and q=q_3. Two input combinations (L_1, K_2) and (L_2, K_1) give us the same level of output q_1. If we fix capital at K1 and increase labour to L3, output increases and we reach a higher isoquant q=q_2. When Marginal products are positive, with greater amount of one input, the same level of output can be produced only using lesser amount of the other. Therefore, isoquants curves slope downwards from left to right (negatively sloped).

2. **Explain Total Product, Marginal Product and Average Product with the examples.**
   Ans: The TP – total product, MP- marginal product and AP – Average Product
   Total Product:
   Total product is the relationship between a variable input and output when all other inputs are held constant. Suppose we vary a single input and keep all other inputs constant. Then for different levels of that input, we get different levels of output. This relationship between the variable input and output, keeping all other inputs constant, is often referred to as Total Product of the variable input.
   Average product
   Average Product is defined as the output per unit of variable input. We calculate it as $AP_L=TP_L/L$, where AP_L is the Average Product of Labour, TP_L is the Total product of labour and L is the amount of labour input used.
   Marginal Product
   Marginal Product of an input is defined as the change in output per unit of change in the input when all other inputs are held constant. It is the additional unit of output per additional unit of variable input. It is calculated by dividing the change in output by change in input labour.
   $MP_L = \Delta TP_L/\Delta L$.
   The concepts of TP, AP and MP can be explained with the help of following table:

Labour	TP	MP_L	AP_L
0	0	-	-
1	10	10	10
2	24	14	12
3	40	16	13.33
4	50	10	12.5
5	56	6	11.2
6	57	1	9.5

The above table shows the total product of labour, Marginal product of labour and Average product of labour. The total product is also sometimes called as total return to or total physical product of the variable input labour. The third column gives us a numerical example of Marginal product of labour. The values in this column are obtained by dividing change in TP by

change in Labour. The last column gives us a numerical example of average product of labour. The values in their column are obtained by dividing TP by Labour.

3. **The following table gives the Total Product (TP_L) schedule of labour. Find the corresponding Average product (AP_L) and marginal product (MP_L) schedules.**

L	0	1	2	3	4	5
TP_L	0	15	35	50	60	68

Ans: Calculation of Average Product (AP_L) and Marginal Product (MP_L). AP_L is obtained by dividing TP_L by Labour (L) and MP_L is obtained from TP_L with the help of formula $TC_n - TC_{n-1}$

L	TP_L	AP_L	MP_L
0	0	0	-
1	15	15	15
2	35	17.5	20
3	50	16.66	15
4	60	15	10
5	68	13.6	8

4. **Write about returns to scale.**

Ans: The returns to scale can happen only in the long run as both the factors (Labour and Capital) can be changed. One special case in the long run occurs when both factors are increased by the same proportion or factors are scaled up.

- **Constant returns to scale:** When a proportional increase in all inputs results in an increase in output by the same proportion, the production function is said display constant returns to scale.
- **Increasing returns to scale:** When proportional increase in all inputs results in an increase in output by a larger proportion, the production function is said to display increasing returns to scale.
- **Decreasing returns to scale:** When a proportional increase in all inputs results in an increase in output by a smaller proportion, the production function is said to display decreasing returns to scale.

  For example, if in a production process, all inputs get doubled. As a result, if the output gets doubled, the production function exhibits constant returns to scale, if output is less than doubled, exhibits decreasing returns to scale and if is more than doubled, exhibits increasing returns to scale.

5. **The following table gives the TVC schedule of a firm. TFC is Rs.10. Find out AFC and AVC.**

Q	0	1	2	3	4	5
TVC	0	15	26	33	40	55

Ans: AFC is obtained by dividing TFC by Quantity and AVC by dividing TVC from Quantity.

Q	TVC	TFC	AFC	AVC
0	0	10	0	0
1	15	10	10	15
2	26	10	5	14
3	22	10	3.33	7.33
4	40	10	2.5	4
5	55	10	2	11

6. **Draw Short run Average Cost (SAC) and Short run Marginal cost (SMC) curves by using the following data in a diagram.**

Q	1	2	3	4	5	6	7
SAC	60	45	25	15	20	30	50
SMC	50	30	20	15	25	45	60

SAC and SMC Curves
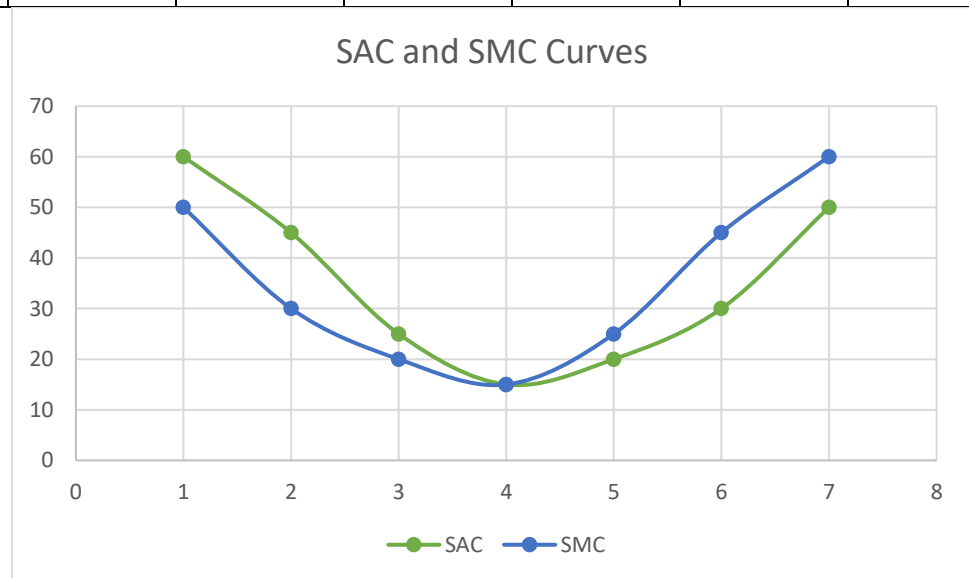
7. Explain the shapes of various long run cost curves.

Ans: In the long run, all inputs are variable. There are no fixed costs, The total cost and the total variable cost coincide in the long run. There are two types of long run costs. They are as follows:

a) **Long Run Average Cost (LRAC)**: The long run average cost is the cost per unit of output produced. It is obtained by dividing the Total Cost by the output produced. It can be calculated as follows:

LRAC = TC/q

Where TC is Total cost and 'q' is quantity of output produced.

In a typical firm the Increasing Returns to scale is observed at the initial level of production. This is then followed by the Constant Returns to Scale and then by the Diminishing Returns to Scale. Accordingly, the LRAC curve is 'U' shaped curve. Its downward sloping part corresponds to Increasing Returns to Scale and upward rising part corresponds to Decreasing Returns to scale. At the minimum point of the LRAC curve, Constant returns to scale is observed.

b) **Long Run Marginal Cost:** The long run marginal cost is the change in total cost per unit of change in output. When output changes in discrete units, then, if we increase production from q_1-1 to q_1 units of output, the marginal cost of producing q_1^{th} unit will be measured as follows:

LRMC = (TC at q1 units) – (TC at q_1-1 units) or LRMC = TC_n – TC_{n-1}

For the first unit of output, both LRMC and LRAC are the same. Then, as output increases, LRAC initially falls, and then, after a certain point, it rises. As long as average cost is falling, marginal cost must be less than the average cost. When the average cost is rising, marginal cost must be greater than the average cost. LRMC curve is there a 'U' shaped curve. It cuts the LRAC curve from below at the minimum point of LRAC. The following diagram shows the shapes of the long run marginal and the long run average cost curves for a typical firm.
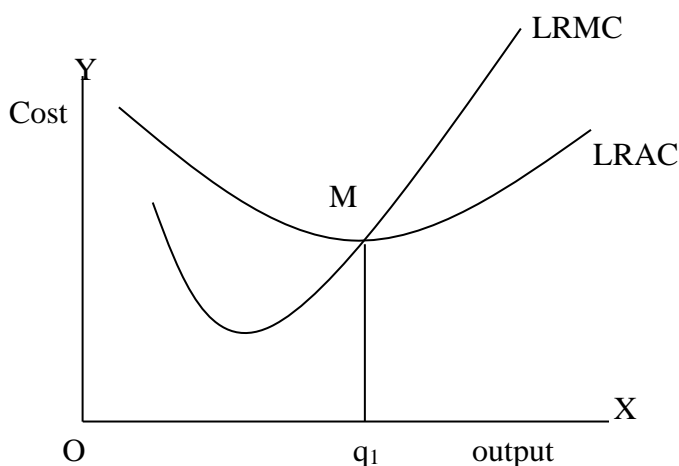
In the above diagram, LRAC reaches its minimum at q_1. To the left of q_1, LRAC is falling and LRMC is less than the LRAC curve. To the right of q_1, LRAC is rising and LRMC is higher than LRAC.

VII Answer the following questions in 20 sentences.

1. **Explain the law of variable proportions with the help of a diagram.**

   Ans: The law of variable proportions say that the Marginal product of a factor input initially rises with the employment level. But after reaching a certain level of employment, it starts falling.

   The law of variable proportions can be explained with the help of the following table and diagram.

Labour	TP	MP_L	AP_L
0	0	-	-
1	10	10	10
2	24	14	12
3	40	16	13.33
4	50	10	12.5
5	56	6	11.2
6	57	1	9.5

   The above table shows the total product of labour, Marginal product of labour and Average product of labour. The total product is also sometimes called as total return to or total physical product of the variable input labour. The third column gives us a numerical example of Marginal product of labour. The values in this column are obtained by dividing change in TP by change in Labour. The last column gives us a numerical example of average product of labour. The values in their column are obtained by dividing TP by Labour.

   If we plot the above table in graph, placing labor on X axis and output on Y axis, we get the curves shown in the diagram below:
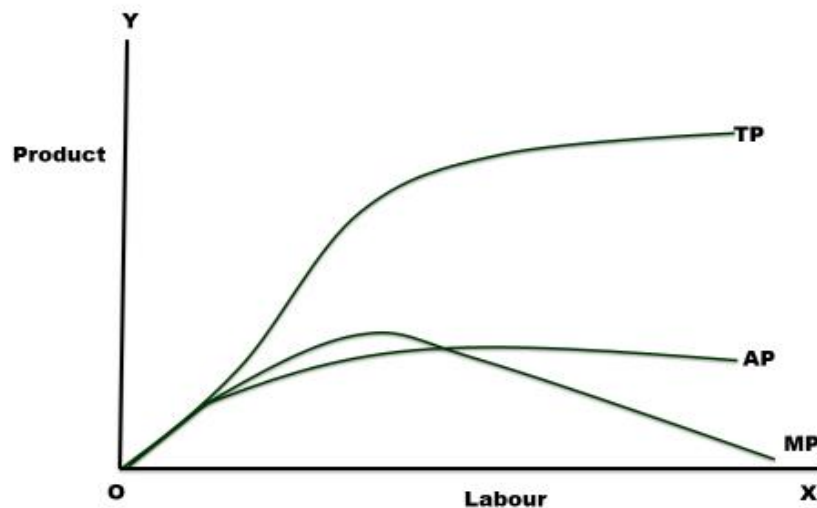
The TP increases as labour input increases. But the rate at which it increases is not constant. An increase in labour from 1 to 2 increases TP by 10 units. An increase in labour from 2 to 3 increases TP by 12 units. The rate at which TP increases is shown by the MP. The MP first increases (till 3 units of labour) and then begins to fall. This tendency of the MP to first increase and then fall is called the law of variable proportions.

The law of variable proportions is also known as law of diminishing marginal product. It occurs because of change in factor proportions. Factor proportions represent the ratio in which the two inputs are combined to produce output. As we hold one factor fixed and keep the other increasing, the factor proportions change. Initially, as we increase the amount of the variable input, the factor proportions become more and more suitable for the production and marginal product increases. But after a certain level of employment, the production process becomes too crowded with the variable input.
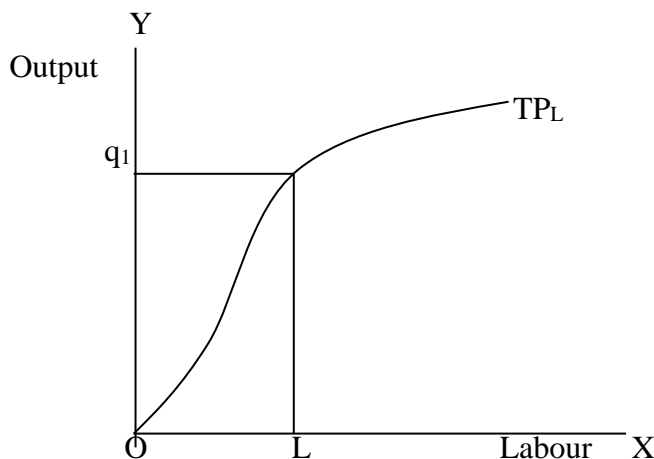
In the above diagram, TP is Total Product curve which is increasing in different proportions due the change in labour input. The AP and MP curves are increasing in the beginning and decreasing later. But the change in MP is greater than AP.

2. **Explain the shapes of Total Product (TP), Average Product (AP) and Marginal Product (MP) curves.**
Ans: Total Product(TP):
Total product is the relationship between a variable input and output when all other inputs are held constant. Suppose we vary a single input and keep all other inputs constant. Then for different levels of that input, we get different levels of output. This relationship between the variable input and output, keeping all other inputs constant, is often referred to as Total Product of the variable input.

The total product curve in the input-output plane is a positively sloped curve as follows:

The above diagram shows the total product curve for labour. When all other inputs are held constant, it shows the different output levels obtainable from different units of labour.

Labour is measured in OX axis and output is measured in OY axis. With L units of labour, the firm can at most produce q_1 units of output.

Average product (AP) and Marginal Product (MP):

Average Product is defined as the output per unit of variable input. We calculate it as $AP_L = TP_L/L$, where AP_L is the Average Product of Labour, TP_L is the Total product of labour and L is the amount of labour input used.

Marginal Product of an input is defined as the change in output per unit of change in the input when all other inputs are held constant. It is the additional unit of output per additional unit of variable input. It is calculated by dividing the change in output by change in input labour.

$MP_L = \Delta TP_L/\Delta L$.

According to the law of variable proportions, the marginal product of an input initially rises and then after a certain level of employment, it starts falling. The MP curve therefore, looks like an inverse 'U' shaped curve.

For the first unit of the variable input, one can easily check that the MP and the AP are same. As the amount of input is increased, the MP rises. AP being the average of marginal products also rises, but rises less than MP. Then after a point, the MP starts falling. However, as long as the value of MP remains higher than the value of the AP, the AP continues to rise. Once MP has fallen sufficiently, its value becomes less than the AP and the AP also starts falling. So AP curve is also inverse 'U' shaped.

This can be diagrammatically represented as follows:
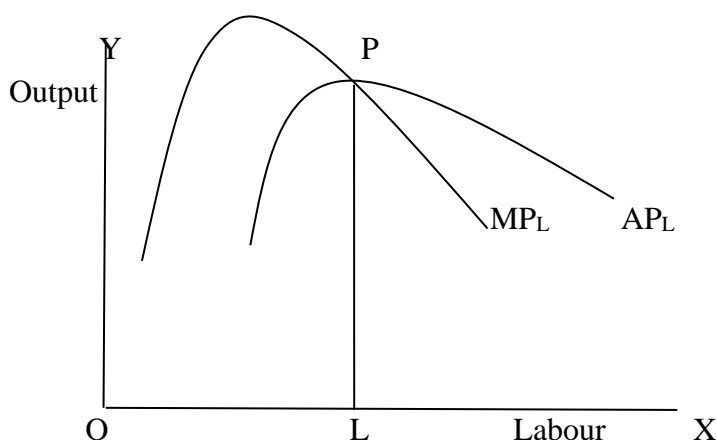
In the above diagram, MPL is marginal product of labour, APL is the average product labour. As long as the AP increases, it must be the case that MP is greater than AP. Otherwise, AP cannot rise. Similarly, when AP falls, MP has to be less than AP. It follows that MP curve cuts AP curve from above at its maximum. In the diagram, AP is maximum at L. To the left of L, AP is rising and MP is greater than AP. To the right of L, AP is falling and MP is less than AP.

3. **The following table gives the average product schedule of labour (AP$_L$). Find the total product (TP$_L$) and Marginal Product (MP$_L$) schedule of Labour.**

L	1	2	3	4	5	6
APL	2	3	4	5	4	3

Ans: The total product is obtained by multiplying AP$_L$ with L and MP$_L$ is obtained from TP$_L$. i.e,

MP$_L$ = TP$_L$ - TP$_{L-1}$ i.e., 6-2=4, 12-6=6, 20-12=8 and so on.

L	APL	TPL	MPL
1	2	2	-
2	3	6	4
3	4	12	6
4	5	20	8
5	4	20	0
6	3	18	-2

4. **Explain the various short run costs.**

The various short run costs are Total Cost, Total Fixed Cost, Total Variable Cost, Average Cost, Average Fixed Cost, Average Variable Cost, and Marginal Cost. The following table shows the various types of short run costs:

a) Total Fixed Cost (TFC):

It refers to the total money expenses incurred on all the fixed factors in the short run. TFC remains constant at all levels of output. Therefore the total fixed cost curve is horizontal straight line to OX axis above the origin which indicates that it is never zero.

$$\textbf{TFC = TC-TVC}$$

b) Total Variable Cost (TVC):

It refers to the total money expenses incurred on the variable factor inputs in the short-run. Total variable cost is the direct cost of the output because it increases along with the output & remains zero when the output is zero. So, the TVC curves starts from the origin & rises sharply in the beginning, gradually in the middle & stretch again sharply in the end the nature of this slope is in accordance with the law of variable proportion.

$$\textbf{TVC = TC-TFC}$$

c) Total Cost (TC):

It is the aggregate money expenditure incurred by the firm on all the factors to produce a given quantity of output. TC varies in the same proportion as total variable cost because the total fixed

cost is constant. The TC curve slope upwards from left to right, above the origin, indicating that, it includes total fixed cost and total variable cost.

d) **Average Fixed Cost (AFC):**
It is the fixed cost per unit of output. In other words, it is average expenses incurred on a single unit of output produced. AFC and output are inverse relation i.e. AFC will be higher when the output level is less and as the output goes on increasing AFC starts reducing, when it is represented in the diagram AFC curve will have a negative slope which falls very stiffly in the beginning and later on becomes parallel to the X axis. .
The Average Fixed Cost is obtained by dividing Total Fixed Cost by Output. AFC=TFC/Output.

e) **Average Variable Cost (AVC):**
It is a variable cost for per unit of output. It can be calculated by dividing total variable cost by the total units of output. When this cost is graphically represented, we get a 'U' shaped AVC, which shows that the cost will be less as the number of units produced increase, this is because as the number of variable inputs are added in a fixed plant the efficiency will increase and vice versa.

AVC=TVC/Output or AVC=AC-AFC

f) **Average Cost (AC):** It is the cost per unit of output produced. It is obtained by dividing total cost by the total output produced i.e. AC = TC/Q or it is also obtained by adding AFC & AVC. If the AC is graphically represented, we get U shaped curve because of the operation of law of variable proportions. The short run AC curve is also called as 'Plant Curves' because it indicates the optimum utilization of a given plant (Industry) capacity.

g) **Marginal Cost (MC):** It is an additional cost incurred to produce an additional output. In other words it is the net additions to the total cost when one more unit of output is produced.

$$MC = TC_n - TC_{n-1} \text{ or } \Delta TC/\Delta q$$

(Where TCn = Total Cost of 'n' selected unit of output and TCn-1 is Total cost of previous output, ΔTC is change in total cost, Δq is change in quantity produced)

5. **Analyse the short run cost curves of TFC, TVC, SAC and SMC with the help of diagrams.**
Ans:
- **Total Fixed Cost (TFC):**

It refers to the total money expenses incurred on all the fixed factors in the short run. TFC remains constant at all levels of output. Therefore the total fixed cost curve is horizontal straight line to OX axis above the origin which indicates that it is never zero.

TFC = TC-TVC

- **Total Variable Cost (TVC):**

It refers to the total money expenses incurred on the variable factor inputs in the short-run. Total variable cost is the direct cost of the output because it increases along with the output & remains zero

when the output is zero. So, the TVC curves starts from the origin & rises sharply in the beginning, gradually in the middle & stretch again sharply in the end the nature of this slope is in accordance with the law of variable proportion.

$$\boxed{\textbf{TVC = TC-TFC}}$$

Graphical representation of TFC and TVC:
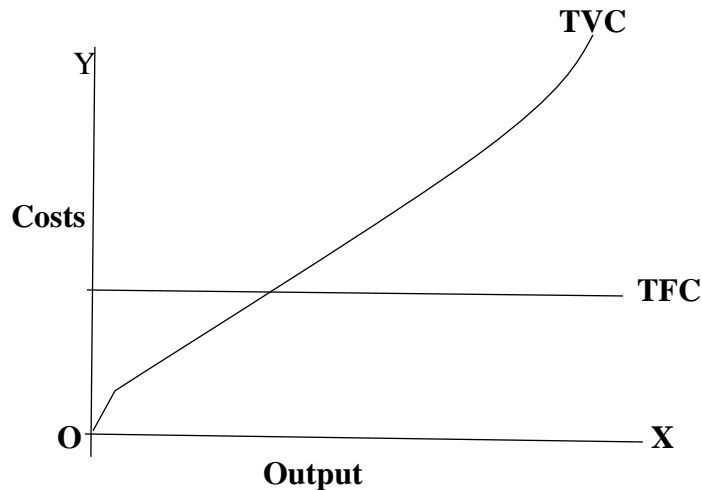
In short run, fixed cost cannot be changed. When there is change in the level of output, whatever change occurs to total cost is entirely due to the change in total variable cost. The shape of TFC is horizontal straight line. It shows that though there is increase in output, there is no change in Fixed Cost. The TVC curve originates from zero and slope upwards as and when output is increased.

Short Run Average Cost (SAC): It is the cost per unit of output produced. It is obtained by dividing total cost from quantity of output produced i.e. AC = TC/Q or it is also obtained by adding AFC and AVC. If the SAC is graphically represented, we get 'U' shaped curve. The short run AC curve is also called as 'Plant Curves' because it indicates the optimum utilization of a given plant (Industry) capacity.

SAC = TC/Q or AFC+AVC

Short Run Marginal Cost (SMC): It is an additional cost incurred to produce an additional output. In other words it is the net additions to the total cost when one more unit of output is produced.

MC = TC$_n$-TC$_{n-1}$ or ΔTC/Δq

(Where TCn = Total Cost of 'n' selected unit of output and TCn-1 is Total cost of previous output, ΔTC is change in total cost, Δq is change in quantity produced)

Graphical representation of SAC and SMC:
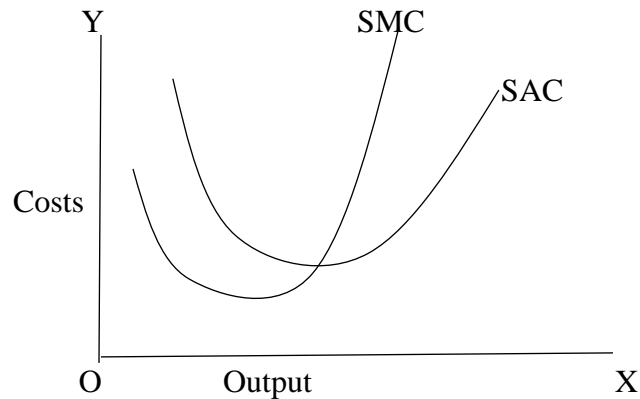
The SAC is the sum of AVC and AFC. In the beginning, both AVC and AFC decrease as output increases. Therefore, SAC initially falls. After a certain level of output, AVC starts rising, but AFC continuous to fall. Initially the fall in AFC is greater than the rise in AVC and SAC is still falling. But, after a certain level of production, rise in AVC becomes larger than the fall in AFC. From this point onwards, SAC is rising. SAC curve is therefore 'U'-shaped.

In case of SMC, as long as SAC is falling, SMC is less than the SAC. When SAC is rising, SMC is greater than the SAC. SMC curve cuts the SAC curve from below at the minimum point of SAC.

6. **A firm's SMC schedule is shown in the following table. TFC is Rs.100. find TVC, TC, AVC and SAC schedules of the firm**

Q	0	1	2	3	4	5	6
SMC	-	500	300	200	300	500	800

Ans:

Q	SMC	TFC	TVC	TC	AVC	SAC
0	-	100	0	100	0	0
1	500	100	500	600	500	600
2	300	100	800	900	400	450
3	200	100	1000	1100	333.33	366.66
4	300	100	1300	1400	325	350
5	500	100	1800	1900	360	380
6	800	100	2600	2700	433.33	450

Note: TFC is given. TVC is obtained by adding SMC for each unit of output like 500 as it is taken, then 500+300=800; 800+200(SMC)=1000 and so on. TC is TFC+TVC, AVC is TVC divided by Q; and SAC is TC divided by Q

.

VIII Assignment and project oriented questions.

1. **Find the missing products of the following table.**

Factor L	TP_L	MP_L	AP_L
0	0	0	0
1	10	-	10
2	22	-	-
3	-	14	12
4	-	8	11
5	50	6	10

Ans:

Factor L	**TP_L**	**MP_L**	**AP_L**
0	0	0	0
1	10	**10**	10
2	22	**12**	**11**
3	**36**	14	12
4	**44**	8	11
5	50	6	10

Note: TP_L is summation of MP_L so 14+22=36; 36+8=44; 44+6=50; MP_L is $TP_n - TP_{n-1}$ so 10-0=10; 22-10=12; AP is TP_L/L so 22/2=11.

CHAPTER-4

THE THEORY OF FIRM UNDER PERFECT COMPETITION

I Choose the correct answer

1. The products in a perfectly competitive market are
   a) Heterogeneous products   c) Luxury goods
   b) Homogeneous products   d) Necessary goods

Ans: (b) Homogeneous products

2. The increase in Total revenue for a unit increase in the output is
   a) Marginal Revenue   c) Total Revenue
   b) Average Revenue   d) Fixed Revenue

Ans: (a) Marginal Revenue

3. *A book seller sells 30 books with the price of Rs 10 each. The Total Revenue of the seller is*
   a) Rs.100   b) Rs. 200
   c) Rs. 300   d) Rs. 400

Ans: (c) Rs.300

4. The firm's profit is denoted by
   a) $\sum$ b) Δ c) Φ d) π

Ans: d) π

5. When the supply curve is vertical, the elasticity of supply is
   a) es=1 b) es=1 c) es=0   d) ex=∞

Ans: c) es=0

II Fill in the blanks.

1. Price taking behavior is the single most distinguishing characteristic of ………………market
   Ans: Perfect competitive market.
2. For a price taking firm Marginal Revenue is equal to……………………
   Ans: Market price
3. The minimum point of AVC where the SMC curve cuts the AVC curves is called as
   ……………………
   Ans: Shut down point
4. …………………cost of some activity is the gain forgone from the second best activity.
   Ans: Opportunity cost
5. …………….is a tax that the Government imposes per unit sale of output.
   Ans: Unit Tax

III Match the following

A	B
1. MR= 2. $\pi =$ 3. AR= 4. Normal profit 5. Perfect competition	a) Perfect information b) Zero profit c) Δ TR/ Δ Q d) TR-TC e) TR/Q

Ans: 1 – (c); 2 – (d); 3 – (e); 4 – (b); 5 – (a)

IV Answer the following questions in a sentence or a word

1. **Write the formula to calculate Average Revenue.**
   AR = TR/Q, TR- Total Revenue; Q – Quantity Sold
2. **Define Marginal Revenue.**
   Ans: Marginal Revenue of a firm is defined as the increase in total revenue for a unit increase in the sale of firm's output.
3. **What is Supply?**
   Ans: It is the quantity that the firm chooses to sell at a given price, given technology and given the factor payments.
4. **What is normal profit?**
   Ans: The minimum level of profit that is needed to keep a firm in the existing business is called as normal profit.
5. **Give the meaning of super normal profit.**
   Ans: Profit that a firm earns over and above the normal profit is called as super normal profit. (Here Total Revenue is greater than Total Cost)
6. **To which side does a supply curve shift due to the technological progress?**
   Ans: The supply curve shifts to the right due to the technological progress.

V Answer the following questions in four sentences
1. **State the conditions needed for profit by a firm under perfect competition.**
   Ans: The following conditions needed for profit by a firm under perfect competition:
   - The Price P must be equal to MC
   - Marginal cost must be non-decreasing at q_0
   - The firm to continue to produce, in the short run, price must be greater than the average variable cost and in the long run, price must be greater than the average cost.
2. **Give the meaning of shut down point.**
   Ans: In the short run, the shut down point is that point of minimum Average Variable Cost where Short run Marginal Cost curve cuts the Average Variable Cost curve. In the long run, the shut down point is the minimum of Long Run Average Cost Curve.

3. **Write the meaning of opportunity cost with an example.**

Ans: Opportunity cost of some activity is the gain foregone from the second best alternative activity. In other words, it is the cost of next best activity which is measured in terms of revenue or benefit sacrificed.

For example, you have Rs.10000 which you decide to invest in your family business. What is the opportunity cost of your action? If you do not invest this money, you can either keep it in the house safe which will give you zero return or you can deposit it in either bank A or bank B in which case you get an interest at the rate of 20 percent or 10 percent respectively. So the maximum benefit that you may get from other alternative activities is the interest from the bank A. But this opportunity will no longer be there once you invest the money in your family business. The opportunity cost of investing the money in your family business is therefore the amount of forgone interest from the bank A.

4. **Mention the two determinants of a firm's supply curve.**

Ans: The two determinants of a firm's supply curve are as follows:
(a) Technological progress
(b) Input prices.

5. **Find out the Market supply where there are supply curves of two producers, S_1 (p) = p - 20 and S_2 (P) = p - 10 respectively.**

Ans: The market supply is obtained by adding S_1 (p) = P - 20 and S_2 (P) = P- 10:

$S_m(p) = S_1(p) + S_2(p)$

$S_m(p) = P-20 + P-10$

$S_m(p) = 2P-30$

6. **Give the meaning of price elasticity of supply and write its formula.**

Ans: The price elasticity of supply refers to the proportionate change in quantity supplied to a proportionate change in price of a commodity.

$$PES = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

$= \Delta q/\Delta p \times p/q$

VI Answer the following questions in 12 sentences.

1. **Explain the features of perfect competition.**

Ans: Perfect competition is a market where there will be existence of large number of buyers and sellers dealing with homogenous products. It is a market with highest level competition.

i) **Large number of sellers and sellers:** The first condition which a perfectly competitive market must satisfy is concerned with the sellers' side of the market. The market must have such a large number of sellers that no one seller is able to dominate in the market. No single firm can influence the price of the commodity. The sellers will be the firms producing the product for sale in the market. These firms must be all relatively small as compared to the market as a whole. Their individual outputs should be just a fraction of the total output in the market.

There must be such a large number of buyers that no one buyer is able to influence the market price in any way. Each buyer should purchase just a fraction of the market supplies. Further the buyers should have any kind of union or association so that they compete for the market demand on an individual basis.

ii) Homogeneous products: Another prerequisite of perfect competition is that all the firms or sellers must sell completely identical or homogeneous goods. Their products must be considered to be identical by all the buyers in the market. There should not be any differentiation of products by sellers by way of quality, colour, design, packing or other selling conditions of the product.

iii) Free Entry and Free exit for firms: Under perfect competition, there is absolutely no restriction on entry of new firms in the industry or the exit of the firms from the industry which want to leave. This condition must be satisfied especially for long period equilibrium of the industry.

If these four conditions are satisfied, the market is said to be purely competitive. In other words, a market characterized by the presence of these four features is called purely competitive. For a market to be perfect, some conditions of perfection of the market must also be fulfilled.

iv) Price Taker: The single distinguishing character of perfect competition is the price taking behaviour of the firms. A price taking firm believes that if it sets a price above the market price, it will be unable to sell any quantity of the good that it produces. On the other hand, if the firm set the price less than or equal to the market price, the firm can sell as many units of the good as it wants sell. The firms in the perfect competitive market are price takers. That means, the producers will continue to sell their goods and services in the price existing in the market. Firms have no control over the price of the product.

v) Perfect information: Price taking is often thought to be a reasonable assumption when the market has many firms and buyers have perfect information about the price prevailing in the market. Since all firms produce the same good and all buyes are aware of the market price, the firm in question loses all its buyers if it rises price.

2. **Write about the third condition of profit maximization of the firm under perfect competition with the help of diagrams.**

   The third condition of profit maximization of the firm under perfect competition. The firm to continue production, in the short run, price must be greater than the average variable cost $(p > AVC)$; in the long run, price must be greater than the Long Ran Average cost $(p > LRAC)$. The third condition has two parts: one part applies in the short run while the other applies in the long run.

   Case 1: Price must be greater than or equal to AVC in the short run. It is true that a profit maximizing firm, in the short run, will not produce at an output level wherein the market price is lower than the AVC. This can be explained with the help of diagram.
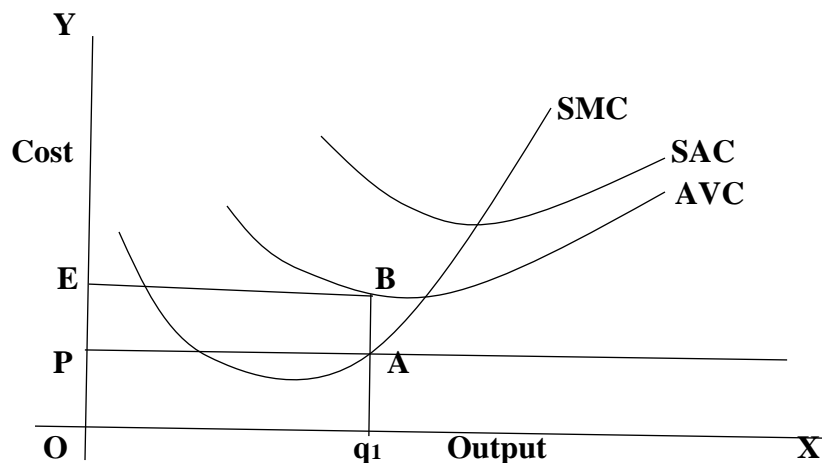
According to the above diagram, at the output level q_1, the market price p is lower than the AVC. So q_1 cannot be a profit-maximising output level. This is can be put as follows:
The firm's total revenue at q_1 is:

   TR = Price × Quantity = Vertical height OP × width Oq_1 = The area of rectangle $OPAq_1$
The firm's total variable cost (TVC) at q_1 is = Average variable cost × Quantity = Vertical height OE × Width Oq_1 = The area of rectangle $OEBq_1$.

   The firm's profit at q_1 is TR – (TVC + TFC); that is, $OPAq_1$ – $OEBq_1$ – TFC. If the firm produces zero output, TR and TVC will be zero. The firm's profit at zero output is equal to – TFC. But, the area of rectangle $OPAq_1$ is less than $OEBq_1$. Hence, the firm's profit at q_1 is EBAp -TFC, which is less than what it obtains by not producing at all. So, the firm will choose not to produce and exit from the market.

Case 2: Price must be greater than or equal to AC in the long run: A profit-maximising firm, in the long run, will not produce at an output level where the market price is less than LRAC. This can be explained with the help of a diagram.
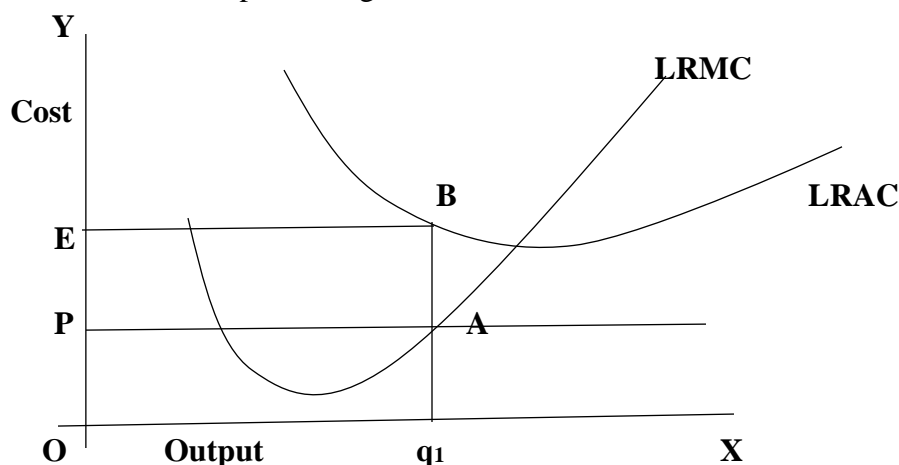
The above diagram depicts that a profit-maximising firm produces zero output in the long run when the market price, P is less than the minimum of its long run average cost (LRAC). If the firm's output level is q_1, the firm's total cost exceeds its revenue by an amount equal to the area of rectangle PEBA.

Therefore, the firm to continue production, in the short run, price must be greater than the average variable cost (p > AVC) and in the long run, price must be greater than the Long Run Average cost (p > LRAC).

3. The following table shows the total revenue and total cost schedules of a competitive firm. Calculate the profit at each output level and determine the market price of the good.

Quantity Sold (q)	TR (Rs.)	TC (Rs.)	Profit	Market Price
0	0	5		
1	5	7		
2	10	10		
3	15	12		
4	20	15		
5	25	23		
6	30	33		
7	35	40		

Ans: Profit = TR-TC, Market price = AR = TR/q

Quantity Sold (q)	TR (Rs.)	TC (Rs.)	Profit	Market Price
0	0	5	-5	0
1	5	7	-2	5
2	10	10	0	5
3	15	12	3	5
4	20	15	5	5
5	25	23	2	5
6	30	33	-3	5
7	35	40	-5	5

4. Write about shut down point, Normal profit and Break Even Point.

Shut down point:

In the short run, the firm continues to produce as long as the price remains greater than or equal to the minimum of AVC. Therefore, along the supply curve as we move down, the last price-output combination at which the firm produces positive output is the point of minimum AVC where the SMC curve cuts the AVC curve. Below this, there will be no production. This point is called the short run shut down point of the firm.

However, in the long run, the shutdown point is the minimum of LRAC curve.

Normal Profit:

The minimum level of profit that is needed to keep a firm in the existing business is defined as normal profit. A firm that does not make normal profits is not going to continue in business. Normal profits are therefore a part of the firm's total costs.

In other words, the profit level that is just enough to cover the explicit costs and opportunity costs of the firm is called the normal profit. If a firm includes both its explicit cost and opportunity costs in the calculation of total cost, the normal profit becomes that level of profit when total revenue equals total cost.

Break Even Point:

In the long run, the firm does not produce if it earns anything less than the normal profit. In the short run, however, it may produce even if he profit is less than this level. The point on the supply curve at which a firm earns normal profit is called the Break Even Point of the firm. The point of minimum average cost at which the supply cure cuts the LRAC curve is therefore the breakeven point of the firm.

5. **Explain the determinants of a firm's supply curve.**

   Ans: A firm's marginal cost curve is a part of its marginal cost curve. Any factor that affects a firm's marginal cost curve is a determinant of its supply curve. Following are the two factors determining a firm's supply curve:

   a) **Technological Progress:** The organizational innovation by the firm leads to more production of output. That means, to produce a given level of output, the organizational innovation allows the firm to use fewer units of inputs. It is expected that this will lower the firm's marginal cost at any level of output, i.e., there is a rightward shift of the MC curve. As the firm's supply curve is essentially a segment of the MC curve, technological progress shifts the supply curve of the firm to the right. At any given market price, the firm now supplies more quantity of output.

   b) **Input prices:** A change in the prices of factors of production (inputs) also influences a firm's supply curve. If the price of input (eg. wage) increases, the cost of production also increases. The consequent increase in the firm's average cost at any level of output is usually accompanied by an increase in the firm's marginal cost at any level of output which leads to upward shift of the MC curve. That means, the firm's supply curve shifts to the left and the firm produces less quantity of output.

   c) **Unit Tax:** A unit tax is a tax that the government imposes per unit sale of output. For example, If the Government imposes unit tax of Rs 20. Then, if the firm produces and sells 10 units of the good, the total tax that the firm must pay to the government is $10 \times 20 = $ Rs 200. The unit tax shifts the firm's supply curve to the left that means, at any given market price, the firm now supplies less units of output.

6. *Assume that 200 balls are produced in a market by the firm at the price Rs.10 for each ball. When the price of ball rises to Rs.30, firm produces 1000 balls. Find the Price elasticity of supply?*

   Ans:

   PED = Percentage change in quantity Supplied ($\Delta Q/Q$ x 100)

Percentage change in price ($\Delta P/P \times 100$)

Price per Ball	Quantity Supplied
Old Price $P_1 = 10$	Old quantity $Q_1 = 200$
New Price $P_2 = 30$	New Quantity $Q_2 = 1000$

Percentage change in Quantity Supplied:

$\Delta Q/Q \times 100 = \dfrac{Q_2 - Q_1}{Q_1}$ $\times 100 = \dfrac{1000 - 200}{200}$ $\times 100 = 800/200 \times 100 = 4 \times 100 = 400$

Percentage change in Price:

$\Delta P/P \times 100 = \dfrac{P_2 - P_1}{P_1}$ $\times 100 = \dfrac{30 - 10}{10}$ $\times 100 = 20/10 \times 100 = 2 \times 100 = 200$

Now the Price Elasticity of Supply (PES) will be

PES = $400/200 = 2$

VII Answer the following questions in 20 sentences.

1. **Explain TR and AR of a firm under perfect competition with diagram.**

   Ans: A firm earns revenue by selling the good that it produces in the market. Let the market price of a unit of the good be 'p'. Let the 'q' be the quantity of the good produced and sold by the firm at price 'p'. Then the Total Revenue and Average Revenue can be discussed as follows:

   Total Revenue (TR):

   The total revenue is defined as the market price (p) of the good multiplied by the firm's output (q). Then, TR= p x q.

   In a perfectly competitive market, a firm views the market price 'p' as given, With the market price fixed at 'p' the TR curve of a firm shows the relationship between its Total Revenue (y axis) and its total output (x axis). The following diagram shows the Total Revenue Curve of a firm.
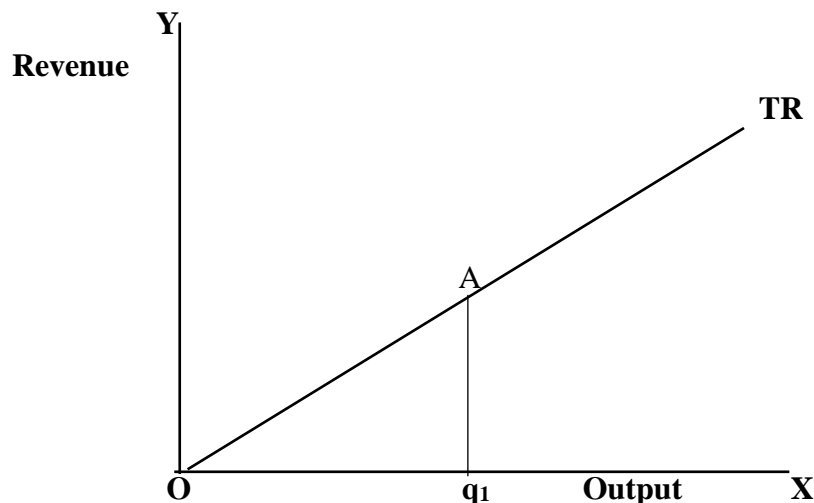
There are three observations we must make. Firstly, when the output is zero, Total Revenue of the firm is also zero. Therefore, TR curve passes through point O. Secondly, the TR increases as the output goes up. Moreover, the equation TR= p x q is that of a straight line. This means that the TR curve is an upward rising straight line. Thirdly, consider the slope of the straight line. When the output is 1 unit (horizontal distance Oq_1 in the above diagram), the Total Revenue (vertical height Aq_1) is px1=p. Therefore the slope of the straight line is $Aq_1/Oq_1=p$.

Average Revenue:

The average revenue (AR) of a firm is defined as Total Revenue per unit of output. This can be represented as follows:

AR=TR/q = p x q/q = p.

For a price taking firm, average revenue equals the market price. Diagrammatically the AR curve can be represented as follows:
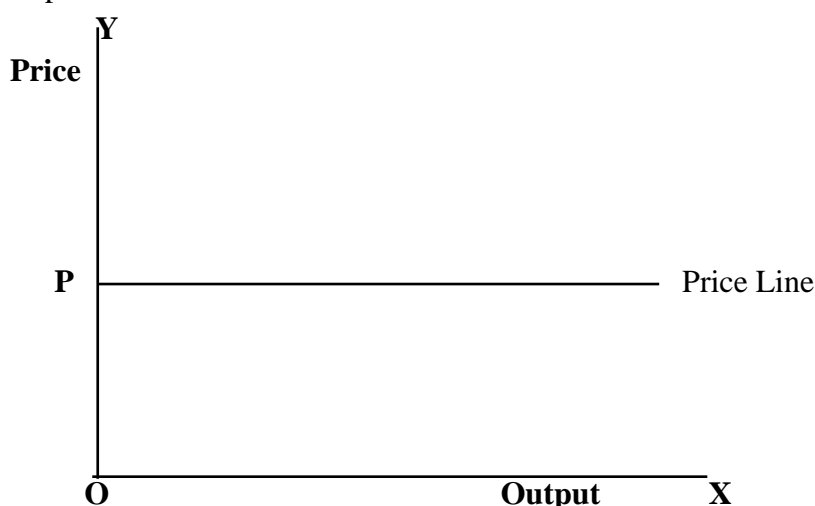
In the above diagram, we plot the market price (y axis), for different values of a firm's output (x axis). Since the market price is fixed at p, we obtain a horizontal straight line that cuts the y axis at a height equal to p. This horizontal straight line is called the price line. The price line shows the relationship between market price and the firm's output level. The vertical height of the price line is equal to the market price p. The price line also depicts the demand curve facing a firm. Observe that the diagram shows that the market price, p, is independent of a firm's output. This means that the firm can sell as many units of the goods as it wants to sell at price p.

2. **Write a short note on profit maximization of a firm under the following conditions**
     a) P=MC
     b) MC must be none decreasing at q_0

Ans: A firm always wishes to maximize its profit. The firm would like to identify the quantity q_0, the firm's profits are less than at q_0. For profits to be maximum, the following conditions must hold at q_0.

a) **The price P must equal MC (P = MC):** Profit is the difference between Total Revenue and Total Cost. Both total revenue and total cost increase as output increases. As long as the change in total revenue is greater than the change in total cost, profits will continue to increase.

The change in total revenue per unit increase in output is the marginal revenue and the change in total cost per unit increase in output is the marginal cost.

Therefore, we can conclude that as long as marginal revenue is greater than marginal cost, profits are increasing and as long as marginal revenue is less than marginal cost, profits will fall. It follows that for profits to be maximum, marginal revenue should be equal to marginal cost.

For the perfectly competitive firm, we have established that the MR=P. So the firm's profit maximizing output becomes the level of output at which P=MC.

b) **Marginal cost must be non-decreasing at q_0:** It means that the marginal cost curve cannot slope downwards at the profit maximizing output level. This can be explained with the help of diagram:
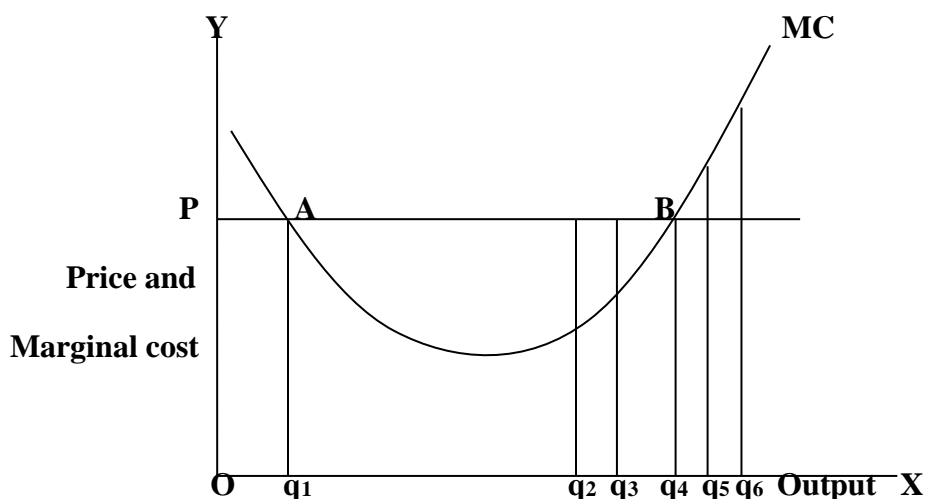
In the above diagram, at output levels q_1 and q_4 the market price is equal to the marginal cost. However, at the output level q_1 the marginal cost curve is downward sloping. The q_1 is not profit maximizing output level.

If we observe all output levels left to the q_1 the market price is lower than the marginal cost. But the firm's profit at an output level slightly smaller than q_1 exceeds that corresponding to the output level q_1. Therefore, q_1 cannot be a profit maximizing output level.

3. **Explain the short run supply curve of a firm with the help of a diagram.**
   Ans: Supply of a firm refers to the quantity that it chooses to sell at a given price, given technology and given prices of factors of production. Supply curve of a firm shows the levels of output that the firm chooses to produce corresponding to different values of the market price by keeping technology and prices of factors of production constant.

   Short Run Supply Curve of a Firm:
   Let us derive a firm's short run supply curve. The derivation of supply curve can be split into two parts viz., firm's profit maximizing output level when the market price is greater than or equal to minimum Average Variable Cost and the firm's profit maximizing output level when the market price is less than the minimum Average Variable Cost.

Case 1: Price or Average Revenue greater than or equal to the minimum AVC:
 This can be explained with the help of the following diagram
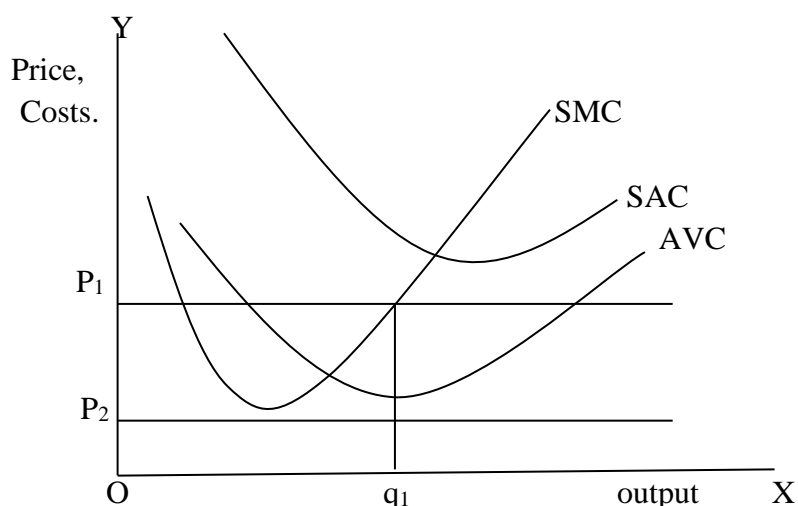
If the market price is P_1, which exceeds the minimum of AVC, the firm starts out by equating P_1 with SMC on the rising part of the SMC curve which leads to the output level q_1. But the AVC at q_1 does not exceed the market price P_1. Thus, when the market price is P_1, the firm's output level in the short run is equal to q_1.

Case -2: Price is less than minimum AVC: If the market price is P_2 which is less than the minimum AVC, at all positive output levels, AVC exceeds P_2. In other words, it cannot be the case that the firm supplies a positive output. So, if the market price is P_2, the firm produces zero output. Combining both the cases, we can conclude that a firm's short run supply curve is the rising part of the Short Run Marginal curve from and above the minimum Average Variable Cost together with zero output for all prices strictly less than the minimum AVC. This can be represented in the following diagram:
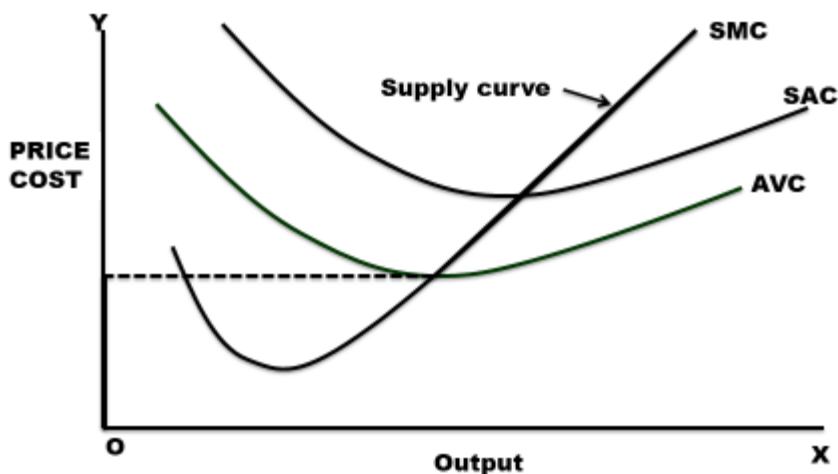
In the above diagram, the short run supply curve of a firm, which is based on its short run marginal cost curve and average variable cost is represented by the curve which rises from the minimum point of AVC curve. The bold line represents the short run supply curve.

4. Illustrate the Long Run supply curve of a firm with the help of diagram.

The long run Supply curve of a firm can be derived with the help of Long Run Marginal Cost Curve. We shall split this derivation into two parts. Firstly, determine the firm's profit-maximising output level when the market price is greater than or equal to the minimum long run Average Cost (LRAC) and then determine the firm's profitmaximising output level when the market price is less than the minimum LRAC.

Case 1: Price greater than or equal to the minimum LRAC: In the long run, if the price is greater than the minimum of LRAC or equal to LRAC, the firm will continue to produce and supply same quantity of output. This can be explained with the help of diagram.
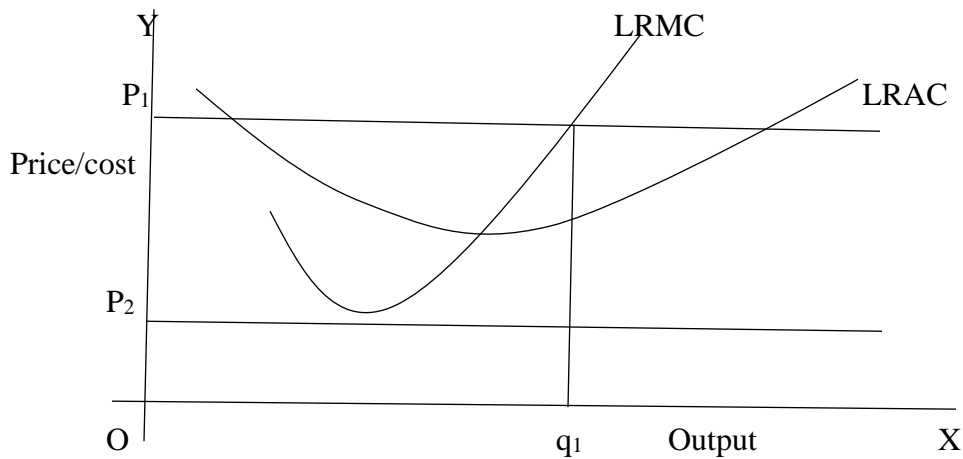
In the above diagram, at the market price is p_1, which is more than the minimum of LRAC, we obtain output level q1. The LRAC at q_1 does not exceed the market price, p1. when the market price is p_1, the firm's supply in the long run is equal to output of q_1.

Case 2: Price less than the minimum of LRAC: In the above diagram the market price is p2, which is less than the minimum LRAC. Here, at all positive output levels, LRAC exceeds p_2. That means, the firm will not supply a positive output when price falls to p_2. So, when the market price is p_2, the firm produces zero output.

By combining cases 1 and 2, a firm's long run supply curve can be derived. The Long Run Supply is the rising part of the LRMC curve from and above the minimum LRAC together with zero output for all prices less than the minimum LRAC. This can be represented in the following diagram, the bold line represents the long run supply curve of the firm.
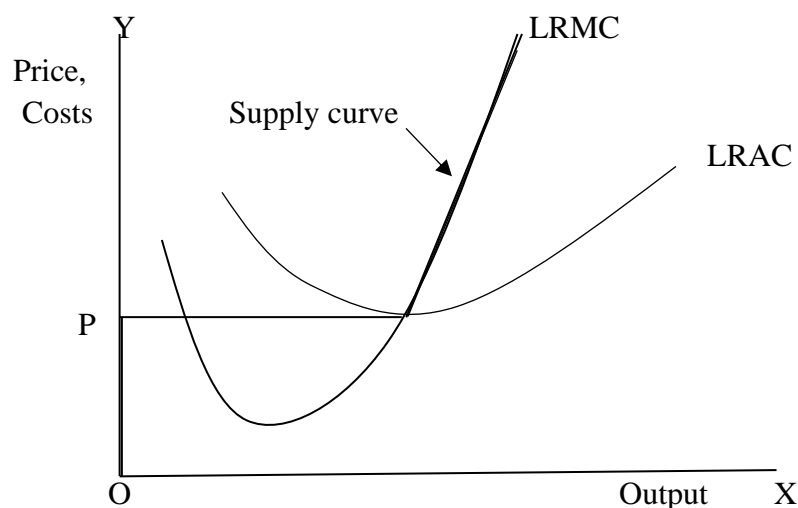
In the above diagram, in the long run, the firm likes to produce and supply when the price is equal or greater than P. When the price increases, the firm also increases its output resulting in rise in LRMC. The rising part of LRMC from the minimum of LRAC is considered as Long Run Supply Curve of a firm which is marked as bold line in the diagram.

5. **Explain market supply curve with the help of a diagram.**

Ans: The market supply curve shows the output levels that firms in the market produce in aggregate corresponding to different values of the market price.

For example, there are firm 1, firm 2, firm3 in the market. Suppose the price is fixed at p. Then the output produced by these firms in aggregate will be supply of firm 1 + supply of firm 2 + supply of firm 3. So, the market supply at price p is the summation of the supplies of individual firms at that price.

The supply curve geometrically with two firms in the market i.e., firm 1 and firm 2 is given below. The two firms have different cost structures. Firm 1 will not produce anything if the market price is less than P_1 while firm 2 will not produce anything if the market price is less than P_2. This can be represented in the diagram:
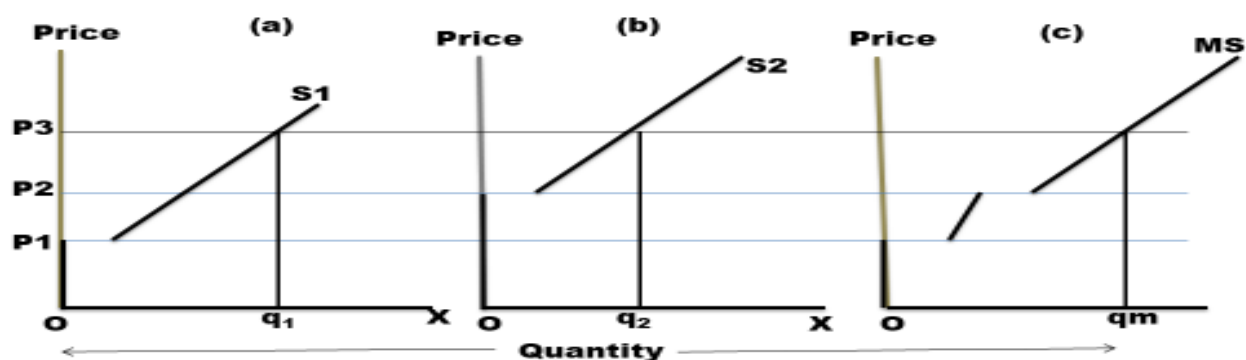
In the above diagram, output is measured in X axis and Price is measured in Y axis. The diagram (a) is the supply curve of firm 1 (S_1), diagram (b) is the supply curve of firm 2 (S_2) and the diagram (c) is the market supply curve (S_m). When the market price is below P_1, both the firms do not produce the goods. Hence the market supply will be zero. If the market price is greater than or equal to P_1, but less than P_2, only firm 1 will produce the goods. In this range, the market supply curve coincides with the supply curve of firm 1. If the market price is greater than or equal P_2, both firms will have positive output levels. If the price is P_3, the firm 1 will supply q_1 units of output and firm 2 supplies q_2 units of output. So, the market supply at price P_3 is q_m, where $q_m = q_1 + q_2$. The market supply curve S_m is obtained by taking a horizontal summation of the supply curves of the two firms in the market S_1 and S_2.

VIII Assignment and project oriented questions.

1. **In a perfectly competitive market when market price of each unit of good is Rs.60, compute the total revenue, marginal revenue and average revenue schedules from the following table.**

Quantity sold	TR	MR	AR
0			
1			
2			
3			
4			
5			

Ans: Hint: For TR Multiply Price and Quantity (PxQ). Market Price is given as Rs.60

$MR = TR_n - TR_{n-1}$ and $AR = TR/Q$

Quantity sold	Price	TR	MR	AR
0	60	0	0	0
1	60	60	60	60
2	60	120	60	60
3	60	180	60	60
4	60	240	60	60
5	60	300	60	60

****

CHAPTER 5

MARKET EQUILIBRIUM

I Choose the correct answer

1. In perfect competition buyers and sellers are
   a) Price makers
   c) Price analysts
   b) Price takers
   d) Price givers
   Ans: (b) Price takers.
2. A situation where the plans of all consumers and firm in the market match.
   a) Disequilibrium situation
   c) Maximisation situation
   b) Equilibrium situation
   d) Partial Equilibrium situation
   (b) Equilibrium situation
3. As a result of increase in the number of firms there is an increase in supply, then supply curve
   a) Shifts towards left
   c) Shifts towards both sides
   b) Shifts towards right
   d) Shifts Horizontally
   Ans: (b) Shifts towards right
4. The firms earn super normal profit as long as the price is greater than the minimum of
   a) Marginal cost
   c) Average cost
   b) Total cost
   d) Fixed cost
   Ans: c) Average cost
5. The government imposing upper limit on the price of goods and services is called
   a) Price ceiling
   c) Price floor
   b) Selling price
   d) Market price
   Ans: **(a)Price ceiling**
6. The government imposing lower limit on the price of goods and service is called
   a) Minimum price
   c) Price Floor
   b) Maximum price
   d) Equilibrium price
   Ans: c) Price floor

II Fill in the blanks

1. In a perfectly competitive market, equilibrium occurs when market demand …………market supply
   Ans: Equals.
2. It is assumed that, in a perfectly competitive market an ……………………is at play.
   Ans: Invisible hand
3. In labour market………………are the suppliers of labour.
   Ans: Households

4. ……………is determined at the point where the demand for labour and supply of labour curves intersect.
   Ans: Wage
5. If the demand curve shifts leftward and supply curve shifts rightward equilibrium price will be………………..
   Ans: Decreasing

III Match the following

A	B
1. Adam smith 2. Excess supply 3. Market equilibrium 4. Possibility of supernormal profit 5. Wage Rate	a) Attraction of new firms b) Operation of invisible hand c) VMP$_L$ d) QS>QD e) QD=QS

Ans: 1 – (b); 2 – (d); 3 – (e); 4 – (a); 5 – (c);

IV Answer the following questions

1. **Define market equilibrium.**
   Ans: A market equilibrium is a situation where the plans of all consumers and firms in the market match and the market clears. Here Quantity demanded is equal to Quantity supplied.
2. **What is equilibrium price?**
   Ans: The price at which market reaches equilibrium is reached is called equilibrium price.
3. **Give an example for price ceiling.**
   Ans: Example, price ceiling on necessary items like, wheat, rice, kerosene, sugar etc. being supplied through Government Fair Price Shops under Public Distribution System.
4. **Given an example for price floor.**
   Ans: Example- agricultural price support i., Minimum support price and minimum wage legislation.
5. **Through which legislation, the government ensures that the wage rate of the labourers does not fall below a particular level?**
   Ans: Minimum Wage Legislation (Minimum Wages Act)

V Answer the following questions in 4 sentences

1. **Define equilibrium price and quantity.**
   Ans: Equilibrium price is the price at which equilibrium is reached in the market.
   The equilibrium quantity is defined as the quantity which is bought and sold at equilibrium price.
   Therefore price and quantity will be at equilibrium when
   $$Q^d (p^*) = q^s (p^*)$$
   p^*denotes the equilibrium price and $Q^d (p^*)$ and $q^s (p^*)$ denote the market dmenad and market supply respectively.

2. Distinguish between excess demand and excess supply.

Excess Demand	Excess Supply
• It is situation where market demand exceeds the market supply. • Here the price of the product increases.	• It is a situation where the market supply exceeds the market demand. • Here the price of the product decreases.

3. What is marginal revenue product labour (MRP$_L$)?

Ans: The extra output produced by one more unit of labour is its marginal product and by selling each extra unit of output, the additional learning of the firm is the marginal revenue she gets from that unit.

Therefore, for each extra unit of labour, she gets an additional benefit equal to marginal revenue times marginal product is called as Marginal Revenue Product of Labour (MRP$_L$).

$$MRP_L = MR \times MP_L$$

MR - Marginal Revenue; MP$_L$- Marginal productivity of Labour.

4. How wage is determined in the labour market?

Ans: The wage rate is determined at the point where the demand for labour and supply of labour curves intersect. That means, the wage rate is determined at that point where the labour that the households wish to supply is equal to the labour that the firms wish to hire.

This is shown in the following diagram:
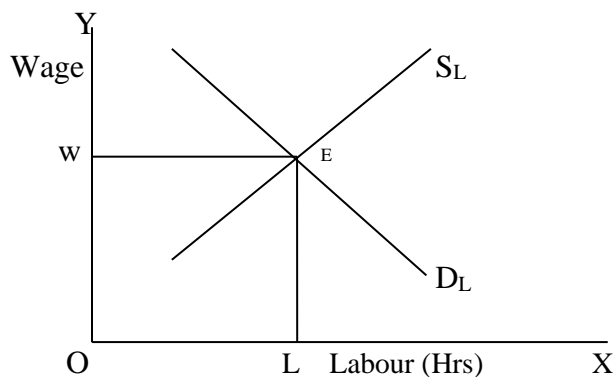
5. Write any two possible ways in which simultaneous shift of both demand and supply curve.

Ans:

a) Both supply and demand curves shift rightwards.

b) Both supply and demand curves shift leftwards.

VI Answer the following questions in 12 sentences.

1. **Consider the market for cotton, the demand curve for the cotton is q= 200-p. Assume that market consists of identical firms in which supply of single firm is q=10+p at the price 20. Calculate the equilibrium number of firms.**

Ans: Market Demand for cotton **:** q= 200-p ;

   Market Supply for Cotton   : q=10+p;

   The Market price   : 20

   Before we calculate the equilibrium number of firms, we need to find out quantity demanded and the supply of each firm.

   At price 20, the market will supply that quantity which is equal to the market demand. Therefore, from the demand equation, we get the equilibrium quantity of demand (q_o)

$$q_o = 200 - p = 200 - 20 = 180$$

   At Po = 20, each firm supplies: $q_{of} = 10+p = 10+20=30$: (q_{of} – quantity of supply of each firm).

   Now the equilibrium number of firms in the market:

   $n_o = q_o/q_{of} = 180/30 = 6$.

   At market price 20, the equilibrium number of firms is 6.

2. **Write a table to show the impact of simultaneous shifts on equilibrium.**

   Ans: The following table shows the impact of simultaneous shifts on equilibrium

Shift in Demand	Shift in Supply	Quantity	Price
Leftward	Leftward	Decreases	May increase, decrease or remain constant
Rightward	Rightward	Increases	May increase, decrease or remain constant
Leftward	Rightward	May increase, decrease or remain constant	Decreases
Rightward	Leftward	May increase, decrease or remain constant	Increases

3. **What is the implication of free entry and exit of firm on market equilibrium? Briefly explain.**

   Ans: In perfect competitive market, it is assumed that there will be free entry and exit of firms. This assumption implies that in equilibrium, no firm earns super normal profit or incurs loss by

remaining in production. Here, the equilibrium price will be equal to the minimum average cost of the firms.

Let us discuss in detail why there will be no super normal profit or no loss to the firms.

Suppose, at the prevailing market price, each firm is earning super normal profit. The possibility of earning supernormal profit will attract some new firms. As new firms enter the market supply curve shifts rightward. However, demand remains same. This causes market price to fall. As prices decrease, super normal profits will eventually extinct. At this point, with all firms in the market earning normal profit.

Similarly, if the firms are incurring loss (less than normal profit) at the prevailing price, some firms will exit. This will lead to an increase in price. Then the profits of each firm will increase to the level of normal profit. At this point, no firm will want to leave since they will be earning normal profit.

Therefore, with free entry and exit, each firm will always earn normal profit at the prevailing market price.

4. **What is price ceiling? Explain with a diagram.**

Ans: The Government imposed upper limit on the price of a good or service is called price ceiling. Price ceiling is generally imposed on necessary items like wheat, rice, kerosene, sugar and it is fixed below the market determined price. It is fixed below the market price because, at market determined price some sections of the population will not be able to afford these goods.

The effect of price ceiling on Market equilibrium can b explained with the help of following diagram.
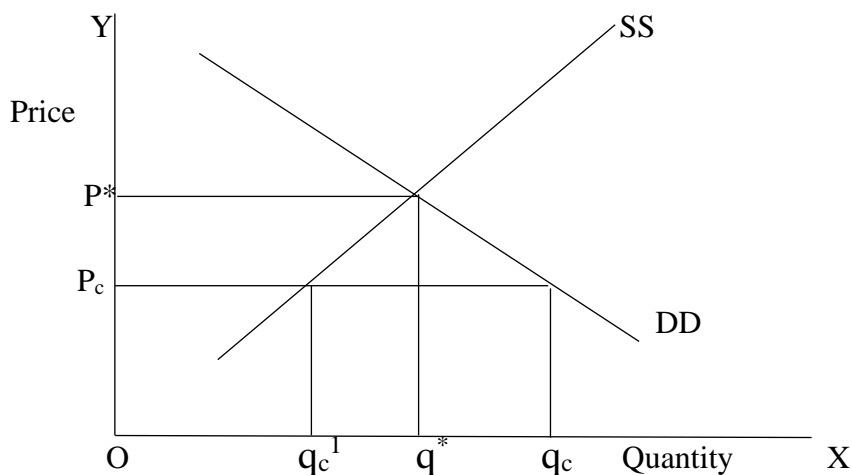
In the above diagram DD is market demand curve and SS is market supply curve. P* is the equilibrium price and q* is the equilibrium quantity. When government imposes price ceiling at P_c which is lower than equilibrium price, there will be excess demand of $q_c^1 q_c$. There will be scarcity of goods.

Here, though the intention of the Government is to help the consumers, it could end up creating shortage of products. In order to solve the scarcity of products, the Government may

issue ration coupons to the consumers so that no individual can buy more than a certain amount of a product. This stipulated amount of a product sold through ration shops are called Fair Price Shops.

5. **Discuss the concept of price floor with the help of a diagram.**

   Ans. The Government imposed lower limit on the price that may be charged for a particular good or service is called price floor. For certain goods and services, fall in price below a particular level is not desirable and hence the Government sets minimum prices for these goods and services.

   Example, agricultural price support programmes and the minimum wage legislation. The Government may impose a lower limit on the purchase price for some of the agricultural goods and the floor is normally set at a level higher than the market determined price for these goods.

   Similarly, through the minimum wage legislation, the Government ensures that the wage rate of the labourers does not fall below a particular level and here again the minimum wage rate is set above the equilibrium wage rate.

   The Price floor can be explained with the help of following diagram
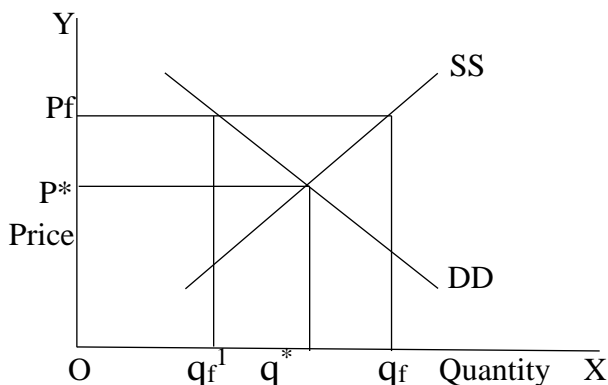
   In the above diagram DD is market demand curve and SS is market supply curve. P* is the equilibrium price and q* is the equilibrium quantity. When government imposes price floor at P_f which is higher than equilibrium price, there will be excess supply of $q_f^1 q_f$. In order to support producers the government needs to buy this excess supply and should take steps to find alternative markets.

VII Answer the following questions in 20 sentences

1. **Explain the market equilibrium when the number of firms are fixed in the market with the help of diagram.**

   Ans: Under perfect competition, market is said to be in equilibrium when quantity demanded is equal to the quantity supplied. Here, with the help of market demand curve and market supply curve we will determine where the market will be in equilibrium when the number of firms is fixed.

This can be illustrated with the help of the following diagram:
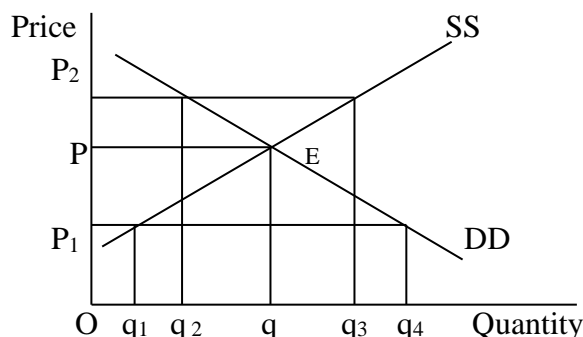
The above diagram illustrates equilibrium for a perfectly competitive market with a fixed number of firms. SS is market supply curve and DD is market demand curve. The market supply curve SS shows how much of the commodity firms would wish to supply at different prices and the demand curve DD tells us how much of the commodity, the consumer would be willing to purchase at different prices.

At point E, the market supply curve intersects the market demand curve which denotes that quantity demanded is equal to quantity supplied. At any other point, either there is excess supply or there is excess demand.

OP is the equilibrium price and Oq is the equilibrium quantity. If the price is P_1, the market supply is q_1 and market demand is q_4. Therefore, there is excess demand in the market equal to q_1q_4. Some consumers who are either unable to obtain the commodity at all or obtain it in insufficient quantity will be willing to pay more than P_1. The market price would tend to increase. All other things remaining constant, when the price increases the demand falls and quantity supplied rises. The market moves towards equilibrium where quantity demanded is equal to quantity supplied. It happens at P where supply decisions match demand decisions.

If the price is P_2, the market supply- q_3 will exceed the market demand q_2 which leads to excess supply equal to q_2q_3. Some firms will not be able to sell quantity they want to sell. Therefore, they will lower their price. All other things remaining constant, when the price falls, quantity demanded rises and quantity supplied falls to equilibrium price P where the firms are able to sell their desired output as market demand equals market supply at P. So, the P is the equilibrium price and the corresponding quantity q is the equilibrium quantity.

2. **Suppose the demand and supply curves of wheat are given by**
   $q^D=250-P$ **and** $q^S=150+P$
   a) **Find the equilibrium price**
   b) **Find the equilibrium quantity of demand and supply**
   c) **Find the quantity of demand and supply when P is greater than equilibrium price**
   d) **Find the quantity of demand and supply when P is lesser than equilibrium price.**
      Ans:

We know that Qd = Qs

The Demand and supply equations given $q^D=250-P$ and $q^S=150+P$ respectively.

For equilibrium Price (P*) $q^D = q^S$ $250-P = 150+P$ $= 250-P -150-P$ $= 100 - 2P$ $2p= 100$ $P= 100/2$ i.e., $P* = 50$	For equilibrium Quantity Demanded and Supplied $q^D=250-P$ $=250-50$ $=200$ $q^S=150+P$ $=150+50$ $=200$ $q^D=q^S=200$	Quantity of demand and supply when P is greater than equilibrium price If P=60 $q^D=250-P$ $=250-60$ $=190$ $q^S=150+P$ $=150+60$ $=210$ So when P > P* $q^S > q^D$	Quantity of demand and supply when P is less than equilibrium price, If P=40 $q^D=250-P$ $=250-40$ $=210$ $q^S=150+P$ $=150+40$ $=190$ So when P < P* $q^D > q^S$

3. *Suppose the demand and supply curves of salt are given by* $q^D=100-P$ *and* $q^S=70+2P$
   a) *Find the equilibrium price and quantity.*
   b) *Now suppose that the price of an input used to produce salt has increased so that the new supply curve is* $q^S=40+2P$. *How does the equilibrium price and quantity change?*
   c) *Suppose the government has imposed a tax of Rs.3 per unit of sale of salt. How does it affect the equilibrium price and quantity?*

Ans: a). The Demand and supply equations given $q^D=100-P$ **and** $q^S=70+2P$ **respectively.**

For equilibrium Price (P*) $q^D = q^S$ $100-P = 70+2P$ $= 100-P -70-2P$ $= 30 - 3P$ $3p= 30$ $P= 30/3$ $\therefore P* = 10$ Equilibrium Price: 10	For equilibrium Quantity Demanded and Supplied $q^D=100-P$ $=100-10$ $=90$ $q^S=70+2P$ $=70+2(10)$ $=70+20$ $= 90$ $q^D=q^S=90$ Equilibrium Quantity: 90

b). Now suppose that the price of an input used to produce salt has increased so that the new supply curve is $q^S=40+2P$. How does the equilibrium price and quantity change?

With new supply
Curve $q^S=40+2P$, new
equilibrium Price and
Quantity
$$q^D = q^S$$
$100\text{-}P = 40+2P$
$= 100\text{-}P -40\text{-}2P$
$= 60 - 3P$
$3p = 60$
$P = 60/3$
$\therefore P^* = 20$
Eqm. Price: 20

For equilibrium
Quantity
Demanded and
Supplied
$q^D=100\text{-}P$
$=100\text{-}20$
$=80$

$q^S=40+2P$
$=40+2(20)$
$=40+40$
$= 80$

$q^D=q^S=80$
Eqm. Quantity: 80

Therefore, with new supply curve, the equilibrium price increases from 10 to 20 and Equilibrium quantity reduces from 90 to 80.

c). Suppose the government has imposed a tax of Rs.3 per unit of sale of salt. How does it affect the equilibrium price and quantity?

Ans:

When the government imposes
Tax of Rs.3 the supply curve
becomes $70+2(P\text{-}3)=$
$70+2P\text{-}6=64+2P$, now the
equilibrium price is

$$q^D = q^S$$
$100\text{-}P = 64+2P$
$= 100\text{-}P\text{-}64\text{-}2P$
$= 36 - 3P$
$3p = 36$
$P = 36/3$
$\therefore P^* = 12$
Eqm. Price: 12

When the government imposes
Tax of Rs.3 the supply curve
becomes $70+2(P\text{-}3)=$
$70+2P\text{-}6=64+2P$, the
equilibrium quantity is

$q^D = 100\text{-}P$
$= 100\text{-}12$
$= 88$

$q^S = 64+2P$
$= 64+2(12)$
$= 64 + 24$
$= 88$
$\therefore q^D = q^S = 88$

Therefore, if the government imposes a tax of Rs.3 per unit of sale of salt, the equilibrium price increases from 10 to 12 and Equilibrium quantity reduces from 90 to 88.

4. When supply curve is unchanged, explain the impact of shifts in demand on equilibrium with the help of diagrams.

Ans: If the market demand curve shifts rightward with supply curve remaining constant, at any price the quantity demanded is more than before. Therefore, now there is excess demand in the market. In response to this excess demand some individuals will be willing to pay higher price and the price would tend to rise. The new equilibrium is attained at that point where the equilibrium price and quantity is greater than the previous one.

Similarly, if the demand curve shifts leftward at any price the quantity demanded will be less than what it was before the shift. Therefore, at the initial equilibrium price, there will be excess supply in the market in response to which some firms will reduce the price of their commodity so that they can sell their desired quantity. The new equilibrium is attained at the point at where the new demand curve and the supply curve intersect and the resulting equilibrium price is less than and quantity will be is less than previous one. Notice that the direction of change in equilibrium price and quantity is same whenever there is a shift in demand curve.

The above situations can be explained with the help of following diagrams:
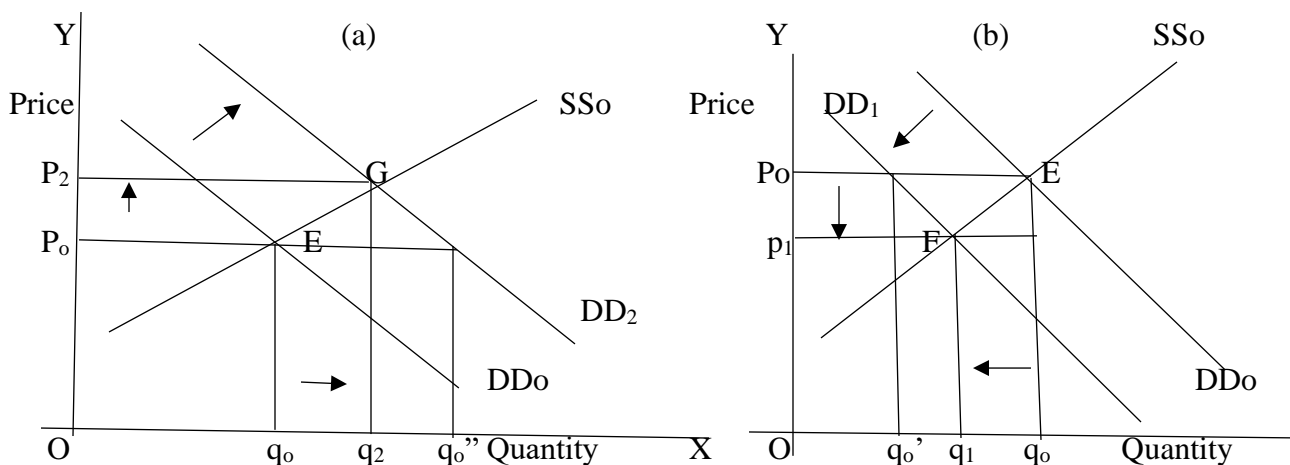
In diagram (a) the market demand curve shifts rightward to DD2 with supply curve remaining unchanged at SS_0 shows that at any price the quantity demanded is more than before. Therefore, at price p_0 now there is excess demand in the market equal to $q_o\ q_o"$. In response to this excess demand some individuals will be willing to pay higher price and the price would tend to rise. The new equilibrium is attained at G where the equilibrium quantity q_2 is greater than q_0 and the equilibrium price p_2 is greater than p_0.

In diagram (b) the demand curve shifts leftward to DD1, at any price the quantity demanded will be less than what it was before the shift. Therefore, at the initial equilibrium price p_0 there will be excess supply in the market equal to $q_o'q_o$ in response to which some firms will reduce the price of their commodity so that they can sell their desired quantity. The new equilibrium is attained at the point F at

which the demand curve DD_1 and the supply curve SS_0 intersect and the resulting equilibrium price p_1 is less than p_0 and quantity q_1 is less than q_0.

If there is hike in the salaries of the consumers, their incomes increase. With an increase in income, consumers are able to spend more money on some goods. But, the consumers will spend less on an inferior good with increase in income whereas for a normal good, with prices of all commodities and tastes and preferences of the consumers held constant, we would expect the demand for the good to increase at each price as a result of which the market demand curve will shift rightward. Here we consider the example of a normal good like clothes, the demand for which increases with increase in income of consumers, thereby causing a rightward shift in the demand curve. However, this income increase will have adverse effect on inferior goods for which the demand curve shifts leftwards.

Therefore, the market equilibrium is at E. Due to the shift in demand to the right, the new equilibrium is at G as shown in diagram (a) and due to the leftward shift, the new equilibrium is at F, as shown in diagram (b). With rightward shift the equilibrium quantity and price increase whereas with leftward shift, equilibrium quantity and price decrease

5. **When the demand curve unchanged, explain the impact of shifts in supply on equilibrium with the help of diagrams.**

Ans: With the demand curve unchanged, If there is rightward shift in supply curve, the equilibrium quantity increases and price decreases whereas with leftward shift in supply curve the equilibrium quantity decreases and price increases. These can be represented in the following diagrams:
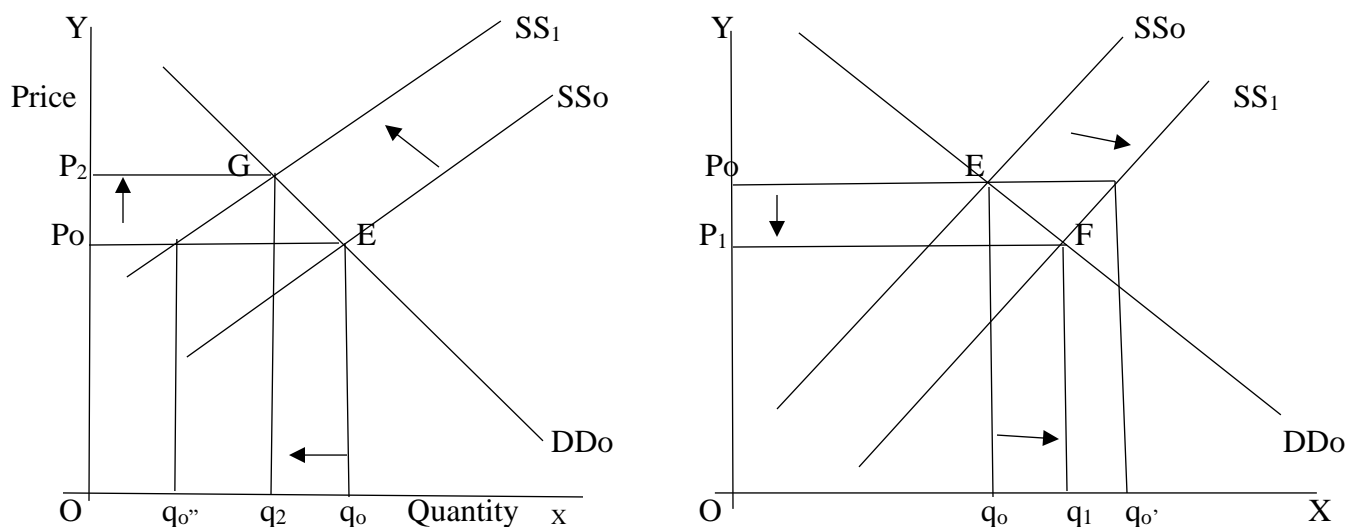
If the market supply curve shifts leftward to SS_2 with the demand curve remaining unchanged, as shown in diagram (a), at the prevailing price, p_0 , there will be excess demand equal to q_0'' q_0. Now some consumers who are unable to obtain the good will be willing to pay higher prices and the market price tends to increase. The new equilibrium is attained at point G where the supply curve SS_2 intersects the demand curve DD_0 such that q_2 quantity will be bought and sold at price p_2.

Similarly, when supply curve shifts rightward, as shown in diagram (b), at p_0 there will be excess supply of goods equal to $q_0 q_0'$. In response to this excess supply, some firms will reduce their price and the new equilibrium will be attained at F where the supply curve SS_1 intersects the demand curve DD_0 such that the new market price is p_1 at which q_1 quantity is bought and sold.

For instance, let us imagine that there is an increase in the price of an input. This will increase the marginal cost of production. Therefore, at each price, the market supply will be less than before. Hence, the supply curve shifts leftward. But this increase in input price has no impact on the demand of the consumers since it does not depend on the input prices directly. Therefore, the demand curve remains unchanged.

Let us imagine that there is increase in the number of firms. Now at each price more firms will supply the commodity, the supply curve shifts to the right but it does not have any effect on the demand curve. We can say that there will be a decrease in price of the commodity and increase in the quantity produced compared to the initial situation.

6. **Explain the simultaneous shifts of demand and supply curve in perfect competition with the help of diagrams.**

   Ans: The simultaneous shifts can happen in four possible ways:
   c) Both supply and demand curves shift rightwards.
   d) Both supply and demand curves shift leftwards.
   e) Supply curve shifts leftward and demand curve shifts rightward
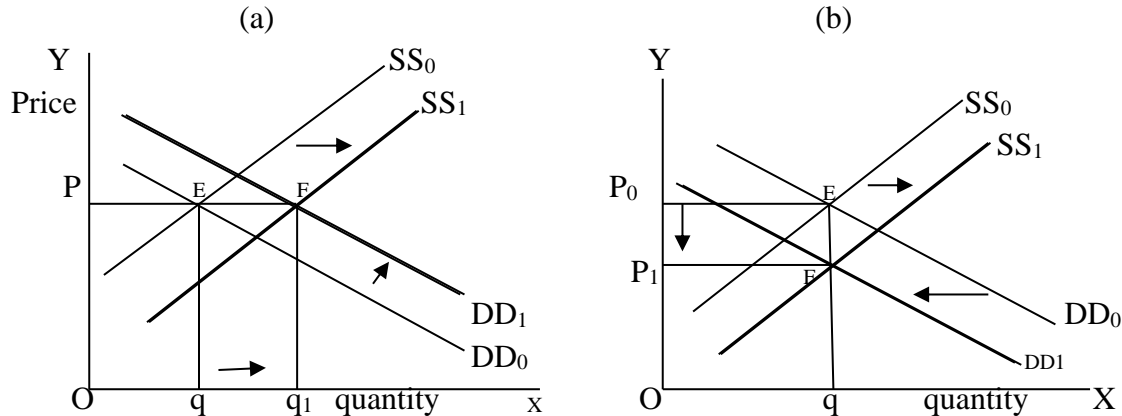   f) Supply curve shifts rightward and demand curve shifts leftward.
           The simultaneous shifts of demand and supply curve in perfect competition can be represented in the following table:

Shift in Demand	Shift in Supply	Quantity	Price
Leftward	Leftward	Decreases	May increase, decrease or remain constant
Rightward	Rightward	Increases	May increase, decrease or remain constant
Leftward	Rightward	May increase, decrease or remain constant	Decreases
Rightward	Leftward	May increase, decrease or remain constant	Increases

           In the above table, each row of the table describes the direction in which the equilibrium price and quantity will change for each possible combination of the simultaneous shifts in

demand and supply curves. For instance, from the second row of the table, we can notice that due to a rightward shift in both demand and supply curves, the equilibrium quantity increases invariably but the equilibrium price may increase or decrease or remain constant.

The following diagrams depict the second and third cases of the above table:

In the above diagram (a) initially, the equilibrium is at E where the demand curve DD_0 and supply curve SS_0 intersect. Here, both supply and demand curves shift rightward where the price remains constant at P but the equilibrium quantity moves from q to q_1.

Similarly, in diagram (b), the supply curve shifts rightward and demand curve shifts leftward where the equilibrium quantity remains same but the equilibrium price decreases from P to P_1.

Therefore, the rightward shifts in both demand and supply curves leads to increase in the equilibrium quantity and equilibrium price remaining constant. The equilibrium quantity remains same and the price decreases if there is leftward shift in demand curve and a rightward shift in supply curve.

Project oriented question:

1. **Draw a diagram for the following table and identify the equilibrium point, equilibrium price, equilibrium quantity, excess demand and excess supply in the diagram.**

P	QD	QS
1	50	10
2	40	20
3	30	30
4	20	40
5	10	50

Ans:
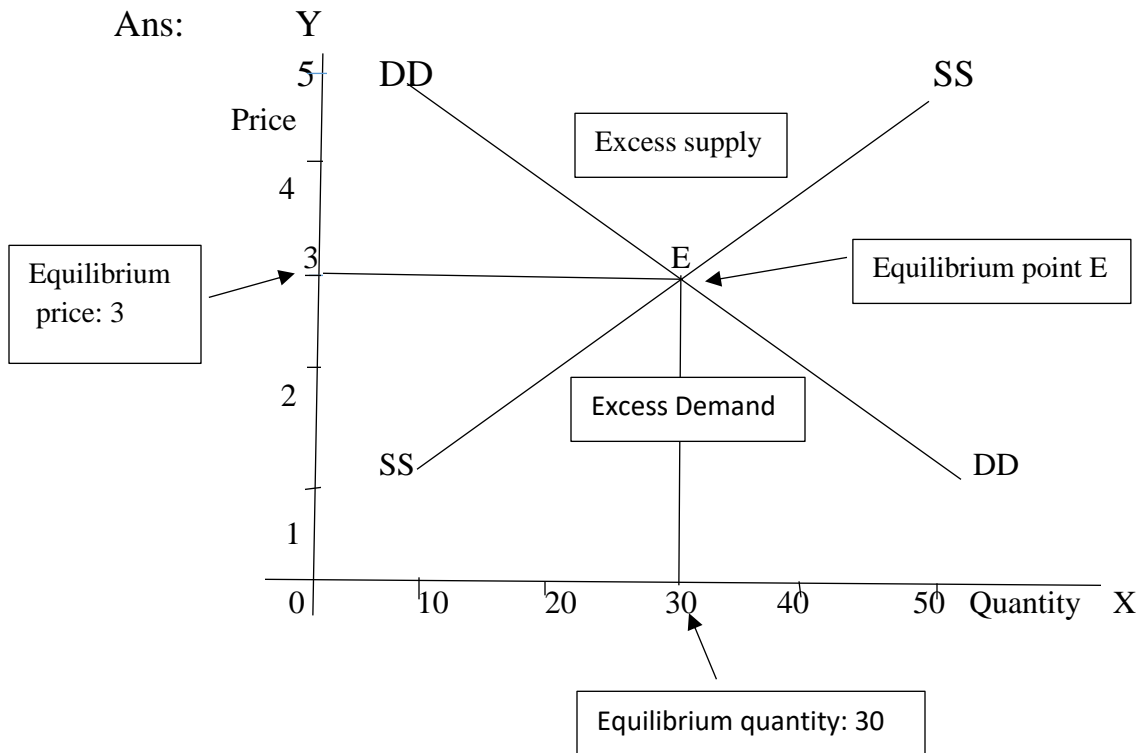
The equilibrium point is obtained at point E where DD curve intersects SS curve. In the table, Demand and Supply are equal at 30. Therefore, Equilibrium quantity is 30. The equilibrium price is 3 at which equilibrium quantity of 30 is bought and sold.

■■

Harish.B,

Lecturer in Economics

GPUC, Shivajinagar, Bangeluru