Economics

(Micro-economics)

Chapter 2: THEORY OF CONSUMER BEHAVIOUR

THEORY OF CONSUMER BEHAVIOUR

The Consumer's Budget

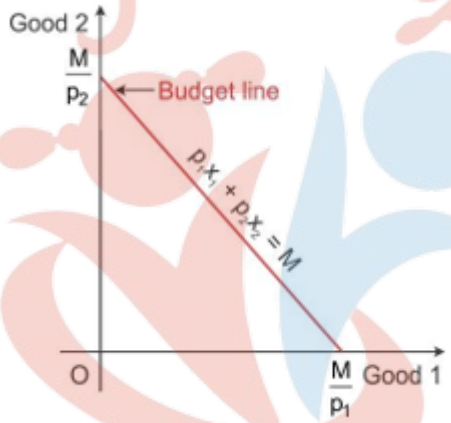
The consumer's budget is the real purchasing power of consumer from which he/she can purchase the certain quantitative bundles of two goods at a given price.

Budget set

Budget set refers to attainable bundles of a set of two goods, given the prices of goods and income of the consumer.

Budget line

A budget line shows set of bundles of good x_1 and good x_2 which a consumer can buy at the given income M and the prices of two goods p_1 and p_2.



Quantity of good 1 is measured on the X-axis and the quantity of good 2 is measured on Y-axis. Any point in the given diagram shows the bundle of two goods. The budget set is represented in the figure which consists of all points on or below the straight line having the equation $p1x1 + p_2x_2 = M$. This line consists of all bundles whose cost is equal to

M. This line is called budget line. This budget line is drawn on the assumptions that the consumers budget is Rs 30, price of a good 1 = Rs 2 per unit and price of good 2 = Re 1 per unit. Accordingly, maximum 15 units of good 1 are purchased when entire budget is spent on good 1 and maximum 30 units of good 2 can be purchased when entire amount is spent on good 2.

Equation of the budget line $p_1x_1 + p_2x_2 = M$

Slope of the budget line = $-p_1/p_2$

i.e. the ratio of prices of two commodities

Preferences of the Consumer

Consumer's behaviour is governed by monotonic preferences. It means that a rational consumer always prefers more of a good as it offers the consumer a higher level of

satisfaction.

Indifference curve

An indifference curve is the curve which represents all those combinations of two commodities which give the same level of satisfaction to a consumer. It slopes downward because an increase in the amount of good 1 along the indifference curve is associated with a decrease in the amount of good 2 as the preferences are monotonic.

Marginal Rate of Substitution (MRS) means the rate at which the consumer is willing to substitute one commodity for the other commodity.

MRS_{xy} = Quantity of the good sacrificed / Quantity of the good obtained.

Properties of indifference curves

- Higher indifference curve offers higher preferences to consumers
- IC_s are convex to the origin because MRS tends to diminish
- IC_s are sloped downwards or negatively sloped
- IC_s never touch or intersect each other

Indifference map

Indifference map refers to a set of indifference curves corresponding to different income levels of the consumer. An indifference curve which is to the right shows a higher level of satisfaction to the consumer. Here, IC_3 shows higher level of satisfaction than IC_2. Thus, the indifference curve relates to a higher level of income of the consumer.

Utility

Utility is the amount of satisfaction which a consumer derives from the consumption of a commodity. A utility function means assigning numbers to all the available bundles. Let us consider any two bundles, if one is preferred to the other, then the preferred bundle gets assigned a higher utility and if the two bundles are indifferent, they are assigned the same utility number.

Equality of the marginal rate of substitution and the ratio of prices

The optimum bundle of the consumer is located at the point where the budget line is tangent to an indifference curve. When the budget lines is tangent to an indifference curve at a point, the absolute value of the slope of the indifference curve and of the budget line are equal at that point i.e. MRS is equal to the price ratio. The slope of the budget line is the rate at which the consumer is able to substitute one good for the other in the market. At the optimum, the two rates should be the same. Thus, a point at which the MRS is greater, the price ratio cannot be the optimum as well as when the MRS is less then the price ratio cannot be the optimum.

Concept of Demand

Demand for a good refers to the desire to buy a good, backed with sufficient purchasing power and the willingness to spend.

Individual Demand and Market Demand

Individual demand for a commodity is the quantity of a commodity which an individual household is willing to buy at a particular price during a specific period.
Market demand is the horizontal summation of individual demands in the market. It indicates various quantities of a commodity which all consumers in the market are willing to buy at different possible prices of that commodity during a specific period.

Law of Demand

The Law of Demand states that while other things remaining constant, the quantity of a good demanded increases with a fall in the price and diminishes when the price increases.

Main Assumptions of the Law of Demand

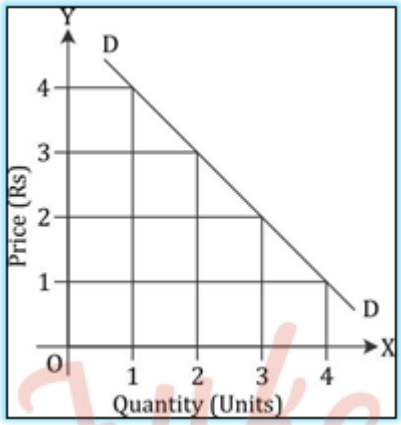
- Prices of related goods do not change
- Incomes of consumers do not change
- Tastes and preferences of consumers remain constant
- No expectations from the consumer to make a change in the price of a commodity in the near future

Demand Schedule and Market Schedule

Demand schedule is a chart or a table showing the quantities of a commodity, demanded at various prices.

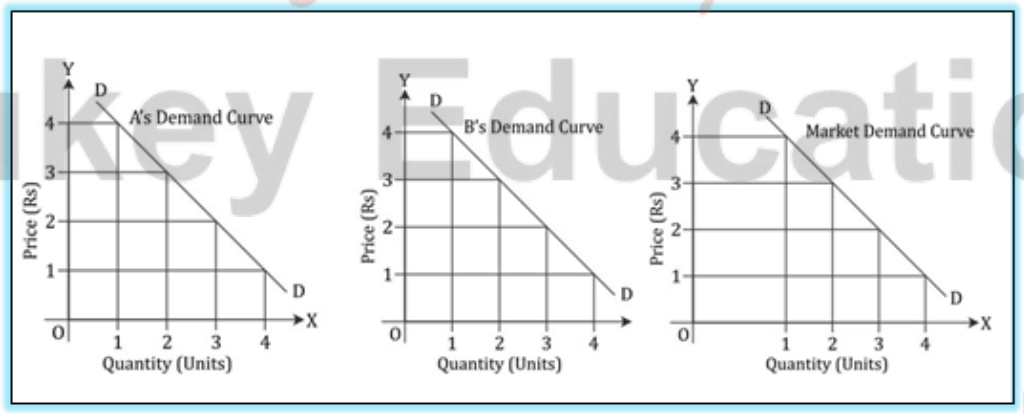
Market demand schedule shows the total demand for the commodity in the market at various prices.

Individual Demand Curve and Market Demand Curve



The individual demand curve is a curve showing different quantities of a commodity which one particular buyer is willing to buy at different possible prices of the commodity at a point of time. In the diagram, the quantity of a commodity is given on the x-axis and the price on the y-axis. DD is the demand curve representing the individual demand schedule. The demand curve slopes downward from left to right, indicating an inverse relationship between the price and the quantity demanded.

The market demand curve is the horizontal summation of the individual demand curves. It indicates various quantities of a commodity which all consumers in the market are willing to buy at different possible prices ofthe commodity at a point of time. The diagram below shows that the market demand curve represents the market demand schedule assuming two consumers A and B in the market. The market demand curve also slopes downward indicating an inverse relationship between the price and quantity demanded.



Why does the demand curve slopes downward to the right?

The demand curve slopes downward because more goods are purchased in response to a fall in price. Thus, there is a inverse relationship between the price of a good and its quantity demanded.

Factors responsible for the downward sloping demand curve:

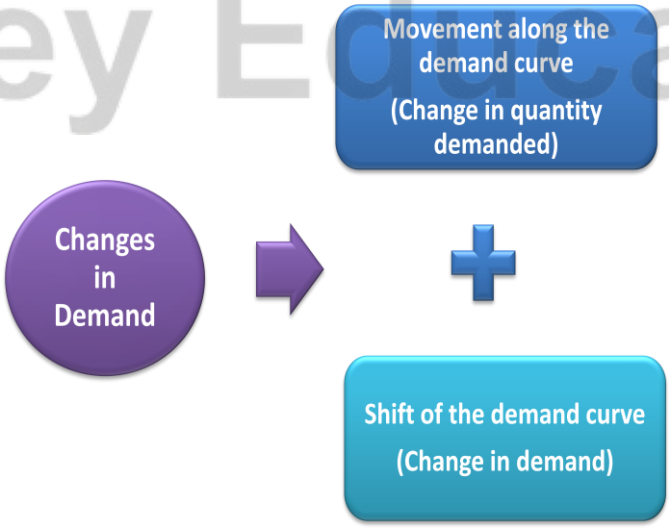
- Law of diminishing marginal utility: The additional utility which the consumer derives from the additional consumption of any commodity is known as marginal utility. A consumer gets maximum satisfaction from the consumption of a commodity when the price paid for the commodity is just equal to its marginal utility. If the consumer consumes more of that commodity at any given time period, the marginal utility will gradually fall. This is called the law of diminishing marginal utility.
- Substitution effect: Substitution of one commodity for the other when it becomes relatively cheaper
- Income effect: A change in quantity demanded when real income of the buyer changes as a result of change in price of the commodity.

Exceptions to the Law of Demand

- **Giffen effect:** A typical inferior commodity consumed by poor people may display an odd behaviour. When the price of such a commodity rises, the poor people may cut down on their purchases of other expensive items and increase their purchases of this commodity.
- **Bandwagon effect:** The bandwagon effect means that the consumer's demand for a commodity is influenced by the taste and preference of the social class to which the consumer belongs.

Changes in Demand

Demand for any commodity depends on several factors besides its price. These factors were categorised as price of the commodity in category 1 and all factors other than price in category 2. Based on these categories of factors influencing demand, changes in demand are divided into change in quantity demanded and change in demand.



Change in Quantity Demanded and Change in Demand:

Change in quantity demanded is the movement along the demand curve i.e. the extension of demand caused by a decrease in the price of the same good and the contraction of demand caused by an increase in the price of the same good.

Change in demand means the shift in the demand curve i.e. the decrease in demand or the backward shift in the demand curve caused by a change in factors other than the price of the good and an increase in demand or a forward shift in the demand curve caused by a change in factors other than the price of the good.

Causes behind Shifts of Demand

- Change in income: If there is an increase in income of the consumers, they will usually buy more of any particular commodity and the demand curve will shift to the right. A fall in income will usually shift the curve to the left. This is applicable to most goods which are normal goods.
- Price of other commodities: If the price of substitute goods falls, consumers will be attracted to the other goods and the demand for the good to consume will fall at any given price. Hence, the demand curve will shift to the left. Likewise, a rise in the price of a substitute will shift the demand curve to the right. If the price of the complementary goods falls, consumers will buy more of the complementary goods and the demand for the good to consume will also rise at any given price. Hence, the demand curve will shift to the right. Similarly, a rise in the price of complementary goods will shift the demand curve to the left.
- Consumer preference: If the producers spend more money on a product advertisement at any given price, consumers will demand the commodity in greater quantities than before. Hence, the demand curve for the commodity will shift to the right. Likewise, if consumers develop distaste for a commodity, the demand curve will shift to the left.

Elasticity of Demand

The elasticity of demand measures the responsiveness of the quantity demanded for a good to a change in its price, price of other goods and changes in the consumer's income. Alfred Marshall was the first economist to develop the concept of price elasticity of demand as the ratio of a relative change in quantity demanded to a relative change in price.

Degrees of Price Elasticity of Demand:

- **Perfectly inelastic demand:** The demand curve will be parallel to the y-axis. If the price increases or decreases, the quantity demanded remains fixed i.e. ed = 0.
- **Inelastic demand:** The slope of an inelastic demand curve is steep when a large change in the price does not bring about a significant change in the demand i.e. ed < 1.

- **Unit elastic demand:** The demand curve will be a rectangular hyperbola as it extends to both axes.
- Percentage change in the demand is equal to percentage change in the price i.e. ed = 1.
- **Elastic demand:** The demand curve is a flat curve when the percentage change in the demand is much greater than the percentage change in price i.e. ed > 1.
- **Perfectly elastic demand curve:** The demand curve is parallel to the x-axis. A small change in the price causes an infinitely large change in the amount demanded i.e. ed ∞ 1.

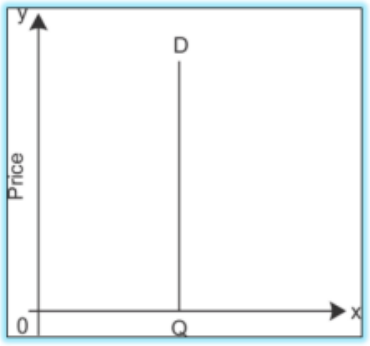


Fig 1: Perfectly Inelastic Demand

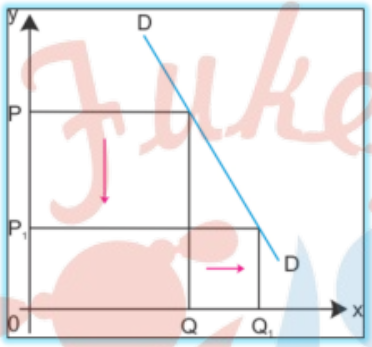


Fig 2: Inelastic Demand

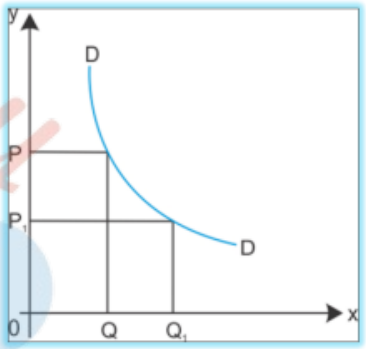


Fig 3: Unit Elastic Demand

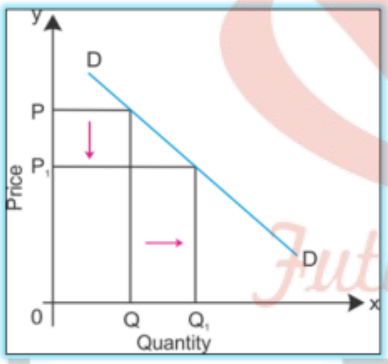


Fig 4: Elastic Demand

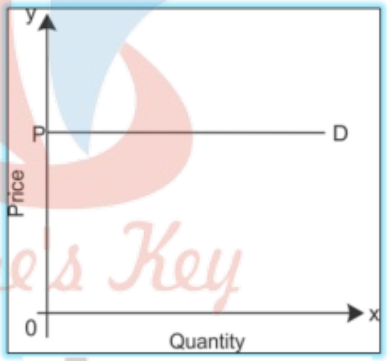


Fig 5: Perfectly Elastic Demand

Factors Affecting Elasticity of Demand

Factors	Nature of the Factor	Elasticity of Demand
• Number of commodity	○ Necessary items ○ Luxury items	○ Relatively inelastic ○ Relatively elastic
• Number of substitutes	○ Many ○ Few	○ Relatively elastic ○ Relatively inelastic
• Variety of uses	○ Many ○ Few	○ Relatively elastic ○ Relatively inelastic
• Income of the purchaser	○ High income group ○ Low income group	○ Relatively inelastic ○ Relatively elastic
• Habit of the purchaser in consuming any commodity	○ Habituated ○ Not habituated	○ Relatively inelastic ○ Relatively elastic
• Durability of the goods	○ Durable ○ Non-durable	○ Relatively inelastic ○ Relatively elastic
• Importance of the commodity in consumer's budget	○ Insignificant share ○ Significant share	○ Relatively inelastic ○ Relatively elastic
• Possibility of postponing consumption	○ Possible ○ Impossible	○ Relatively elastic ○ Relatively inelastic
• Price level	○ High ○ Low	○ Relatively elastic ○ Relatively inelastic
• Time	○ Short-run ○ Long-run	○ Relatively inelastic ○ Relatively elastic

Method of Measurement

Total expenditure method, proportionate method and geometric method are the three different methods to measure the price elasticity of demand.

The price elasticity of demand for a good is the percentage change in demand for the good divided by the percentage change in its price. Price elasticity of demand is a pure number and it does not depend on the units in which the price of the good and the quantity of the good are measured. Price elasticity of demand is a negative number as the demand for a good is negatively related to the price of a good. ep = Percentage change in the demand for the good/Percentage change in the price of the good.

$$e_p = \frac{\Delta Q/Q \times 100}{\Delta P/P \times 100} \text{ (or) } e_p = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Where ep = Price elasticity of demand, ΔQ Change in demand,

ΔP Change in price, Q original demand and P original price.

Absolute changes in price and quantity are measured in original units, whereas relative changes are not based on units of measurement. They are calculated as percentage changes in price and quantity.

- The total expenditure method measures the elasticity of demand. The changes in expenditure with a change in the price of a good are measured by this method. Three possible situations in this method:
- If a rise or fall in the price of a good has no change in its total expenditure, then the elasticity of demand is unitary.

- If with a fall in the price of a good, the total expenditure increases, and if with a rise in the price of a good, the total expenditure decreases, then the demand for this good is greater than unitary elastic.
- If with a fall in the price of a good, the total expenditure decreases, and if with a rise in the price of a good, the total expenditure increases, then the demand for this good is less than unitary elastic.

Importance of Elasticity of Demand

The concept of elasticity of demand has been applied in a variety of fields in Economics such as price setting, wage bargaining, determining the international terms of trade, indirect taxation and devaluation policy.

Types of Elasticity of Demand

- The price elasticity of demand for a good is the percentage change in the demand for the good divided by the percentage change in its price.
- ep = Percentage change in the demand for the good/Percentage change in the price of the good
- The income elasticity of demand shows the tendency in quantity demanded for any commodity because of 1% change in the money income of the consumer.
- ed = Percentage change in quantity demanded/Percentage change in money income
- The geometric method measures the elasticity of demand at different points on the demand curve and is also known as the point method of measuring the elasticity of demand.
- eg = Lower segment of the demand curve/Upper segment of the demand curve
- The cross elasticity of demand measures the responsiveness of demand of a commodity to a change in the price of other related commodity.
- ec = Percentage change in demand of commodity X / Percentage change in price commodity Y

Class : 11th Economics (Microeconomics)
Chapter-2 : Theory Of Consumer Behaviour

Budget Line
Shows all the combinations of two commodities that a consumer can afford at given market prices and within the particular income level.

Condition of Consumer Equilibrium
•$MRSxy = \frac{MUx}{MUy} = \frac{Px}{Yy}$
• Indifference curve should be convex to origin.

Law of Diminishing marginal Utility
The law of diminishing marginal utility is a law of economics stating, that as a person increases consumption of a product, there is decline in the marginal utility that person derives from consuming each unit.

Budget Set
Set is the set of bundles of goods an agent can afford

Meaning
A graph that shows a combination of two goods that give a consumer equal satisfaction and utility thereby making the consumer indifferent.

Condition of consumer Equilibrium using marginal Utility
• Marginal utility of last rupee spent on each commodity is same.
• Marginal utility fails as **consumption** increases.

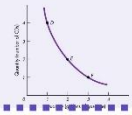
The Consumer Budget

Indifference Curve

Consumer Equilibrium through Indifference curve Analysis

Preference of the Consumer

Shape of Indifference Curve
• Convex to origin
• Downward sloping.

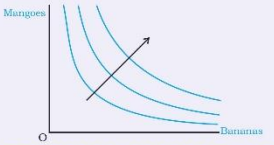


Marginal Utility
The benefit gained by consuming one additional unit of product or service.

Consumer's Equilibrium

Utility
Utility is a measure of preferences over some set of goods and services. It represents satisfaction experienced by the consumer from a good.

Indifference Map
The graph representation of two or more indifference curves showing the several combination of different quantities of commodities, which consumer consumes



Consumer's Equilibrium & Demand

Demand

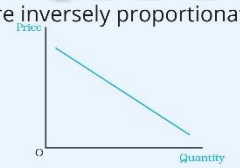
Meaning
Quantities of a commodity or a service that people are willing and able to buy at various prices

Demand analysis

Measurment
$e_D = \frac{\text{percentage change in demand for the good}}{\text{percentage change in the price of the good}}$

Price Elasticity of Demand

Demand Curve & Low of Demand
Law of demand states that the demand and price of a commodity are inversely proportionate



Factor Affecting
• Number of Close Substitutes,
• Switching Cost,
• Degree of necessity,
• Habits of Consumers.

Perfect Elastic
ed =∞, Does exist in real life

Perfect Inelastic
ed =0 e.g., Demand for rare medicine.

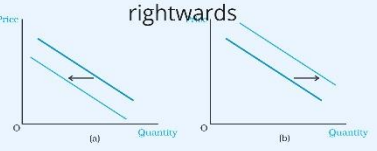
Unitary Elastic
ed =1, There is no perfect example of it. Close example is Clothing.

Forms

Relatively Elastic
ed >1, e.g., furniture, motor vehicles, etc.

Relatively Inelastic
ed <1, e.g., gasoline, salt, food, etc.

Shift in Demand curve
If the prices of other goods, the consumer's income and her tastes and preferences change, demand curve shifts leftwards or rightwards



Important Questions

Multiple Choice Questions-

1. Who gave the cardinal concept of utility?
   (a) Marshall
   (b) Pigou
   (c) Hicks
   (d) Samuelson
2. Consumer's behaviour is studied in:
   (a) Micro Economics
   (b) Macro Economics
   (c) Income Analysis
   (d) None of these
3. Which of the following statement is true ?
   (a) Utility means want-satisfying power
   (b) Utility is a function of intensity of desire
   (c) Desire of consumption gives birth to utility
   (d) All of these
4. Which is the First Law of Gossen?
   (a) Law of Demand
   (b) Law of Diminishing Marginal Utility
   (c) Law of Equi-marginal Utility
   (d) Consumer's Surplus
5. Which of the following is a characteristic of utility ?
   (a) Utility is a psychological phenomenon
   (b) Utility is subjective
   (c) Utility is a relative concept
   (d) All of these
6. How we calculate marginal utility ?

(a) ΔTU/ΔQ

(b) ΔMU/ΔQ

(c) ΔQ/ΔTU

(d) ΔQ/ΔMU

7. When TU becomes maximum, MU is:

(a) Positive

(b) Negative

(c) Zero

(d) None of these

8. Which of the following is true ?

(a) TU increases till MU is positive

(b) TU is maximum when MU is equal to zero

(c) TU declines when MU is negative

(d) All of these

9. Who basically propounded the concept of Law of Equimarginal Utility ?

(a) Marshall

(b) Gossen

(c) Ricardo

(d) J. S. Mill

10. In difference curve is:

(a) Convex to the origin

(b) Concave to the origin

(c) Both (a) and (b) true

(d) All of these false

11. The ability of satisfying human want in a goods is called its:

(a) Productivity

(b) Satisfaction

(c) Utility

(d) Profitability

12. Slope of budget line or price line is:

(a) –PxPy

(b) –PyPx

(c) +PxPy

(d) +PyPx

13. Utility is related to:

(a) Usefulness

(b) Morality

(c) Satisfaction of human wants

(d) All the above

14. Utility can be measured by:

(a) Money

(b) Exchange of goods

(c) Weight of the good

(d) None of these

15. Law of Equi-marginal utility is called:

(a) Law of increasing utility

(b) Law of diminishing utility

(c) Law of substitution

(d) None of these

Very Short:

1. How is total utility derived from the marginal utility?
2. An individual bought 50 units of a product at Rs. 4 per unit. When the price falls by 25% it demand rises to 100 unit. Find the price elasticity of demand.
3. Which curve shows the various combination of two products that give the same amount of satisfaction to the consumer?
4. Define Utility.
5. State the law of equi-marginal utility.
6. What will be the MU when TU is maximum?
7. What is the reason behind a convex indifference curve?

8. Which direction the indifference curve slope?
9. What is a consumer surplus?
10. What is the point of satiety?

Short Questions:

1. Distinguish between 'increase in demand' and 'increase in quantity demanded' of a commodity.
2. Given price of a good, how does a consumer decide as to how much of that good to buy?
3. Explain how the demand for a good is affected by the price of its related goods? Give examples.
4. Distinguish between normal goods and inferior goods. Give example also.
5. Explain any four factors that affect price elasticity of demand.
6. Define marginal utility. State the law of diminishing marginal utility.
7. If a good can be used for many purposes, the demand for it will be elastic. Why?
8. "If a product price increases, a family's spending on the product has to increase." Defend or refute.
9. Suppose there are 30 consumers for a good, having identical demand function: d(p) =10-3P for any price less than or equal to 10/3 and d(p)=0 for any price greater than 10/3. Write the market demand function.
10. How would you comment on the elasticity of demand when 8% decrease in price of a

Long Questions:

1. Is the demand for the following elastic, moderate elastic, inelastic? Give reason.
   (a) Demand for petrol
   (b) Demand for textbooks
   (c) Demand for cars
   (d) Demand for milk
2. Explain four determinants of demand for a commodity.
3. Describe the assumption which is made to determine the consumer's equilibrium position.
4. Explain relationship between total utility and marginal utility with the help of a schedule.
5. Given e_D = - 0.02, and percentage increase in price = 20%, find change in expenditure on the commodity.

MCQ Answers:

1. (a) Marshall
2. (a) Micro Economics
3. (d) All of these
4. (b) Law of Diminishing Marginal Utility
5. (d) All of these
6. (a) ΔTU/ΔQ
7. (c) Zero
8. (d) All of these
9. (c) Ricardo
10. (a) Convex to the origin
11. (c) Utility
12. (a) –PxPy
13. (d) All the above
14. (a) Money
15. (c) Law of substitution

Very Short Answers:

1. The total utility is the total sum of marginal utilities of different unit of goods.

   TUn = MU1 + MU2 + MU3…….MUn
2. Elasticity of demand is 4.
3. Indifference Curve
4. The "Utility" in economics determines the satisfaction received or expected to be acquired from the consumption of product and services.
5. The law of equi-marginal utility refers to a balanced position where a consumer distributes his income between different goods in such a way that the value derived from the last rupees is the same as the first one.
6. The MU will be zero when TU is maximum.
7. The reason behind a convex indifference curve is the diminishing marginal rate of substitution.
8. The indifference curve slopes downward to the right.
9. Consumer surplus is defined as the difference between what the consumer wants to

pay for a product and what he actually pays.

10. The point of satiety is when the marginal utility becomes zero.

Short Answers:

1. When demand increases at given price then it is called 'increase in demand'. On the other hand, when demand increases by decrease in the price of a commodity then it is called increase in quantity demand.
2. Consumer purchases up to the point where marginal utility is equal to the price (MU=P). So long as marginal utility is greater than price, he keeps on purchasing. As he makes purchases MU falls and at a particular quantity of the good MU becomes equal to price. Consumer purchases up to this point.
3. Related goods are either substitutes or complementary

   Substitutes Goods: When price of a substitute falls, it becomes cheaper than the given good. So the consumer substitutes it for given good will decrease. Similarly, a rise in the price of substitute will result in increase in the demand for given good.

   For example: Tea and Coffee.

   Complementary Goods: When the price of a complementary good falls its demand rises and the demand for the given good will increase. Similarly when price of complementary good increases, then demand for given good decreases.

   For example: Car & Petrol.
4. **Normal Goods:** These are the goods the demand for which increases as income of the buyer rises. There is a positive relationship between income and demand or income effect is positive.

   Example: Rice, Wheat

   Inferior Goods: These are the goods the demand for which decreases as income of buyer rises. Thus, there is negative relationship between income and demand or income effect is negative.

   Example: coarse grain, coarse cloth.
5.

   1. **Nature of Commodity**: Necessaries like Salt, Kerosene oil etc. have inelastic demand and luxuries have elastic demand.

   2. **Availability of substitutes**: Demand for goods which have close substitutes is relatively more elastic and goods without close substitutes have less elastic demand.

   3. **Different uses**: Commodities that can be put to different use have elastic demand for instance electricity has different uses.

   4. **Habit of the consumer**: Goods to which consumers become habitual will have

inelastic demand.

Examples – Liquor and Cigarette.

6. **Marginal Utility**: It is addition more to the total utility as consumption is increased by one more unit of the commodity.

   Law of Diminishing Marginal utility: It states that as consumer consumes more and more units of a commodity, the utility derived from each successive unit goes on decreasing. According to this law TU increases at decreasing rate and MU decreases

7. If a good can be used for many purposes , the demand for it will be more elastic because with a decrease in its price it is put to several uses and with a rise in its price it is withdrawn from its many existing uses. So that, there is a considerable change in demand in response to some change in price.

8. When product price increases, expenditure on the commodity will not increase in the situation when Ed>1 (elasticity of demand is greater than unity). It will increase only in situation when Ed<1. In a situation when Ed=1. Expenditure will remain constant, even when prices rise.

9. Market demand function is simply a horizontal summation of individual demand functions. Since demand function for all the 30 consumers is identical, we can write market demand simply as 'individual demand function multiplying by a factor of 30'.

   Thus: Individual demand function:

   D(p)= 10-3P

   Market demand function:

   Md(p)=10 x 30 – 3 (30)P

   = 300-90 P.

   commodity causes 2% increase in expenditure of the commodity?

10. Elasticity of demand must be greater than unity (implying a situation of elastic demand) when expenditure on the commodity responds inversely to any change in price of the commodity.

Long Answers:

1.

(a) The demand for petrol is moderately elastic as when the cost of petrol rises, the customers will decrease the use of it.

(b) The demand for textbooks is inelastic because even if the price rises the demand will never change.

(c) The demand for cars is elastic as it is a luxury good so when the price of a car goes up, the demand for it comes down

(d) The demand for milk is elastic because when the price of the milk increases the

consumer starts taking less quantity of milk.

2. The four determinants of demand for a commodity are mentioned below.

- Price of Commodity- When the cost of the good increases the demands of it decreases and vice-versa.
- Income of the consumer- When the income of a customer increases, the demand for normal goods also increases and vice-versa.
- Price of related goods- In a complementary product, demand increases with the decrease in the price of complementary goods. In terms of a substitute, the demand for goods decreases with the fall in the price of other substitute goods.
- Taste and preference of customer- With the change in people's taste and liking demand increases and with the decrease in taste demand decreases.

3. The assumption which is made to determine the consumer's equilibrium position are mentioned below.

- Rationality- The consumer has a rational behavior, they want to consume maximum from his given income and price
- Utility in Ordinal- It is assumed that the consumer ranks his performances according to that satisfaction from each combination of products.
- The Consistency of Choice- It is also assumed that the customer's choices are consistent.
- Perfect Competition-The perfect competition in the market form in which large number of sellers are selling homogenous product.
- Total Utility- This depends on the total quantities of product consumed by the consumer.

4.

Quantity (Units)	Total utility	Marginal utility
0	0	–
1	8	8
2	14	6
3	18	4
4	20	2
5	20	0
6	18	– 2

1. As long as MU is positive, TU increases.
2. When marginal utility is equal to zero then total utility is maximum.
3. When marginal utility is negative; Total utility starts diminishing.

5.

$$\frac{\Delta q}{p} \times 100 = 20$$

$$\uparrow$$

$$Percentage\ change\ in\ price$$

$e_D = -0.02, so\ that$

$$\frac{\frac{\Delta q}{p} \times 100}{\frac{\Delta p}{p} \times 100} = -0.02$$

OR

$$\frac{\frac{\Delta q}{q} \times 100}{20} = -0.02$$

OR

$$\frac{\Delta q}{q} \times 100$$

(%change in quantity demanded)=-0.02 20=-0.4

Implying 4% decrease in quantity demanded owing to 20% increase in price of the commodity.

We know,

Old expenditure = P Q

New expenditure =P(1+0.2) Q(1-0.04)

Percentage change in expenditure

$$= \frac{New\,\text{exp}\,enditure - Old\,\text{exp}\,enditure}{Old\,\text{exp}\,enditure} \times 100$$

$$= \frac{P(1+0.2) \times Q(1-0.04) - PQ}{PQ} \times 100$$

$$= \frac{PQ(1.2)(0.96) - PQ}{PQ} \times 100$$

$$= \frac{[(1.2)(0.96) - 1]PQ}{PQ} \times 100$$

= 1.152-1 100

= 0.152 100 =15.2

Implying that expenditure on the commodity increases by 15.2% owing to increase the

commodity by 20%. Which is why ed is less than 1.