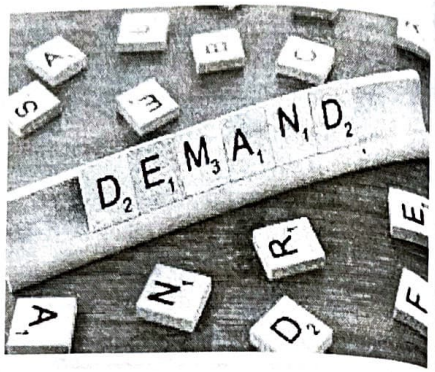
Unit - 3 Estimation of Demand



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➤ Objective Study
➤ Self Study

1. Concept of Demand

Introduction : In managerial economics, the most important problem is that of taking business decisions. It is necessary to make analysis of market demand to take decisions regarding production of particular goods, the quantity of production etc. The main objective of demand analysis is to find out the factors determining sales and measuring their effects. The process of production is managed in this way.

What are the determinants of market demand ? What are their effects on market demand and in what proportions ? What is the elasticity of demand of a commodity ? What are the effects of advertisements on sales ? etc. are known in this manner.

The scope and objectives of analysis of market demand in pure economics and managerial economics are quite different. In pure economics, principles of demand analysis are discussed mainly. While in managerial economics, how the market demand analysis is used in practice is studied. The objective of pure economics is to study rational behaviour of a consumer through market demand analysis. While the objective of managerial economics is to know how demand factors affect entire market trends through market demand analysis. On the basis of this analysis, what the demand will be in future is forecast. How the demand of a commodity can be changed through changes in sales cost is estimates. The decisions regarding production, raw material etc. are taken. Thus, in managerial economics, the estimate of demand is made through market demand analysis and the process of production is arranged accordingly. What should be the sale in future ? What should be the price policy ? What should be the policy regarding quality of production ? etc. are decided on the basis of market demand analysis.

The objective of market demand analysis is to make maximum sales and profit. For this estimation of demand, demand forecasting and knowledge of determinants of market demand and types of demand are necessary. The manager analyses market demand and frames policy regarding production of goods, distribution, pricing etc. and produces maximum goods at minimum cost and earns maximum profit.

2. Meaning and Definition of Demand :

"At any time and place, at a certain price, if a consumer has a desire to buy + capacity to buy + readiness to pay and if the commodity is available, it is called demand."

Definitions of Demand :

- **Aldred Marshall** defined demand as, "Demand is the quantity of a comodity which will be bought at a given prie at a given time."
- **John Maynard Keynes** described aggregated demand as, "The total amount of goods and servies demanded in the economy at a given overall price level and in a given period.
- **Paul Samuelson** defined demand as "Demand is a schedule of the quantities of a goods that will be bought per unit of time at various prices, other things being equal.

3. Difference between Desire and Demand : If a person has desire to buy a car but he has no capacity to satisfy that desire, the desire does not result in demand. e.g. A beggar's desire to buy a car is not a demand

In the same, if a person has a desire to buy a car and also has a capacity to buy it but he is to ready to pay the market price of a car, the desire and capacity to buy doesn't end in demand. Thus, desire to buy must be backed by capacity to buy and readiness to pay. Then only the demand takes place.

In economics, demand is discussed in the context of a certain time. Demand changes with time. e.g. If we say that there is a demand of 100 quintal mangoes, it is not clear because demand can be for a day, for a week or a month. Here, there is no clarity in statement. The demand is made in the context of time. To say there in June, there was a demand of 100 quintal mangoes is still not clear because the demand depends on prices. Therefore, demand must be expressed in the context of time and price. In the same way, availability of a commodity is also an important pre-condition for a demand. In a communist country, if a person wants to buy an air-conditioned car, he has capacity to buy and readiness to pay but if AC cars are not available, the demand cannot take place. Desire is the first step of demand but to turn desire into demand, it must pass through different phases.

2. Types of Demand

1. **Introduction :** Analysis of types of demand is important in principles of economics but it is more important in managerial economics. It is necessary to make necessary analysis of demand, in order to take decisions. What should a firm produce and in what quantity ? It can be decided with the help of such analysis. If the manager has knowledge of factors affecting demand and the types of demand, we can make proper estimates of demand and forecasting for demand in changing circumstances.

➢ **Meaning of Demand :** "At any time, any place, at certain price the desire of a consumer to purchase a commodity + capacity of purchase + readiness to pay the price if commodity is available, it is called demand."

In the market, the total of demands made by individual consumers at different prices is called market demand.

2. **Kinds (types) of Demand :** Following are the types of demand.

(1) Individual demand and market demand.
(2) Demand of consumer goods and demand of industrial product.
(3) Demand of Perishable goods and demand of durable goods.
(4) Derived demand and autonomous demand
(5) Demand of a firm and demand of an Industry.
(6) Demand of the entire market and demand of a part of the market.
(7) Short run demand and long run demand..

1 Individual Demand and Market Demand :

(A) Individual Demand : Individual demand refers to the demand for a commodity from the individual point of view. The quantity of a good that a consumer would buy at a given price during a given period of time is his individual demand for that particular good.

(B) Market Demand : Market demand is defined as the total amount of purchases of a product on family of products within a specific demographic. The demographic may be based on factors such as age, gender or involve the total amount of sales that are generated in a particular geographic location.

2 Demand of Consumer's Goods and Producer's Goods :

(1) Demand of Consumer's Goods : Consumers' goods can be defined as demand for such goods would satisfy consumer's want directly. It means that the goods which are used for final consumption is known as consumer's good. e.g. ready made clothes, prepared food residential house. Consumer goods may be further devided into (i) durable and (ii) non-durable goods.

(i) Durable goods : Durable consumers goods are those which go on being used over a period of time. e.g. a car, a refrigerator, an umbrella, an electric bulb, a ready - made shirt.

(ii) Non - durable goods : The non-durable consumer goods are those which can not be consumed more than once e.g. sweets, bread, milk etc.

(2) Demand of Producer's Goods : Producer's goods are those which are used for the production of other goods - either consumer goods or producer goods themselves E.g. machines looms, tools etc. Producers' goods can also be classified into two types :

(i) Perishable goods (ii) Durable goods :

(i) Perishable Producer's goods : The things that can be used once, are perishable producer's goods e.g. cement, coal etc.

(ii) Durable Producer's goods : The goods that can be used more than once are durable producer's goods e.g. Machines, tools etc.

(3) Difference between Demand of Consumer's goods and Producer's goods :

No.	Demand of Consumer's Goods	Demand of Producer's Goods
(1)	It is a demand made by consumers.	It is a demand made by producers or entrepreneurs.
(2)	It satisfies direct need. It is therefore, a direct demand.	It satisfies the need indirectly. It is the derived demand.
(3)	It depends on the income of the consumers.	The demand depends on the demand of goods used in production.
(4)	It is demanded to satisfy the demand of consumer's goods.	It is demanded by businessmen for the purpose of profit.

3 Demand of Perishable Goods and Durable Goods :

(a) Demand of Perishable Goods : The thing that can be used for once only is called perishable. Such thing can be consumption commodity or productive commodity e.g. Milk is a consumption commodity and cement is a productive comodity.

Characteristics : (1) Such things have a very short life, because they cannot be stored. (2) Such things have to be sold immediately (3) The demand of such things are changing. (4) The demand fo such things depends on the price of commodity and the present income of the consumer.

(b) Demand of Durable Goods : The things which can be used more than once during a certain period are durable goods e.g. shoes are consumption goods while a machine is productive commodity.

Characteristics : (1) Such things can be used for a long time. (2) Such things are demanded for two reasons (a) Depreciation demand (b) Expansion demand (3) The demand of such things is affected by changes in price, technical changes, change in substitutional goods, maintenance cost, expectations about future income etc. (4) The decisions of the sale of such goods has to be taken in the context of long period.

(c) Difference between demand of Perishable Goods and Durable Goods :

(1) Demand of perishable commodity depends upon current circumstances, while demand of durable commodity depends on future situation. (2) In comparison to perishable commodity, it is very difficult to analyses durable commodity. (3) Generally, demand of perishable commodity is used to attain the current demand, while demand of durable commodity creates replacement demand.

One of the characteristic of demand for durable goods is a volatile relation to business conditions. Since current output of a durable product provides only a small fraction of the total current services demanded of that kind of product; sales are hyper - sensitive to small changes in the demand for service. If we assume for example that normal automobile production is used (1) to replace 10 percent of the existing stock of cars, and (2) to expand car population by 5 percent, then a 3 percent. Increase in the demand for Motor transportation will raise the new car demand by about 30 percent. This phenomenon is known as the acceleration principle.

Besides durable consumer's goods the acceleration principle is also applicable to durable producer's goods.

Suppose the demand for consumer goods expands then there will be a need to expand the production of capital goods in order to produce the consumer goods. Thus if more bicycles are demanded, more machinery will be required to produce bicycles.

Now suppose that in a certain year there exist 10 Lakh cycles with an average life of twenty years. This means 50,000 cycles will be produced in that year for replacement if the demand for cyeles goes up to 11 lakhs in the next year 50,000 cycles

will be produced for replacement plus 1 lakh to meet the increase in demand. Thus a 10 percent increase in demand for cylces (from 10 lakhs to 11 lakhs) leads to a 200 percent increase in the demand for machinery required for cycle manufacture.

4 Derived Demand and Independent Demand :

(a) Derived Demand : The demand of a commodity which is connected with the demand of another original commodity is called derived demand e.g. The demand of cement is connected with building and construction therefore, it is a derived demand. It is compulsory demand for a producer. Demand for all producer's goods, raw material and component is derived. Derived demand is generally supposed to have less price elasticity than independent demand. Derived demand facilitates when proportions of the two product are fairly fixed.

Characteristics : (1) Demand of such things is compulsory for producer. (2) The demand of such things is connected with the quality of a product e.g. the use of inferior commodity when the quality of a commodity decreases, the demand of original commodity also decreases (3) Usually, the demand of money, labour etc. is derived demand.

(b) Independent Demand (Autonomous Demand) : The demand of commodity that does not depend others, it is not connected with the demand of other commodity, it is an independent or autonomous demand e.g. demand for grains, clothes and other consumption goods is independent demand. Independent demand is direct demand. This types of product satisfy the need of customer directly.

(c) Differences : (1) The demand of independent commodity is more elastic than the demand of derived commodity (2) It is difficult to make hard and fast demarcation between the two. The difference between the two is not that of origin but of proportion. (3) In case where proportion between the parent and the dependent goods is not fixed, it is more difficult to determine the derived demand for the dependent goods on the basis of the demand of parent goods. It is difficult to estimate the derived demand on the basis of the demand for parent product. (4) When a commodity has alternative use and if it is possible to change the proportion of the production of the basic goods, it becomes difficult to calculate the demand of desired goods e.g. Goods used in building houses but as substitutes, one can use steel or aluminium also. Therefore, along with the development of housing construction, it is difficult to estimate the demand of wood.

5 Demand of a Firm and Demand of an Industry :

(a) The demand of a firm : The demand of a firm is the demand for a commodity produced by the firm e.g. Demand for Maruti Car. The demand of a firm takes place at micro level. Every firm tries to differentiate their products by product differentiation, the demand of a firm is different from the demand of an industry.

(b) The demand of an Industry : The demand of commodities made by entire industry is called the demand of an industry e.g. The demand for Maruti car is the demand of a firm but the demand of different cars like Maruti, Tata Qualis, Ambassador etc. is the demand of car (automobile) industry. In short, the demand of an industry is the total of all firm operating in an industry.

6 The demand of the Entire Market and the demand of a Part of the Market :

(a) The demand of an Entire Market : The demand of a commodity which is connected with a part of the market only is called the demand of a part of the market. In managerial economics, the concept of the demand of a part of market is more useful. The decisions regarding the price of a commodity, the publicity etc. are taken in the context of the demand of a certain part of the market. When the market is limited to a certain area or class, the producer has to take decisions regarding production, price and advertisement accordingly. Usually, when a local producer enters the production of a certain commodity, the demand in the beginning is for a certain part only, but in the long run, it becomes the entire market (market for the larger areas) e.g. The market of Nirma Power was limited to Gujarat only but now it has become quite large. It has covered the entire market.

(b) Demand by the Market Segment : The demand of commodity can have a segmented behaviour, certain products may be very popular in specific type of market segments but the same may not be so popular in the other assignment of market or other region. Such market segment is very popular in the consumer product and also in the case of industrial products.

A particular brand of biscuits, detergent cake, toilet soaps, tooth paste, carpets etc. can have limited market which may be related to a particular segment.

7 Short run demand and Long run demand :

(a) Short run demand : Demand for short run is related with current demand. Short run demand refers to the demand with its immediate reaction to price changes, income fluctuations etc. The price of a commodity and the change in the income of the consumers affect the short run demand immediately. The demand of certain things are for certain period only. e.g. the demand of woollen clothes in winter. Therefore, the producers often resort to advertisement and liberal admission for sale.

(b) Long run demand : The demand which is not related to season or other factor but it is of a long run nature is called long run demand. The long run demand is connected with the price of a commodity, publicity, change in quality of products etc. To adjust with new situations takes time for the market e.g. garments, toilet soap, tooth paste etc. These demands are long run demands. For this, the management should adopt long term marketing strategy. It would prove profitable for them.

➢ **Difference between short run and long run demand :**

(1) The short term demand can be of a temporary nature and the demand change is also of a short run. Thus, the producer has to make changes in the variable cost factors only. The long run changes in the demand can be adjusted through change in the scale of operation and/or other long run changes. The new firms can also enter in the market.

(2) The short term changes are due to changes in the taste and preference of the consumer. The changes in price also influence the short-run demand. Consumers are used to old product so they do not make drastic changes in their demand. Thus, the demand changes is comparatively small.

(3) The short run changes are more fluctuating and uncertain. It is not possible to go for the long run estimation through short run changes. The technological changes can be done only in the long run. In the short run, the firm has to concentrate on output, purchase, inventory and related aspects.

(4) The short run is related with the current demand and for the long run it is related with future demand.

(5) The short run, demand depends on price of the product and income of the consumer. The long run demand depends on consumer's choice, technology, business practices, government policy, financial policies government policy by related to business and foreign trade.

(6) The short run phase demands on long run decision making. If short run changes are consistent then accordingly the long run decisions are made. The expansion of plants and other details can also be worked out accordingly.

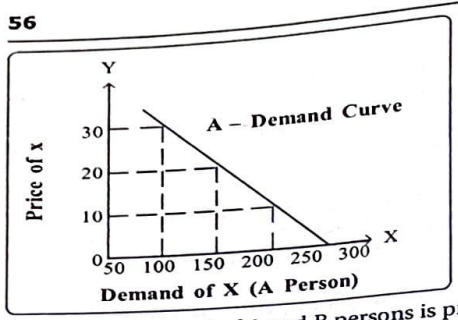
The accumulated short run decisions affect the long run decision.

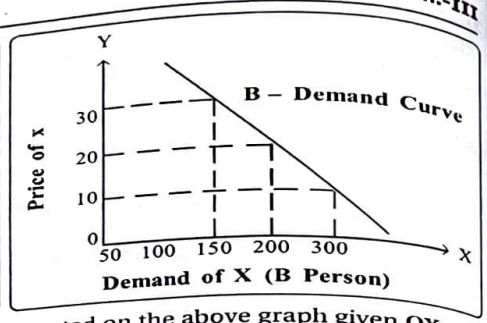
3. Individual Demand and Market Demand

1. **Individual Demand :** In economics, the commodity demanded by a person or a family at different prices is called individual demand. Individual demand curve can be obtained on the basis of individual demand schedule.

2. **Example :** Suppose A and B are different persons, they demand units of X commodity in a following way :

Price of X ₹	A's demand Unit	B's demand Unit
30	100	150
20	150	200
10	200	300





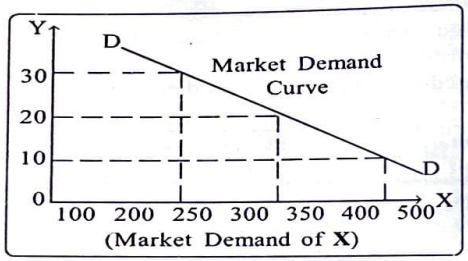
The demand of A and B persons is presented on the above graph given OX axis presents the demand and OY axis presents the price. A and B are the demand of A and B persons respectively.

3. Market Demand : The total of demands made by different customers individually in market at different prices is called market demand. In economics, study of market demand is important and not the study of individual demand. On the basis of schedule of market demand, market demand curve can be obtained.

Example : Suppose there is demand of X commodity by A and B. Let us assume that there are only two customers.

The demands of X commodity by them are as follows :

Price of X (in ₹)	Demand of X (in units)	Demand of B (in units)	Market demand (in units)
30	100	150	250
20	150	200	350
10	200	300	500



According to above schedule, it can be seen that demand of X at ₹ 30 is 250 units. At 20 it is 350 units and at ₹ 10 it is 500 units. Thus, at different prices following demand curve DD is available. From the above discussion, it can be concluded that by adding the demands of A and B at different prices, one can know market demand. Such a market demand is also with negative slope like individual demand curve.

4. Firm Demand and Industry Demand

1. Introduction : The quantity of a firm produce that can be disposed off at a given period of time connotes the demand for the firm's product. The aggregate demand for the product of all the firms of an industry is known as the market demand for industry's product. E.g. In the economy if the total demand of 50,000 motor car for every year it is called industry demand. And demand for 20,000 motor car of Maruti Company then it is called firm demand.

It may be noted here that within an industry, the products of one manufacturer can be substituted by products of another manufacturer even though the products themselves might be different by brands name. Thus an industry covers all the firm producing similar products which are close substitues to each other irrespective of differences in trade names. E.g. Dalda, Rath, Panghat. Obviously firm producing distant substitutes would be excluded from the purview of the industry. Ghee and groundnut oil being used as cooking media, can be substituted for vanaspati, yet they are only distant substitutes and will be excluded from vanaspati industry as such.

An industry demand schedule represents the relation of the price of the product to the quantity that will be bought from all the firms. It has a clear meaning that the products of the various firms are close substitutes. It becomes vague when there is considerable product differentiation within the industry.

2. The demand of a Firm :

(a) The demand of a firm : The demand of a firm is the demand for a commodity produced by the firm e.g. Demand for Maruti Car. The demand of the firm takes place at micro level. Every firm tries to differentiate their products by product differentiation, the demand of a firm is different from the demand of an industry.

The demand of a firm depends on the nature of the market.

(1) In perfect competition : The demand of a commodity of a firm is a completely elastic. In this market, as these are innumerable firms making homogeneous products, the firm has to accept the price determined by the industry and take decisions regarding it. Therefore, the demand curve of a firm is parallel to horizontal line.

(2) In monopoly market : There is only one firm and near substitute commodity is not available, therefore the demand curve of a firm has negative slope and it is inelastic.

(3) In oligopoly : Very few number of sellers, firms are small and they produce almost homogeneous or least distinct, goods, the demand of curve of a firm is uncertain. Their demand depends on the behaviour of rival producers. The decision regarding price is limited by other rival competitors also. Therefore, the firm shows some rigidity regarding price. However, district goods have an independent demand function in oligopoly.'

(4) **In monopolists competition :** The demand curve of a firm has a negative slope but it is elastic because there is a large number of firms making near substitutes in the market. Such firms can make changes in demand by product differentiation and sales cost. (Publicity expenditure)

(5) **In homogeneous oligopoly :** When sellers are few and their products are standardized, business is highly transferable among competitors. E.g. aluminium, cement and steel producer. The firm's own demand curve could be uncertain depending upon what its competitor do. What usually happens is that the sellers charge the same price to stay in the market.

3. **The demand of an Industry :** The demand of commodities made by entire industry is called the demand of an industry e.g. The demand for Maruti car is the demand of a firm but the demand of different cars like Maruti, Tata Quails, Ambassador etc. is the demand of car (automobile) industry. In short, the demand of an industry is the total of all firm operating in an industry. The group of firms manufacturing the homogeneous or near substitute goods is called an industry. For the forecasting of sales, the knowledge of demand of a firm is necessary. When the demand of a commodity is considered as a whole (at micro level), it is called the demand of an industry. The demand of an industry is also connected with form of market. In perfect competitive market, demand of an industry is very important because price of a product is determined by demand and supply of whole industry. While in monopoly only one seller (firm), so there is no question of industry demand. Here, only firm's demand is important. While in monopolistic competition, where there are many sellers with differentiated products, the industry demand curve has little meaning. When the degree of product differentiation is large, the individual seller's demand function is like that of a single firm monopolist.

The industry demand schedule is a useful guide for studying the demand for a firm's product. The relation of the individual firm's sales to its price should be determined by the industry demand schedule. The degree of relationship will depend upon the competitive structure of the industry.

5. Elasticity of Demand : Meaning and Types

1. **Introduction :** In determinants of demand, three main determinants are most important. Elasticity of demand is usually discussed in the context of price elasticity of demand. This means that if all other factors remain constant but if prices of goods change, how and how much the demand is affected is discussed in it. Beside this cross elasticity of demand, explains how the changes in price of related goods (substitute and complementary) affect the demand and how the increase in number of the consumers and advertisements of goods affects the demand.

These can be known through income elasticity of demand and advertisement / publicity elasticity of demand respectively. In short, in demand elasticity **four** things are mainly included.

2. **Meaning of Elasticity of Demand :** *"If other factors remain constant, due to change in price, the change takes place in demand. The ratio or measurement of the change in demand is called elasticity of demand."*

Elasticity of demand presents the quantitative relationship between the change in price of a commodity and resultant change in demand of the commodity. Generally, as there is an inverse relationship between price of a commodity and its demand, demand elasticity is negative.

Equation :

$$\text{Elasticity of Demand of X} = \frac{\text{Percentage change in demand of X}}{\text{Percentage change in price of X}} = \frac{P\Delta Q}{Q\Delta P}$$

P = price, Q = demand, D = change.

To explain the meaning of elasticity of demand, various economists have given the following definitions.

(1) According to **Prof. Benham**, *"The effect on quantity of commodity by the changes in price of the commodity is elasticity of demand."*

(2) According to **Prof. Stonier** and **Hague**, *"The technical term used by the economists to show the measurement of responses of demand in the context of changes in price is called elasticity of demands."*

(3) According to **Prof. Meyers**, *"As a result of changes in price of a commodity on the changes in purchase of the commodity is elasticity of demand."*

(4) According to **Kenneth Bolding**, *"Quantitative measurement of responses in demand in the context of changes in price of goods is called elasticity of demand."*

(5) According to **Prof. Craincross**, *"Elasticity of demand of a commodity indicates the rate of purchase of goods due to change in price."*

Example : Suppose the price of x is ₹ 10 and its demand is 100 units. When its price goes down to ₹ 8, the demand goes up to 150 units. Find out the elasticity of demand.

$$\text{Elasticity of Demand of X} = \frac{\text{Percentage change in demand of X}}{\text{Percentage change in price of X}} = \frac{P\Delta Q}{Q\Delta P}$$

$$= \frac{10\times 50}{100\times 2} = \frac{5}{2} = 2.5 \text{ Elasticity of Demand.}$$

3. **Matters included in Elasticity of demand (Types) :**

(1) Price elasticity of demand
(2) Income elasticity of demand
(3) Cross elasticity of demand
(4) Advertising or Publicity elasticity of demand

(1) Price Elasticity of Demand :

Meaning : If all other factors remain constant and if the price of X changes, the ratio of change in the demand is called price elasticity of demand. The price elasticity of demand presents the quantitative relationship between the changes in the price of a commodity and the demand of the commodity.

Equation : Price Elasticity of Demand of X = $\frac{\text{Percentage change in demand of X}}{\text{Percentage change in price of X}}$

(2) Income Elasticity of Demand :

Meaning : If other factors remain constant and the income of the consumer goes up, the demand for goods goes up. This change or the ratio of change can be called income elasticity of demand. In short, income elasticity of demand shows the quantitative relationship between the change in consumer's income and the change in demand.

Equation : Income Elasticity of X = $\frac{\text{Percentage change in demand of X}}{\text{Percentage change in income of consumer}}$

(3) Cross Elasticity of Demand :

Meaning : If all other factors remain constant, the price of related goods changes demand of the basic goods (X) changes. Its ratio is called cross elasticity of demand. Cross elasticity of demand goods presents the quantitative relationship between the price of related goods and change in the demand.

Equation : Cross Elasticity of Demand of X = $\frac{\text{Percentage change in demand of X}}{\text{Percentage change in price of X}}$

Difference between elasticity of demand & cross elasticity of demand : In elasticity of demand other factors and price of related goods are taken as constant and the price of the basic commodity changes which affects the demand of the goods are analysed. **e.g.** Elasticity of demand of tea can be known if other factors are constant but suppose the price of tea changes, demand of tea changes in that proportion. This measurement or ratio is called price elasticity of demand.

While the cross elasticity of demand can be known as follows.

If the price of the commodity remains constant but if the price of related goods (substitute or complementary) changes, the price of basic goods changes. This ratio of change is called cross elasticity of demand. **e.g.** Cross elasticity of tea can be known by keeping the price of tea constant but the price related goods (coffee for example) changes, the demand for tea also changes. The proportion of demand is called cross elasticity. In modern market, there are many substitute goods and their price changes affect the demand of goods. Thus this concept becomes useful in finding out the probable effects of cross elasticity of demand.

(4) Advertising or Publicity Elasticity of Demand : In the modern market, to avail of market and to maintain it, the publicity cost has become inevitable. Producers spend huge sums of money after advertisement and try to expand their market sell their goods in the market.

Meaning : If all other factors remain constant due to changes on advertisements, the demand of goods changes. This measurement or ratio is called Advertising elasticity of demand. In short, Advertising elasticity of demand indicates the quantitative relationship between the cost on Advertising and changes in demand.

Equation : Advertising Elasticity of Demand of X =

$$\frac{\text{Percentage change in demand of X}}{\text{Percentage change on advertisement cost}}$$

6. Price Elasticity of Demand : Meaning and Types

1. Meaning of Price Elasticity of Demand : If the other factors remain constant, the amount or ratio of change in demand due to change in price is known as the Price Elasticity of Demand. The elasticity of demand shows the quantitative relationship between price and demand.

The Price Elasticity of Demand is to be represented by the following formula:

$$\text{Price Elasticity of demand } (E_p) = \frac{\text{Proportionate change in demand for Commodity } x}{\text{Proportionate change in price of Commodity } x}$$

Suppose the demand for commodity x increases by 6% due to price decreases of 2%.

Price Elasticity of demand for commodity x

$$= \frac{\text{Proportionate change in demand for Commodity } x}{\text{The proportionate change in price of Commodity } x}$$

$$= \frac{+6\%}{-2\%} = |3|$$

Here, the things should be considered : (1) Price elasticity of demand is represented by digit only. It is not represented by percentage, kg, ₹, meter etc. (2) Generally there is inverse relationship between price and demand and hence the value of Price elasticity of demand is negative.

There are different definitions of Price Elasticity of demand.

(1) Prof. Marshall : *"The degree of elasticity of demand depends upon the extent of rise in demand because of a fall in price and upon the extent of fall in demand because of a rise in price."*

(2) Prof. Meyers : *" The elasticity of demand shows the change in the quality demanded due to change in price of the commodity."*

(3) **Prof. Kenneth Boulding :** *" The commodity of demand shows the quantitative measure of change in demand and change in price."*

2. **Types of Price Elasticity of Demand :** The degrees of price elasticity of demand are categorized by the amount of change in demand due to the price change.

(1) Relatively Elastic Demand ($\varepsilon_p > 1$)

(2) Unitary Elastic Demand ($\varepsilon_p = 1$)

(3) Relatively Inelastic Demand ($\varepsilon_p < 1$)

(4) Perfectly Inelastic Demand ($\varepsilon_p = 0$)

(5) Perfectly Elastic Demand ($\varepsilon_p = a$)

(1) Relatively Elastic Demand ($\varepsilon_p > 1$) : When the percentage change in demand is greater than the percentage change in price then such demand is called relatively elastic demand. The value of relatively elastic demand would be greater than 1.

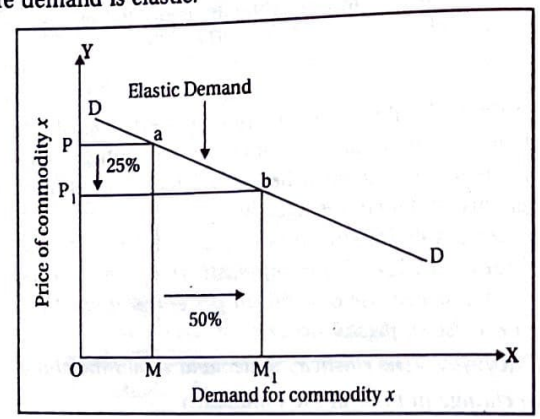
➢ **Ex :** When the price of commodity x is ₹ 40 then the demand is 100 units. If the price decreases to ₹ 30 then the demand increase to 150 units, find the elasticity of demand.

Price Elasticity of demand for commodity

$$X = \frac{\text{Proportionate change in demand for commodity X}}{\text{Proportionate change in price of commodity X}}$$

$$= \frac{P\Delta Q}{Q\Delta P} = \frac{+50\%}{-25\%} = |2|$$

The percentage change in demand is greater than the percentage change in price. Therefore demand is elastic.



The price decreases by PP_1 (25%) and demand increases by MM_1 (50%). The demand curve which passes through a and b is elastic. Generally, the demand for luxury goods is elastic e.g. demand for car.

(2) Unitary Elastic Demand ($\Sigma_p = 1$) : When the percentage 'change in demand is proportionate to percentage change in price then it is called unitary elastic demand.

➢ **Ex :** Suppose there is demand of 100 units of x commodity at the price of ₹ 40 and the price of goes down to ₹ 20 the demand increases to 150 units. What is the elasticity of demand ? Let us find out with the help of formula.

Price Elasticity of Demand of Commodity

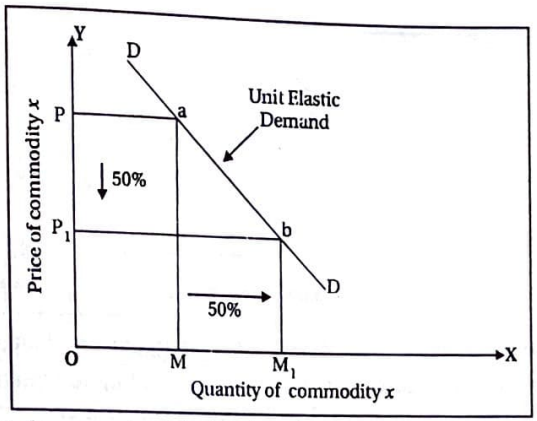
$$X = \frac{\text{Proportionate change in demand of commodity X}}{\text{Proportionate change in price of commodity X}}$$

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

$$= \frac{+50\%}{-50\%}$$

= Elasticity of demand equal to 1.

The proportionate change in demand is equal to the proportionate change in price.



The price decreases by PP_1, (50%) and demand increases by MM_1 (50%). The demand curve passes through a and b shows that elasticity of demand is 1. The price and demand change in opposite direction by the same amount.

(3) Relatively Inelastic Demand ($\varepsilon_p < 1$) : When the percentage change in demand is Proportionately lesser than percentage change in price then such demand

is called relatively inelastic demand. According to equation, the answer would be less than one.

Ex : Suppose Commodity x is demanded 100 units at ₹ 40 but its price is reduced to ₹ 20 and the demand of x goes up to 125 units. Find out its elasticity.

Price elasticity of demand of commodity

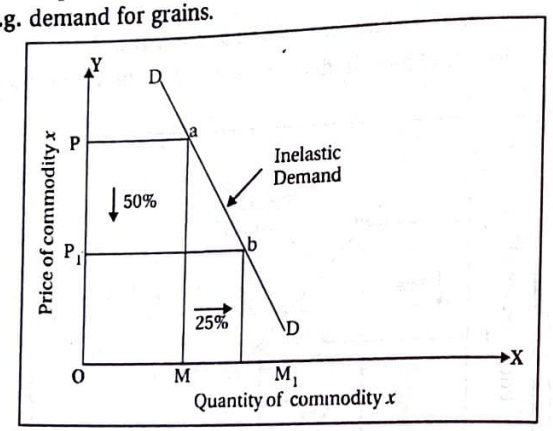
$$X = \frac{\text{Proportionate change in demand of commodity X}}{\text{Proportionate change in price of commodity X}}$$

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

$$= \frac{+25\%}{-50\%}$$

$$= \left|\frac{1}{2}\right|$$

The price decreases by pp_1 (50%), the quantity demanded increases by (25%) the demand curve DD passes through points a and b shows that elasticity of demand is less than 1. **e.g.** demand for grains.



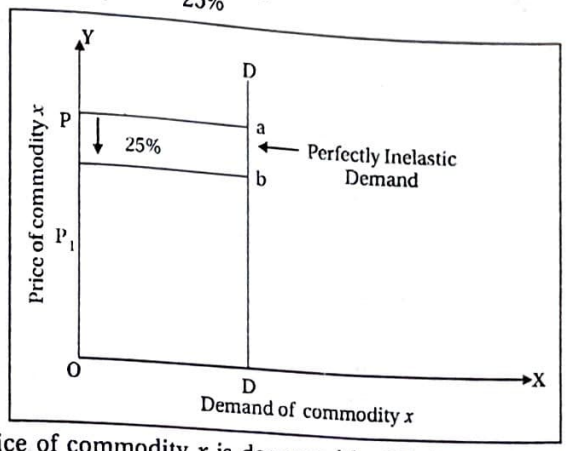
(4) Perfectly Inelastic Demand ($\varepsilon_p = 0$) : When there is change in the price of a commodity but there is no change in demand according to equation, the answer would be zero, such demand is called perfectly inelastic demand or zero elasticity.

➢ **Ex :** Suppose Commodity x is demanded 100 units at ₹ 40 but if its price is reduced to ₹ 30 the demand does not change, it remains 100 units. Find out the elasticity of commodity x.

Price elasticity of demand for Commodity

$$X = \frac{\text{Proportionate change in demand of commodity X}}{\text{Proportionate change in price of commodity X}}$$

$$= \frac{P\Delta Q}{Q\Delta P} = \frac{0\%}{25\%} = 0$$



The price of commodity x is decreased by PP_1 (25%). The demand remains constant at DD. It means that the demand is not affected by the change in price. The demand for such commodities are perfectly inelastic and the demand curve is parallel to Y axis.

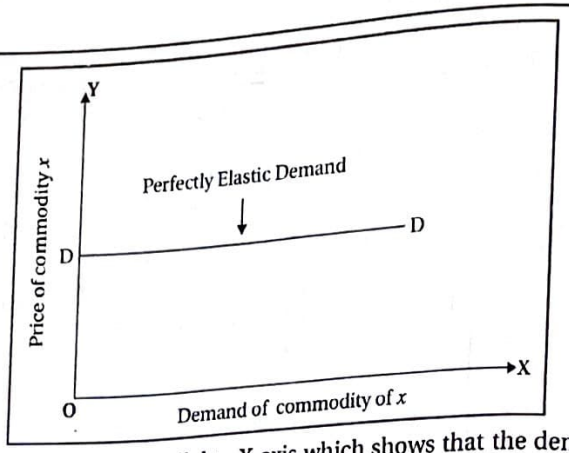
(5) Perfectly Elastic Demand ($\varepsilon_p = \infty$) : When the consumer is ready to buy certain commodities at a particular price but when there is a little increase in price and he is not willing to buy any commodity at all, it is called perfectly elastic demand. And its demand curve is parallel to horizontal base. In the same way, when there is a little change in the price and there is unlimited or infinitive change in demand, it is called infinitely elastic or perfectly elastic demand. The demand curve of such commodities is parallel to horizontal base line.

Presentation through Formula : Suppose 1% decreases in the price of commodity X increases the demand by α.

Price Elasticity of demand of commodity

$$X = \frac{\text{Proportionate change in demand of commodity X}}{\text{Proportionate change in price of commodity X}}$$

$$= \frac{\infty}{1\%} = \{(\overset{x}{T}\overset{x}{})\} \text{ infinite}$$



The demand curve is parallel to X axis which shows that the demand changes with OD price.

DD is a demand curve which is parallel to horizontal axis. The price to the commodity is OD. The consumers are ready to buy certain amount of commodity at this price.

Generally, it is not possible in the real world. It is useful to explain the situation of perfect competition in economics.

7. Factors Affecting Price Elasticity of Demand

1. Introduction : When the price of things changes, the demand also changes. The quantity or measurement of this change must be known. For this, it is necessary to think about the various factors affecting elasticity of demand or the changes in demand.

If the change in demand is more than the change in price, it can be called elastic demand and if it is less, it is called inelastic demand.

2. The factors affecting Elasticity of Demand : The factors affecting the elasticity of demand can be classified into three divisions : (a) The nature of goods (b) Time factor (c) Element of income.

a The Nature of Goods : (1) Primary or essential commodities : The things like grains, cloth, salt etc. are primary commodities and their demand is usually demand inelastic. Such things are essential for life, so even if their prices change, there is not much change in their demand. **e.g.** If even if the price of grains goes up, it is essential to satisfy hunger and so there will not be much reduction in demand in comparison to increase in price. On the other hand, even if their prices go down, percentage increase in demand will be negligible because there is no change in one's requirement of grains.

(2) Luxury goods : Luxury goods like fans, radios, TV, AC etc. are usually demand elastic. Such things are not inevitable. People can live without them and so when there is change in price, there is more change in the demand also.

(3) Priority of the customers place in consumer's budget : The trivial, ordinary things like needle, salt, post-card, pin etc. are cheap and they are demand inelastic. The budget to be spent on such thing is negligible and so changes in their price do not affect the demand much. **e.g.** If a person requires some pins and his total budget is Rs. 1,000. The price of a pin is 2 paise. Even if it is raised to 4 paise, the total purchasing capacity will not be much affected because, a person may spend a few rupees on such things and so there is not much change in the demand. On the other hand, grains, house rent, electricity etc. are major expenses in a person's budget, so the changes in their prices affect demand. The demand here becomes demand elastic.

(4) Very precious / costly things : Things like precious stones (diamonds), pearls, video etc. are quite costly. They are generally demand inelastic. Such things are not essential for living, but they are used only by the rich people. So, demand of such things donot change much even if prices change.

(5) Substitute goods : If the nearest substitution of a commodity is available, its demand is elastic. **e.g.** Philip radio, Cibaca toothpaste etc. have other nearest substitutes and the change in them affect the demand of these goods. On the other hand, if substitution is remote, there is less demand elasticity. If other things are not availables as substitute, their demand is perfectly inelastic.

(6) The things with alternative uses : The things with alternative uses have elastic demand because if their prices increases, their use is transferred from less important to more important purposes. **e.g.** If power changes go up, people may stop or cut down on power consumption on fans, A.C.s, electric irons and geysers.

(7) Essential services : Medical services, legal advice etc. are often essential and their demand is usually inelastic because medical services are necessary. Sick people cannot be cured of diseases with medical help.

(8) Postponement purchase : The goods whose purchase can be postponed or delayed have demand elasticity. People may wait or postpone if the price of certain goods go up. They must continue to use old, repaired article. **e.g.** chappals, shoes, clothes etc. They can be postponed for sometime. But if the consumption of a house is going on cement, bricks etc. become essential. Their purchase cannot be postponed. But one can wait for building construction if he has not begun till cement price subside.

(9) Complementary commodities : Usually, the complementary goods have demand elastic. To make such goods, more than one things is required. If the price of commodity goes down, the goods made by the use of these things have not higher

increase. e.g. To make tea, tea powder, sugar, milk etc. are required. At this time if the price of tea powder decreases and if sugar and milk are high, there is no big demand in tea.

(10) The price of goods : Generally, if the price of the commodity is very high, the demand is inelastic. When the price of a commodity is low, the demand is elastic. The upper part of the demand curve has more slope and the lower part has less slope.

(11) Customary requirements : As human beings are social animals, the demand of customary requirements are inelastic. e.g. tobacco, cigarette, snuff etc. Even if their prices change, there is not much change in demand. In the same way, for wine and drugs addicts, demand is inclastic. Even if the prices go up, there is not much decrease in the demand.

b Element of Time : Generally, for a short time, majority of goods have inelastic demand and in the long run, majority of goods have elastic demand.

The following are the causes for less elasticity of demand for a short period and more elasticity of demand for a long period.

(1) Durability of goods : Scooter, TV etc. are durable goods and they satisfy requirements of the people for a long time. So, if price of the goods decreases and till old things are not used up, the demand does not increase. Demand is affected when in the long run when new goods are purchased.

(2) Habit : In short time, people donot change their habits or they donot change the structure of their consumption. In the long run, habit can be changed, so for a short period, demand is inelastic and for the long period, the demand is elastic. e.g. If a person smokes a certain brand of cigarette and if its price goes up, its consumption in a short time cannot be decreased but in the long time, he can change his habit and use another cheaper brand of cigarettes or give up the habit of smoking. The longer the period of time, the more the elasticity of demand.

(3) Standard of living : In a short time, a person tries to maintain his standard of living without reducing his demand by reducing his savings or using his savings. Therefore, for a short period, the demand is inelastic. It is not possible to sustain demand for a long time, so demand decreases and so in the long run it is elastic.

(4) Assumptions regarding future : If prices of goods have reduced for short time but if there is still possibility of decrease in near future, demand becomes inelastic but in the long period, the demand becomes elastic.

(5) Technical difficulty and commodity with combined demand : If the thing has a joint demand or if it is not possible to change for technical reasons, the demand in a short time becomes inelastic. e.g. If the price of petrol decreases but it is necessary for consumption in a car or a scooter, there is no sudden rise in the demand of petrol but in the longer period, it can increase. If the price of a commodity

increases in a short period, but due to technical problems, its demand cannot be decreased. But in the long run by making technological changes, demand can be decreased.

(6) Discovery of substitute goods : If the price of a commodity goes up but till substitutes are not discovered, its demand does not decrease. Therefore, for a short period, its demand is inelastic. But in the long run, its substitute can be used.

c Element of Income : The element of income also affects elasticity of demand. Generally, the commodities of the rich people are demand inelastic because the changes in price do not affect the demand of the rich people. The demand of the poor people is demand elastic. Even ordinary changes affect their purchasing power. Very poor people are unable to buy food and so for them even the essential commodities like foodgrains in elastic.

8. Methods of Measuring Price Elasticity of Demand

There are three methods of measuring elasticity of demand.

(A) Percentage (Proportionate change) Method

(B) Total Outlay Method

(C) Geometric Method.

(A) Percentage method of calculating elasticity of demand : In this method, the elasticity of demand is determined on the basis of percentage change in demand due to the change in price. The following equation is used for it.

Equation : Elasticity of Commodity x

$$= \frac{\text{Percentage change in demand of commodity } x}{\text{Percentage change in price of commodity } x}$$

$$= \frac{P\Delta Q}{Q\Delta P} = \text{Here, P = Price, Q = Demand, } \Delta = \text{Change}$$

(B) Total outlay method of calculating elasticity of demand : In this method, due to change in price of commodity, the change in total cost of a consumer for the purchase of that commodity and the change in sale- income of the producer or trader. The elasticity of demand is measured according to this method. There are three types of elasticity of demand.

(1) Elastic demand : Suppose the price of a commodity 'A' is reduced and the demand increases in proportion to the total cost for that commodity 'A' is reduced and the demand increases in proportion to the total cost for that commodity or sale income increases more than that then it is called elastic demand.

Suppose the price of A is ₹ 10 and the demand 100 units. Now, the price goes down to ₹ 5 and the demand is 300 units. Find out its elasticity of demand.

Price of A	Demand of A	= Total cost/ Total sale Income
₹ 10 x	100 units	= ₹ 1,000
₹ 5 x	300 units	= ₹ 1,500

In the above example, when the price of A is reduced to ₹ 5 from ₹ 10, there is a great change in demand. The cost for A goes up to ₹1000 to ₹1500. Thus, it is called elastic demand.

(2) Inelastic demand : Suppose the price of commodity 'B' is reduced and the change in demand is such that the total cost or sale cost decrease then it is called inelastic demand.

Example : suppose the price of B is ₹ 10 and its demand is 100 units. The price of B is reduced to ₹ 5 and demand goes up to 150 units. Find out its elasticity.

Price of B	Demand of B	= Total Cost/ Total sale Income
₹ 10 x	100 units	= ₹ 1,000
₹ 5 x	150 units	= ₹ 750

In this example when the price of B is reduced from ₹ 10 to ₹ 5 the change in demand less and the total cost is reduced from ₹ 1000 to 750. Thus it is called inelastic demand.

(3) Elastic demand equal to Unity (unit elastic demand) : When the price of commodity 'c' is reduced, the demand increases to the extent that the total cost or total sale income remains as before. This means that it remains static. It is called unit elastic demand.

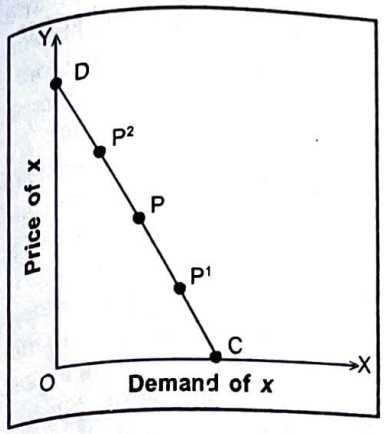
Example : Suppose the price of 'C' is ₹ 10 and its demand is 100 units. Now the price is reduced to ₹ 5 and the demand goes up to 200 units. Find out its elasticity.

Price of C	Demand of C	= Total cost/ Total sale income
₹ 10 x	100 units	= ₹ 1,000
₹ 5 x	200 units	= ₹ 1,000

In this example, when the price of 'C' is reduced from ₹10 to ₹5, the demand of C increases to the extent that the total cost is ₹ 1,000. It is called unit elastic demand.

(C) Geometrical method of measuring elasticity of demand : Prof. Marshall has given this theory to find out the elasticity of demand of any point on the demand curve. The following equation is used for this.

$$\text{Elasticity of the point} = \frac{\text{Demand curve below the point}}{\text{Demand curve above the point}}$$



Suppose Demand Curve DC = 5". P point is at 2.5". Find out elasticity. Also find out elasticity of P^1 and P^2.

$$\text{Elasticity of P} = \frac{\text{Demand curve below the point}}{\text{Demand curve above the point}}$$

$$= \frac{PC}{PD} = \frac{2.5}{2.5} = 1 \text{ (Unit elasticity)}$$

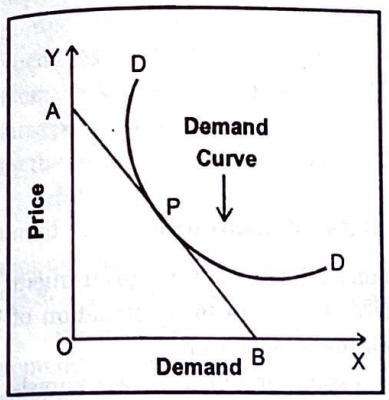
$$\text{Elasticity of } P^1 = \frac{\text{Demand curve below } P^1}{\text{Demand curve above } P^1}$$

$$= \frac{P^1C}{P^1D} = \frac{1"}{4"} = \frac{1}{4} = \text{Inelastic Demand}$$

$$\text{Elasticity of } P^2 = \frac{\text{Demand curve below } P^2}{\text{Demand curve above } P^2} = \frac{P^2C}{P^2D} = \frac{4"}{1"} = 4 \text{ Elastic Demand}$$

In the above circumstances, at the point D on the vertical axis, the lower portion is 5" and upper portion is infinite, therefore, the answer would be infinite elastic demand. While portion under point 'C' is perfectly inelastic demand.

➢ **When demand curve is non-linear :**



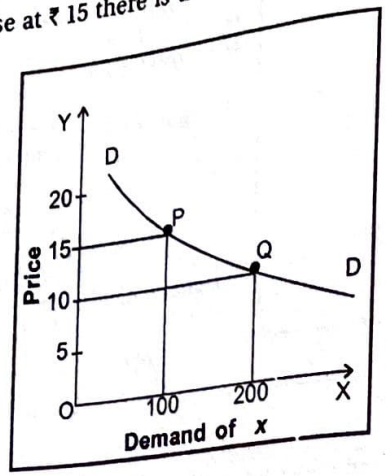
When demand curve is non-linear, on any point of the demand curve a line touching demand curve is drawn. From this meeting point of the touching line, the elasticity can be found on the basis of the lower portion and the upper portion.

In the figure given here, if we want to find out the elasticity of demand of point P, a line A B is drawn touching the point P. Now the portion below point P, can be calculated as PB ÷ P and upper part PA $\left\{\frac{PB}{PA}\right\}$ to find out elasticity.

➢ **Elasticity of Internal Point :** When the elasticity of any part of the demand curve (elasticity between the two points of demand curve) is to be found out by the following equation can be used :

$$\text{Elasticity} = \frac{\text{Original demand} - \text{New demand}}{\text{Original demand} + \text{New demand}} \div \frac{\text{Original price} - \text{New price}}{\text{Original price} + \text{New price}}$$

Example : Suppose at ₹ 15 there is the demand of 100 units for X and at ₹ 10, it is 200 units.



According to equation :

Average Elasticity of PQ

$$= \frac{\text{Original demand} - \text{New demand}}{\text{Original demand} + \text{New demand}} \div \frac{\text{Original price} - \text{New price}}{\text{Original price} + \text{New price}}$$

$$= \frac{100 - 200}{100 + 200} \div \frac{15 - 10}{15 + 10} = \frac{100}{300} \div \frac{5}{25}$$

$$= \frac{100}{30} \times \frac{25}{5}$$

$$= \frac{5}{3} \text{ Elastic Demand}$$

9. Importance of Price Elasticity of Demand

It is necessary for the traders, producers, finance minister and the government to have the knowledge of the concept of elasticity of demand for explanation of certain principles of business economics and their implementation.

(1) In price determination in a firm : It is necessary for a firm to have knowledge of the elasticity of demand to frame price policy for maximum profit for the goods produced by it. If the demand of the product is price elastic, the firm can keep the prices low and increase sales. In this manner, it can earn maximum profits. On the other hand, if the demand of the product is inelastic, higher prices can be

charged as there is no fear of reduction in sale and pricing policy to earn maximum profit can be framed. In perfectly competitive market, the products of individual firms are completely price elastic and the control of the firm over price is zero. This means that the individual firm has to accept the price fixed by the industries. On the other hand, in monopolistic market, the products of the firm are completely inelastic and so the firm can fix high price and earn maximum profit.

In short, the concept of elasticity of demand is useful for the business firms in determining the price or changing the price in order to boost their sales and earn maximum profit. However, the demand of a commodity depends not merely on prices but other factors also. Therefore, it must collect the data of past demand and prices to fix the prices of commodities. It is difficult to take decision regarding prices merely on the basis of elasticity of demand. Therefore, the firm must have a separate division for research and analysis. The firm must study the effects of different factors and changes in prices on demand through various statistical techniques.

(2) In framing the price policy of farm produces : In countries like USA, the policy of controlling prices of farm produces has been implemented. As the farm produces have elastic demand, it is possible to charge higher prices for them because even if the prices rise, there is not much reduction in the demand. Therefore, the consumers have to spend more on farm produces and the income of the farmers goes up.

The paradox found in prices of farm produce can be explained with the elasticity of demand. The demand for foodgrains is inelastic and therefore, if there is bumper crop, the demand may not increase resulting in fall in prices of farm produces. As a result, even if the yield is higher, the income of the farmers does not increase. Very often, it decreases. In these circumstances, to encourage and support farm production, it is necessary to fix minimum support prices of the farm produces by the government in advance.

(3) Monopolists : It is necessary to have the knowledge of elasticity of demand to implement the policy of price discriminization for monopolists. The monopolist keeps the prices low in demand elastic market and fixes prices higher for demand inelastic market to earn maximum profit.

(4) International trade : It is necessary to have the knowledge of elasticity of demand to make balance of trade profitable in foreign trade. It must have the knowledge of profitability of import or export through elasticity of demand e.g. If our exports are demand elastic, lower price can be fixed to get large foreign market and if demand is inelastic, the price can be kept high and without the fear of losing the market,Thus more income can be earned through exports.

(5) To frame tax related policy : The finance minister is required to have the knowledge of elasticity of demand to frame tax policy. Generally, the demand of the rich people is price inelastic and the demand of the poor people is price elastic. The higher taxes can be levied on the consumer products demanded by the rich people without much opposition. If the government wants to levy taxes on producers or sellers, it must levy taxes on demand of the products with price elasticity because the tax-burden cannot be shifted to consumers for demand elastic products. On the other hand, if the government wants to impose tax burden on consumer, it must levy taxes on price inelastic goods.

(6) To decide the scope of public utility : It is necessary to have knowledge of elasticity of demand to decide which products should be placed in public utility. For common masses, the essential commodities and services are generally price inelastic so their production and distribution should be handled by public sector. If the private sector produces or distributes such essential commodities or services, there is a possibility of exploitation of the consumers through price rise. That is the reason why in most of the other countries of the world, transport, elasticity, water etc. are produced and distributed by public sector.

(7) To take decision of devaluation : A country has to take decision regarding devaluation of its money in order to remove basic disparity in balance of payments. For this, it is necessary to know the elasticity of import-export goods. If the demand for import and export goods is price elastic, devaluation becomes relevant. If the demand for imports is inelastic, even if imports are made cheaper, there will be no reduction in imports and foreign exchange will not be saved in substantial quantity. In he same way, when demand for export is inelastic, even if exports are made cheaper by devaluation, there will be no increase in its demand.

(8) Regarding other things : In a free economy, factors of production are distributed on the basis of demand, it is necessary to have the knowledge of elasticity of demand to understand effetiveness of the consumer demand.

(9) In framing of the government policy : It is necessary to have the knowledge of elasticity of demand in determining how growing industries of the country can be protected and through what measures. If the demand for foreign goods is elastic, the industries of the country can be protected by import duty and if the demand in inelastic, import quota or import control must be adopted as measures. Suppose demand for imports are price inelastic and even if the government imposes import duties and the imports become costlier. People may not reduce their demand for such goods if they do not want to do without them. Thus, through import substitution the market of the country can be obtained. In such circumstances, import ban may become necessary to protect the indigenous industries.

(10) In determinate factor cost : Any factors of production, in condition of demand elasticity can set maximum return or value e.g. If the demand of labour in an industry is inelastic and if entrepreneur cannot do without it, it can get more wages through union. But if the demand for labour is elastic and if machines can be used as substitutes easily, there is a possibility that demand for more wages may results in unemployment.

(11) To determine the price of combined goods : When certain goods are produced in a combined manner, it is difficult to find out their production cost separately. e.g. In cotton, cotton is a main product, cotton seed is a subordinate product. Therefore, the price regarding cotton seed can be fixed through its demand elasticity. If its demand is inelastic, the price can be fixed at a higher rate and if its demand is price elastic, it must be kept low. Thus, maximum profit can be made by determining the price in this manner.

(12) To take decision regarding selling cost : In modern imperfect competitive market, it is necessary to have the knowledge of elasticity of demand to decide the selling cost . If the selling cost helps in making the demand of a commodity inelastic, even if the price goes up, the consumer will not reduce his demand. But even after spending cost on selling, if the elasticity of demand cannot be reduced, it will not be profitable for the producer.

(13) Theorical importance : Through the knowledge of concept of elasticity of demand, what will be the impact of changes in price on different persons of the society can be known. Therefore, for the study of principles of value and distribution, the study of concept of elasticity of demand is necessary.

10. Income Elasticity of Demand : Meaning and Types

1. **The Meaning of Income Elasticity of Demand :** *"Other factors remaining constant, the ratio of change in demand due to change in consumer's income is called income elasticity of demand".*

Income Elasticity of Demand of X

$$= \frac{\text{Percentage change in demand of X}}{\text{Percentage change in income of the consumers}}$$

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

Here, Y = income, Q = demand, Δ = change

2. **Examples :** Suppose the income of the consumer is ₹ 1,000 and his demand for X is 100 units. If all factors remain constant but if the demand goes up to 300 units, find out the income elasticity of demand

Income Elasticity of Demand of X

$$= \frac{\text{Percentage change in demand of X}}{\text{Percentage change in income of the consumers}}$$

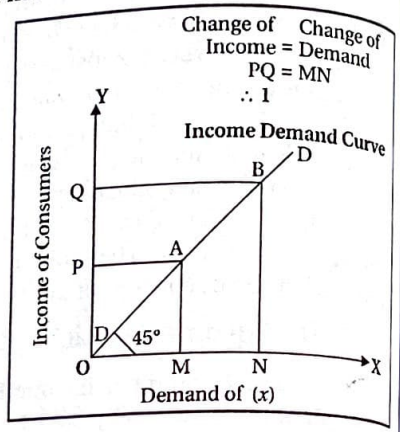
$$= \frac{1000 \times 200}{100 \times 1000} = 2 \text{ positive income elastic demand.}$$

3. Types of Income Elasticity of Demand :

There are three main types of income elasticity of demand : (a) Positive Income Elasticity (b) Negative Income Elasticity (c) Zero Income Elasticity.

A Positive Income Elasticity : If the income of the consumer goes up, the demand for commodities goes up and if the income of the consumer goes down, the demand for commodities goes down and if there is direct relationship between consumer's income and demand for the commodity, it is called positive income elasticity. Positive income elasticity of demand has three types.

(1) Unit Elastic Demand : When the income of the consumer and demand of the commodity move in the same direction and in equal percentage proportion and if the answer is 1 according to the equation, it is called unit elastic demand. If the demand curve is drawn downward, it meets the point of origin at 45°.

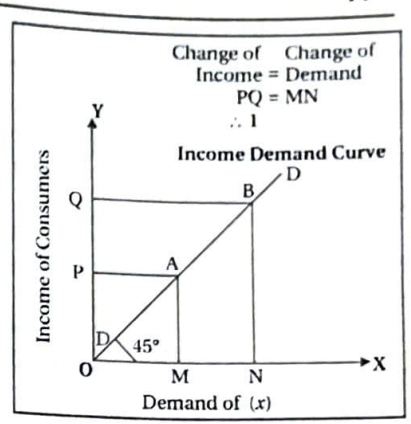


In the figure given here, the income of the consumer is PO and the demand of X is OM. Then the income of the consumer goes up to QO, the demand goes up to ON. Increase in consumer's income PQ is equal to increase in demand MN. The answer will be 1. If the DD curve is extended downward, at the point 'O', it meets at the cycle of 45 degrees.

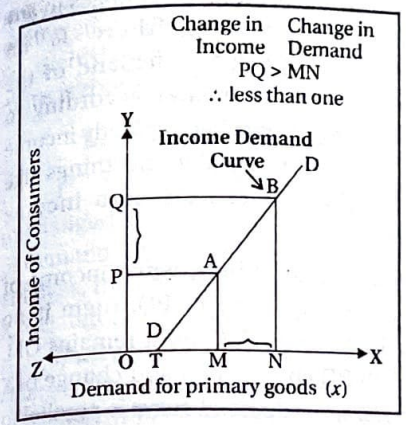
(2) Income elastic demand more than one / unit : When the change in consumer's income and demand for commodities move in the same direction but the percentage change in demand is more than the percentage change in the income of the consumer, the answer according to equation is more than 1, it is called income elastic demand more than one. If the income elastic demand curve is drawn downwards, it crosses horizontal line on the left side of the origin. Usually, the luxury goods have such income elastic demand more than 1.

In the figure given here, on OX demand for goods has been indicated and on OY the income of the consumers is indicated. When the income of the consumer is PO.

the demand for X is OM. It indicates combination 'A'. If the income of the consumer goes up to QO, the demand moves higher up to ON. This shows combination 'B'. DD curve linking A and B, if extended downward crosses baseline on the left side of O. In this figure, the change in demand MN is higher than the change of income PQ. Calculating with the equation, the answer is more than one and the demand curve is income elastic.



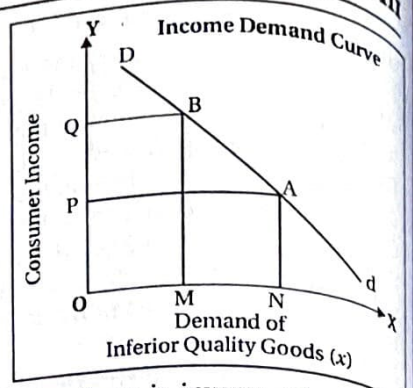
(3) Income Inelastic Demand : When the income of the consumer and the demand for the commodity move in the same direction but the percentage change in demand is less than percentage change in consumer's income and if the answer calculated with the help of equation is less than 1, it is called income inelastic demand. Income inelastic demand curve if drawn downward crosses baseline on the right side of origin 'O'. Usually, such demand is for primary essential goods.



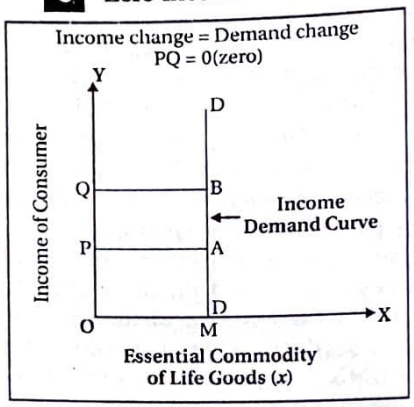
In the figure given here, OX indicates primary goods X and on OY, the income of consumer has been shown. When the consumer's income is PO, the demand for X is OM. But when the income of the consumer goes up to QO, demand goes up to OM. But the increase MN is less than income of the consumer PQ. Thus to indicate such changes, the DD demand curve joining A and B combination is extended downward. It crosses OX baseline on the right side of origin 'O'.

B Negative Income Elasticity : When the income of the consumer and demand for the commodity move in opposite directions, it is called negative income elastic demand. Usually, the inferior goods like jowar, maize etc. have negative income elastic demand. Such income - demand curve is usually with negative slope. People always want to buy superior quality goods but due to limitation of the income, they have to buy inferior quality goods. In these circumstances, when income rises, the consumer is able to buy costly goods in place of inferior quality goods. He reduces his demand of inferior quality goods and buys more units of better quality goods.

In the figure given here, on OX demand of inferior quality goods has been shown. On OY axis income of the customer's has been indicated. When the consumer income is PO, the consumer has to demand inferior quality goods up to ON. It indicates A' combination Now when the consumer's income goes up, he is able to buy costly item units in place of inferior quality goods. Thus, he reduces his demand from ON to OM. It indicates 'B' combination. Thus, when income rises, demand for inferior quality goods decreases and as there is inverse relationship between income and demand for inferior quality goods, DD income curve is with negative slope.



C **Zero Income Elasticity :** When the income of the consumer changes in any percentage proportion, there is no percentage change in the demand of the commodity and the answer according to equation is zero. It is called perfectly income elastic demand. Generally, the things like water, clothings etc. have zero income elasticity.



In the figure given here, when income of the consumer goes up to PQ, there is no change in demand of X and it remains OM. Thus, with PQ change, demand change of X is zero. Here, DD demand curve is parallel to vertical line

11. Factors Affecting Income Elasticity of Demand

Following factors affecting income elasticity of demand.

(1) Type of goods : The type of goods affects the income elasticity of goods e.g. the inferior quality goods have negative income elasticity because people buy such goods unwillingly. But when the income increases, he buys better quality goods and reduces his demand for lower quality goods. In the same way, the demand for primary or essential commodities of life is less income elastic because these goods being essential to live life are affected less in demand in proportion to income. The demand

for luxury goods is more income elastic than one / unit because one can live without such goods easily. In the same way, one cannot live without certain ineviatble things like air, water etc. Therefore, even if income changes, there is no change in demand for such goods. Therefore, such demand is completely income inelastic.

(2) Income level : At different levels of income, the demand for a commodity by the consumer changes e.g. If the income of a person is very low, he cannot buy costly silk bed sheet. His demand is zero income elastic. But if his income level rises, his demand for silk bed sheet may go up. Thus, demand becomes positive income elastic. At a very high level of income, he can buy ever. costlier bed sheet than the silk one. In such case, his demand might become negative income elastic.

(3) Nature : The nature of the consumer also affects the income elasticity of demand. Miserly natured consumers have less income elastic demand than one. The extravagant consumers have less income elastic demand than one.

(4) Safety : The countries where consumers have social security, security of services and employment, their demand is more income elastic because they donot require to such for future. But in a developing country like India where people are not protected by social insurance schemes, it is necessary for them to save for the future. So, their demand has less income elasticity. The people who have earned well have more income elasticity than people who have not earned much.

12. Cross Elasticity of Demand : Meaning and Types

1. Meaning of Cross Elasticity of Demand : If all other factors remain unchanged but if the price of X changes, the change of demand of X is called elasticity of demand. While if all factors remain unchanged but if the price of related goods 'Y' changes, the demand of X changes. The ratio of this change is called cross elasticity of X. Related goods may be complementary or substitute goods.

If all other factors are constant and the price of tea changes, the demand of tea changes. This is called elasticity of demand but if the price of coffee changes, the ratio of change in price of tea is called cross elasticity of demand.

In the same way, if the prices of motor-car are constant and if the price of petrol changes, the ratio of change in demand of a car can be called cross elasticity of demand.

Equation : Cross Elasticity of Demand $= \frac{\text{Percentage change in demand of X}}{\text{Percentage change in demand of Y}}$

$= \frac{Py \Delta Qx}{Qx \Delta Py}$

Here, Py = price of y in the beginning. Qx = demand of X in the beginning

ΔPy = price of y after change. ΔQx = changed in demand of X.

Example : Suppose the price of tea is ₹ 2 and its demand is for 100 cups. At the same time, the price of coffee is ₹ 2 but if it is raised to ₹ 3 the demand of tea goes up to 200 cups. Find out the cross elasticity of demand.

$$\therefore \text{ Cross Elasticity of Demand} = \frac{\text{Percentage change in demand of tea}}{\text{Percentage change in demand of coffee}}$$

$$= \frac{2\times100}{100\times1}$$

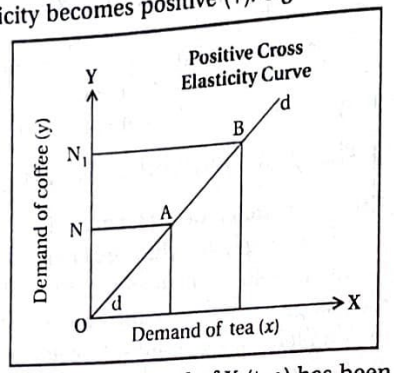
= 2 Cross Elasticity of Demand.

2. Types of Cross Elasticity of Demand :

Cross elastic demand is elastic demand. On the basis of relationships between related goods 'Y'and original goods X, the cross elasticity has three types :

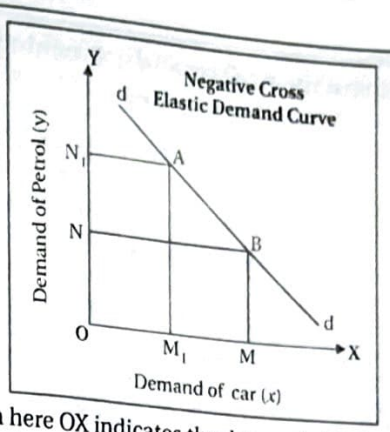
(1) Positive Cross Elasticity (2) Negative Cross Elasticity (3) Zero Cross Elasticity.

(1) Positive Cross Elasticity : Generally, if two things are used as substitutes of each other, cross elasticity becomes positive (+). **e.g.** Tea and coffee.



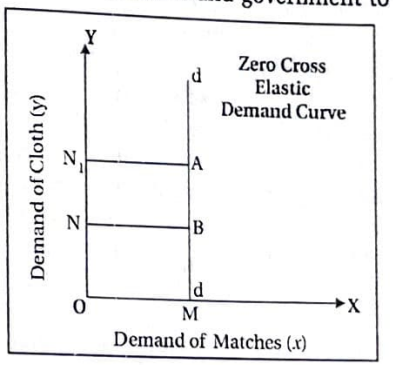
In the figure given here, the demand of X (tea) has been shown on OX and the price of related goods Y has been indicated on OY. The price of coffee is equal to NO where demand of tea is OM. But if the price of coffee (Y) is N_1O, coffee becomes costlier than tea (X), people will demand tea more as substitute. As a result, the demand of tea will be OM to OM_1. Thus, the price of Y and demand X change in the same direction, so the cross elasticity of demand of X (tea) will be positive (+) and dd cross elastic demand curve has positive slope as in the figure.

(2) Negative Cross Elasticity of Demand : Usually, when two things are complementary to each other, cross elasticity becomes negative. The cross elastic demand curve showing such changes has negative slope as in the figure here. **e.g.** petrol and motor-car.



In the figure given here OX indicates the demand of X (motor car) and on vertical line the price of petrol has been indicated. The price of motor-car is constant and the price of petrol was NO. The demand of motor car was OM. The price of petrol went down to N_1O and the demand of motor car goes up from OM to OM_1. Thus, there is inverse relationship between the price of petrol 'Y' and the demand of X (motor-car) and the dd curve elastic demand curve will be with negative slope.

(3) Zero Cross Elasticity : When two things are quite unrelated even if the price of Y changes, there is no effect on demand of X. As a result, the percentage change in demand of X remains zero. Such cross elastic demand curve is parallel to vertical line as in the figure given here. In the figure given here, OX indicates the demand of matches on OY, the price of cloth has been indicated. Firm manufacture the products which are nearest to substitute product, then it is necessary to have a knowledge for manufactures to take decision in business and government to formulate the policy.



13. Advertising Elasticity of Demand : Meaning and Factors and Usefulness

1. **Introduction :** In the modern competitive or partial competitive market of economy, advertising has a great significance. Under advertising, various visible or verbal activities are done by the firm for the purpose of creating or increasing demand for its goods or services. Informative advertising is very helpful for the consumer in making rational purchase decisions.

But the extension of demand through advertising can be measured by advertising or promotional elasticity of demand (E_A) which measures the expected changes in demand as a result of change in other promotional expenses. The demand for some goods is affected more by advertising such as the demand for cosmetics.

2. **Meaning of Advertising or Publicity Elasticity of Demand :** In the modern market, to avail of market and to maintain it, the publicity cost has become inevitable. Producers spend huge sums of money after advertisement and try to expand their market sell their goods in the market.

Meaning : If all other factors remain constant due to changes on advertisements, *the demand of goods changes. This measurement or ratio is called Advertising elasticity of demand.* In short, Advertising elasticity of demand indicates the quantitative relationship between the cost on Advertising and changes in demand.

Equation :

$$\text{Advertising Elasticity of Demand of X} = \frac{\text{Percentage change in demand of X}}{\text{Percentage change on advertisement cost}}$$

3. **Factors affecting Advertising Elasticity of Demand :**

(1) Nature of the products and time factor : Given the huge regiment of products and services it is not possible that same kind of promotional campaigns are carried for all the products. Thus depending on the products the advertisements are made. So it is natural that the advertising elasticity of demand differs from product to product. For some products like the television sets, refrigerator, washing machines, music systems that fall in the category of consumer durables the response from the consumers is not quick due to the durable nature of such products. Such products are not bought by consumers frequently and purchases are made when the current items owned by them are rendered possess. On the other hand services like restaurants, make up items, new fast food items, latest fashion wear see immediate responses from the consumers. Thus the time taken by the end users differ and this will affect the advertising elasticity.

(2) Timing of the promotional activities: The responsiveness of the quantity demanded may change with the change in the timing of the promotional activities. For instance, during the festival season the advertising of certain products is undertaken

with a view to capture the benefit of the festival season. Certain products are launched prior to the commencement of the festivals to generate good response. Thus the advertising elasticity may be high during a particular period of the year and may not be same during the other months.

(3) Product stage : You may have come across the term product life cycle. It indicates the different phases which a product passes through. Depending upon the stage in which the product falls, the advertising elasticity of demand will differ accordingly. E.g. A new product will see a different kind of demand than a mature and already established product. Also if the firm is catering to a new market then it may take some time for the consumers to accept the product. Thus the stage of the product and the kind of market also influences the advertising elasticity.

(4) Promotional activities of the competitors : Businesses today face stiff competition from each other and the firm always has to keep itself in the market so that its presence is felt. This can be done through advertising. Every firm has control over its activities. But at times when a particular product has lot of competition in the market then the advertising campaign of the competitors' also matters. The firm needs to understand the competitors' response to its advertising. The promotional campaigns of the competitor firms also should be observed so that the firm understands where exactly it stands in the market and can make changes accordingly.

The above factors show us that the advertising elasticity changes with the time, competition and product stages.

4. **Importance of Advertising Elasticity of Demand :** We saw what we mean by advertising elasticity of demand along with its calculation. In today's competitive environment the economy though run by pillars like price and income has to face other challenges also. The business firms face severe competition and as a result promotional activities have occupied significance. Just as promotional activities are important for any firm, the promotional elasticity also has its significance because it gives the actual response of the promotional activities on the quantities demanded.

Many of the firms spend huge amounts every year on advertising their products to boost up sales. There is a direct relationship between the extent of advertisement and volume of sales.

The promotional elasticity of demand is also called the advertising elasticity of demand. It measures the responsiveness of demand to change in advertising. The reason for finding out the advertisement elasticity of demand by the company manager is to determine the effects of advertisement on sales.

The advertising elasticity of demand gives an idea to the firm as to how much the quantity demanded responds to the change in advertisement expenditure. Once this is known then the firm can focus on the promotional activities according to the projections of its sales.

We know that the price elasticity of demand is always negative due to inverse relation between price and quantity. Income elasticity is positive for normal goods and negative for inferior goods. What do you think is the nature of promotional elasticity of demand? The coefficient of advertising elasticity of demand is always positive. Why would anybody undertake advertising to decrease its sale? It is a matter of common sense that promotional activities are undertaken with a purpose of extending the demand for the products and services.

14. Importance of Cross Elasticity of Demand

When a firm manufactures the products which are nearest to subsitute product, it is necessary for manufactures to have information to take decision in business and government to formulate the policy.

(1) From the government point of view : The government can be benefitted by the knowledge of the cross elasticity of demand in determining the distribution of limited factors of production for welfare of the people e.g. If the government wishes that fewer factors should be employed in luxury goods, heavy taxes must be levied on petrol or diesel and by increasing their prices, the demand for motor-cars etc. can be reduced.

(2) In determining tax policy : The knowledge of cross elasticity of demand becomes useful to the government in framing tax policy e.g. Instead of levying taxes on scooter, it can levy taxes on petrol and earn more income through taxes with minimum protest.

(3) Traders or producers : The purpose of a trader or producer is to earn maximum profit. It is necessary for a trader or a producer to have the knowledge of cross elasticity of demand in taking decisions regarding production or sale. e.g. If there is a change in the price of Coca Cola, the producer of Pepsi can obtain the estimate of demand of Pepsi through the cross-elasticity index of Pepsi and take appropriate decision regarding production or sale to earn maximum profit. In the same way, if there is a change in the price of the petrol, the estimate regarding the change in demand of scooters or motor-cars can be obtained on the basis of cross elasticity index and policy can be framed to earn maximum profit.

(4) From frame price policy : The business firm can take decision regarding price policy with the help of cross elasticity of demand. Particularly when a firm produces commodities that can be used as substitutes, it must decide prices in such a way that demand of other product is not adversely affected. e.g. Maruti Udyoga Limited produces Maruti-800, Maruti Esteem, Maruti van, Alto, Swift etc. In such cases, it must decide price of all products in such a manner that it does not affect the demand of other products of the company. For this purpose, the concept of cross elasticity of demand becomes useful in finding out the effects of other products.

In the same way, when many firms operate in market, one product of a company may be substitute of the other. In such cases, by deciding the price of a product, its effect can be known through the concept of cross elasticity of demand. e.g. If the price of Maruti Esteem is changed, Tata Indica as a rival product must have the information of cross elasticity of Maruti Esteem. In modern time, many cellphone companies are busy in the field of mobile telephones. The concept of cross elasticity becomes useful in determining the policy regarding services charges and other facilities

(5) For controlling malpractices of monopolists : It is useful to have the information of cross elasticity of demand in order to control monopolists' malpractices. Very often the firms counter the competition of products of other firms with high cross elasticity and try to establish monopoly. They often construct cartel and buy the products if other firms to avoid competition. Thus, they try to make huge profits by monopolising the market. It is necessary to control such activities through laws e.g. In 1995, after the implementation of policy of globalisation, Coca Cola had tried to buy Goldspot, Limca, Thums Up etc. with high cross elasticity of demand and monopolie them with the name PURE DRINKS. But it did not succeed as Pepsi, another multinational company has given it a tough fight.

15. Importance of Income Elasticity of Demand

(1) From Government's point of view : If the government knows about the income elasticity of demand of the people, it can know demand for which commodities will increase and in what quantity with the rise in income of the people. Then it can frame the policy regarding production and distribution of commodities.

Particularly in a planned economy, the knowledge of income elasticity is very necessary. The Government can estimate the changes in demand due to increase in income and decide regarding the increase in production through different industries. It can set targets regarding production and distribute the factors of production accordingly.

(2) From trader's point of view : If the traders or producers know about the income elasticity of demand and about the increase in income of various groups of people, they can produce and sell goods demanded by consumers. They can get adequate market and earn profit.

e.g. If the demand of the product produced by the producers is income elastic, producers can keep the increase in demand in mind that will take place with the increase in income and they can increase production and earn more profit through more selling. On the other hand, if the demand of the products produced by them it inelastic, they can assume that less demand will be there in comparison to increase in income and increase production accordingly. Therefore, there will be no dumping of goods in the market.

If there is the phase of boom in the market, the demand for luxury goods increases but as they income elastic demand, they decrease in demand when there is recession. On the other hand, less income demand elastic is not much affected by boom or recession.

(3) To know the nature of a commodity : From income elasticity of demand of a commodity, its nature can be understood. If its demands is income elastic, it is a luxury commodity. If it is income inelastic, it is primary and essential commodity. If the demand for a commodity has negative income elasticity, it will be inferior quality commodity and if its income elasticity is zero, it will be essential commodities for life such as water, salt etc.

(4) To understand the food problem : In a developing country like India, the knowledge of income elasticity of demand becomes very helpful in understanding the problem of food e.g. In India, income elasticity of demand for food is 0.7 and therefore, though production has gone up, there is still huge demand for food and so the food problem persists.

(5) To frame tax policy : The products with high income elasticity such as jewellery, perfumes, cosmetics etc. can be levied high rates of taxes and state or government revenues can be increased without much protest

(6) To decide the marketing strategy of a firm : To a business firm, the knowledge of income elasticity of demand becomes useful in framing its marketing strategy. If the factor of income of the consumers is an important one in demand, the firm can sell its goods / products in the areas or cities with higher income groups. Thus, it can decide its strategy for marketing and spend more on publicity and sales - schemes.

Objective Study

➤ **Choose the correct option from the given options :**

(1) What is the primary objective of demand analysis in managerial economics ?
- (A) To understand the rational behavior of a consumer
- (B) To determine the factors affecting entire market trends
- (C) To measure the effects of price changes on individual demand
- (D) To discuss the principles of demand analysis

(2) How does managerial economics use market demand analysis ?
- (A) To study consumer behavior in theory
- (B) To make decisions regarding production and raw materials
- (C) To determine government policy on trade
- (D) To forecast inflation rates

(3) What is the ultimate goal of market demand analysis in managerial economics ?
- (A) To minimize costs and sales
- (B) To maximize sales and profit
- (C) To analyze historical sales data
- (D) To study price elasticity in a theoretical context

(4) What are the essential components for a consumer's desire to turn into demand ?
- (A) Desire, time, availability of the commodity
- (B) Desire, capacity to buy, readiness to pay
- (C) Time, price, availability of substitutes
- (D) Capacity to buy, historical prices, future expectations

(5) How is individual demand different from market demand ?
- (A) Individual demand is based on theory, while market demand is based on practice
- (B) Individual demand is made by one person, while market demand is the total demand by all individuals in the market
- (C) Individual demand is only for luxury items, while market demand includes necessities
- (D) Individual demand fluctuates more than market demand

(6) Which of the following is not a type of demand ?
- (A) Demand of Consumer's Products
- (B) Demand of Industrial Products
- (C) Demand of Government Policies
- (D) Demand of Perishable and Durable goods

(7) How does the demand of consumer goods differ from industrial goods ?
- (A) Consumer goods satisfy direct needs, while industrial goods are used to produce other goods
- (B) Consumer goods are always perishable, while industrial goods are durable
- (C) Consumer goods have more elastic demand than industrial goods
- (D) Consumer goods are influenced by government policies more than industrial goods

(8) What is derived demand ?
- (A) Demand that depends on other demands
- (B) Demand that is completely independent of other demands
- (C) Demand that fluctuates seasonally
- (D) Demand for luxury items only

(9) In perfect competition, what is the nature of the demand curve for a firm ?
- (A) Perfectly inelastic
- (B) Downward sloping
- (C) Completely elastic
- (D) Uncertain

(10) What is the demand of an industry ?
- (A) The demand for products produced by a single firm
- (B) The total demand for all firms in an industry
- (C) The seasonal demand for a specific product
- (D) The demand unaffected by market competition

(11) What distinguishes short run demand from long run demand ?
- (A) Short run demand is unaffected by income changes
- (B) Long run demand is related to future market conditions
- (C) Short run demand is more stable than long run demand
- (D) Long run demand only applies to luxury goods

(12) Which of the following factors affects short run demand ?
(A) Consumer's choice and technology
(B) Business practices and government policies
(C) Current price of the product and consumer's income
(D) Long-term financial strategies

(13) How many types of price elasticity of demand are there ?
(A) Two (B) four (C) Five (D) Seven

(14) What will be the elasticity of demand if percentage change in demand is less than the percentage change in price ?
(A) Elastic demand (B) Inelastic demand
(C) Perfectly elastic demand (D) Perfectly inelastic demand

(15) What will be the nature of demand if elasticity of demand is 1 ?
(A) Perfectly elastic demand (B) Perfectly inelastic demand
(C) Unit elasticity of demand (D) Elastic demand

(16) How many types of income elasticity are there ?
(A) Two (B) three (C) Four (D) Five

(17) What is the meaning of the change in demand due to change in price of related goods ?
(A) Price elasticity of demand (B) Cross elasticity of demand
(C) Income elasticity of demand (D) Price elasticity of supply

(18) Which relationship of price and demand is explained by elasticity of demand ?
(A) Correlation (B) Inverse
(C) Quantitative (D) Equal

(19) What is elasticity of demand in case of perfect competition ?
(A) Elastic (B) Inelastic
(C) Perfectly elastic (D) Perfectly inelastic

(20) What is the elasticity of demand for luxury goods ?
(A) Elastic (B) Inelastic
(C) Perfectly elastic (D) Perfectly inelastic

(21) What is the income elasticity of giffen goods ?
(A) Unit income elasticity (B) Income elasticity is greater than 1
(C) Zero income elasticity (D) Negative income elasticity

(22) Which of the following goods may have zero income elasticity ?
(A) Bajara (B) Scooter (C) Niddle (D) Ghee

(23) What is the slope of demand curve when demand is perfectly inelastic ?
(A) Negative slope (B) Parallel to vertical axis
(C) Parallel to horizontal axis (D) Positively slopped

(24) Which type of demand we get when the price elasticity of demand is 1 through formula ?
(A) Price Elastic (B) Price Inelastic
(C) Unit Elastic (D) Perfectly Price Elastic

(25) When there is a little change in the price and there is a unlimited or infinitive change in demand then it is called _____demand.
(A) Price Elastic (B) Price Inelastic
(C) Perfectly Inelastic (D) Perfectly Elastic

(26) Demand of which of the following goods can be price elastic ?
(A) Grain (B) TV
(C) Pin (D) Service of Doctor

(27) How is the elasticity of demand with far substitution between two commodities ?
(A) More (B) Equal (C) Less (D) Zero

(28) How is the elasticity of demand in long run compare to short run ?
(A) More (B) Equal (C) Less (D) Infinitive

(29) How is the demand of most of goods of rich people ?
(A) Elastic (B) Perfectly Elastic
(C) Inelastic (D) Unit Elastic

(30) Cross elasticity of demand of which goods can be zero ?
(A) Complementary (B) Near Substitute
(C) Uncorrelated (D) Less Substitute

(31) How is the demand curve of cross elasticity of demand in context of petrol and motor ?
(A) Negative Slope (B) Positive Slope
(C) Parallel to Vertical Axis (D) Parallel to Horizontal axis

(32) Stretching the income demand curve towards the downside and at horizontal axis, from origin point to left side then how is the income elasticity of demand ?
(A) More than unit (B) Unit elastic
(C) Less than unit (D) Zero

(33) From the following which goods has negative income elasticity of demand ?
(A) Luxury (B) Basic (C) Life necessity (D) Inferior

(34) By changing the price of goods x, then what is known by changing the ratio of demand of x ?
(A) Price Elasticity of Demand (B) Cross Elasticity of Demand
(C) Income Elasticity of Demand (D) None of the given

(35) Which type of relationship is indicated by advertising elasticity of demand between the cost on advertising and changes in demand ?
(A) Qualitative (B) Inverse (C) Quantitative (D) Negative

Answers

(1) B	(2) B	(3) B	(4) B	(5) B	(6) C	(7) A	(8) A	(9) C	
(10) B	(11) B	(12) C	(13) C	(14) B	(15) C	(16) B	(17) B	(18) C	
(19) C	(20) A	(21) A	(22) C	(23) B	(24) C	(25) D	(26) B	(27) C	
(28) A	(29) C	(30) C	(31) A	(32) A	(33) D	(34) A	(35) C		