Microeconomics I and Statistics

As per new B Com CBCS syllabus 2017 for CU

SECOND EDITION

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Preface

This text on *Microeconomics I and Statistics* is strictly for Paper GE 1.1 Chg. of Semester I which is common to honours and general courses in the new syllabus prescribed by the University of Calcutta under the framework of choice based credit system (CBCS) of the University Grants Commission (UGC). The book is designed to cover all the topics keeping in mind the structure of CBCS provided in the UGC guidelines of CBCS. As the total credit hours for each paper under the new system are strictly specified, the chapters in the book are precise, yet comprehensive and easy-to-understand for honours and general undergraduate students of commerce under the University of Calcutta. While it contains the necessary topics completely covering the syllabus of the University of Calcutta, it also captures well the syllabi prescribed by the leading universities in India.

About the Book

Microeconomics I and Statistics is designed for undergraduate commerce students and others in learning microeconomic theory and basic statistics. The main purpose is to articulate the basic questions of microeconomic theory and statistical problems in a student-friendly manner. The primary objective is to motivate the students to learn the concepts, to conceptualize the problem properly, and to secure good marks in the University examination. Some problems on microeconomics are discussed with mathematical treatment along with graphical illustration to understand the problem clearly and more logically. The mathematical parts are for advanced learning, especially for curious students, while others could skip these parts without losing the logic of the problem.

Key Features

- The contents of the book and sequence of topics are prepared by following the CBCS-based new syllabus prescribed by the University of Calcutta.
- Practical examples are inserted to make theories easily understandable to the students.
- Numerical problems are provided to understand different aspects of microeconomics and statistics.
- A plethora of numerical examples, and exercises including multiple-choice questions with answers are provided by following the probable question patterns in the semester system.
- Solutions of the University questions as well as model questions are provided, which will help the students to prepare for their examinations.

Organization of the Book

The first part containing microeconomic theory is divided into five chapters by following the sequence as shown in Module I of the syllabus.

Chapter 1 provides a basic idea of the demand function and the related issues on law of demand. The law of demand is explained and illustrated in terms of charts and diagrams. The perceptions of elasticities of demand have been discussed clearly. Ideas about the elasticities of demand are necessary to conceptualize

the nature of demand for different commodities. This chapter takes care of different concepts of elasticities of demand in a comprehensive manner.

Chapter 2 focuses on the problems of consumers' behaviour under the framework of Marshallian cardinal utility approach, and ordinal utility approach developed first by Hicks and Allen. In a market-based economy, consumers determine the demand for goods and services, and the supply of inputs used in production by solving the constrained utility maximization problem. The concepts of price effect, substitution effect, and income effect are illustrated graphically to easily understand the different shapes of the demand curve for a commodity.

Chapter 3 discusses the concepts of production function, both under short run and long run. Production is an economic activity performed by the firms. Firms determine the supply of output and demand for inputs by solving either constrained output maximization, or constrained cost minimization, or ultimately, profit maximization problem. The problems of constrained optimization that a rational firm has to face is analysed in this chapter with the help of isoquants and isocost lines. The notion of homogeneous function is highly mathematical. However, we have used this concept in a simple form to analyse the behaviour of the long-run production function.

Chapter 4 contains different ideas about costs of production mostly relevant in business economics. Cost functions are basically the mirror image of production functions. The derivation of different aspects of cost function from the production function has been illustrated intelligibly by using simple functional form as well as graphical techniques.

Chapter 5 deals with the market analysis. Exchange between consumers and firms—the two basic economic agents—takes place in the market to determine equilibrium quantity and price of a commodity. Microeconomics deals with the market for a particular commodity. This chapter deals with the nature and characteristics of a perfectly competitive market. Walrasian and Marshallian stability in a competitive market are illustrated lucidly. The impacts of taxes and subsidy in the framework of demand and supply are also discussed in this chapter.

The second part of this book deals with statistics based on Module II of the syllabus prescribed by the University of Calcutta. All chapters in this module contain sufficient numerical examples and many numerical problems for self-assessment of the students.

Chapter 1 of the second part of this book discusses some fundamentals in statistics. It covers the basic steps to be followed in the collection of data and their proper presentation in tabular form, graphs, and figures. Summarization of data is an important step for statistical analysis. Frequency distribution is a popular form of summarization of data. This chapter illustrates the different aspects of frequency distribution and its diagrammatic presentation.

Chapter 2 covers the measures of central tendency and discusses how to calculate them, and under what conditions a particular measure may be used most appropriately. The mean, median, and mode are the popular measures of central tendency. This chapter deals with these measures of central tendency of a distribution.

Chapter 3 deals with the measures of dispersion that seek to quantify the variability of the data. This chapter is concerned with some important measures of dispersion such as range, quartile deviation, mean deviation, and standard deviation, to quantify the extent to which the values in a distribution differ from the average of the distribution.

Chapter 4 takes care of various statistical techniques to distinguish among the various shapes of a distribution. This chapter makes the student familiar with some statistical measures in terms of moments, the concept of skewness and kurtosis.

Chapter 5 contains different methods of interpolation used in statistics and mathematics. Interpolation, is not only useful in statistics, but is also useful in science, business, or any time there is a need to predict values that fall within two existing data points.

Acknowledgements

It is a great pleasure to thank those people who have helped us put this book together. Their generosity and insights were generous. We, of course, are solely responsible for any errors. We acknowledge our debts especially to our colleagues and friends at the University of Calcutta, Goenka College of Commerce and Business Administration, and Hooghly Women's College, many of whom have been of immense help while preparing this text.

We like to thank the Head of the Department of Economics of the University of Calcutta, and the Principal of Hooghly Women's College who inspired us at different stages of the project. Comments given at the early stage by several colleagues after going through large portions of the manuscript very much improved the book.

We are grateful to all that we have discovered while teaching our students. We hope this book can serve to help them. Comments made by the reviewers are gratefully acknowledged. We also thank the editorial team at Oxford University Press, India for all their patience and support.

Panchanan Das
Anindita Sengupta

Brief Contents

Detailed Contents

Features of the Book

Figures and Graphs

Numerous well-labelled figures and graphs are provided throughout the book to graphically present various economic theories.

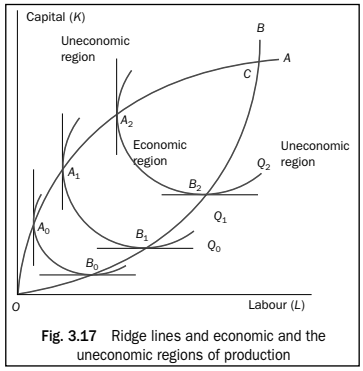

Fig. 3.17 Ridge lines and economic and the uneconomic regions of production

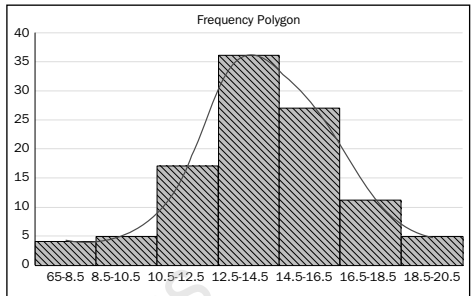

Fig. 1.8 Frequency polygon

Table 2.5 Marginal rate of substitution

Consumption of *X*	Consumption of *Y*	Total utility derived	Marginal rate of substitution ($MRS_{xy} = dY/dX$)
1	12	U_0	–
2	8	U_0	$\|(8 - 12)/(2 - 1)\| = 4$
3	5	U_0	$\|(5 - 8)/(3 - 2)\| = 3$
4	3	U_0	$\|(3 - 5)/(4 - 3)\| = 2$
5	2	U_0	$\|(2 - 3)/(5 - 4)\| = 1$

Tables

Informative and authoritative economic data are presented in the form of numerous tables.

Worked-out Examples

Numerous worked-out examples are provided in the section on Statistics to help students grasp the concepts.

Example 2.2 A restaurant in South Kolkata sold medium, large, and big size soft drinks for ₹35, ₹45, and ₹60, respectively. Of the last 10 drinks sold, 3 were medium, 4 were large, and 3 were big. Find the mean price of the last 10 drinks sold.

Solution: The mean price of the last 10 drinks sold is

$$\bar{x} = \frac{35 + 35 + 35 + 45 + 45 + 45 + 45 + 60 + 60 + 60}{3 + 4 + 3} = \frac{3 \times 35 + 4 \times 45 + 3 \times 60}{3 + 4 + 3} = 46.5 \text{ (₹)}$$

Example 2.6 The average marks of 40 students in section A of B.Com Semester I is 65 and average marks of 35 students in section B of the same semester is 68. Find the average marks of 75 students of both the section of B.Com Semester I.

Solution: We are given the following information.

Section	Number of students	Average marks
Section A	40	65
Section B	35	68
Combined	75	?

EXERCISES

[According to CU syllabus of Economic-I paper for B Com Honours and General, third unit requires 10 lectures and 12 marks. Therefore, we have incorporated the short-answer type questions carrying two marks, medium-answer type questions carrying four marks, and broad-answer type questions carrying eight marks in the exercise.]

SHORT-ANSWER TYPE QUESTIONS (2 MARKS)

1. What do you mean by marginal utility?
2. What would be the value of marginal utility when total utility is maximum? [CU B Com (G), 2008]
17. What is an indifference map?
18. What do you mean by a budget line?
19. What are the conditions required to achieve consumer's

MEDIUM-ANSWER TYPE QUESTIONS (4 MARKS)

1. What are the basic assumptions of cardinal utility theory?
2. Explain the law of diminishing marginal utility.
3. What is the relation between the marginal utility curve and demand curve in Marshallian theory?

LONG-ANSWER TYPE QUESTIONS (8 MARKS)

1. Explain the law of diminishing marginal utility.
2. Distinguish between total utility and marginal utility with the help of a suitable diagram.
7. What are the axioms of choice in the ordinal utility theory?
8. What is an indifference curve? Derive indifference curve

Exercises

Exhaustive chapter-end exercises are provided for the students to practice the concepts.

Question Bank

Numerous additional solved questions with answers are provided in a question bank for students to prepare themselves for examinations.

Question Bank – Microeconomics I

MULTIPLE-CHOICE TYPE QUESTIONS

1. If the demand for a good is inelastic, an increase in its price will cause the total expenditure of the consumers of the good to
   (a) increase
   (c) a movement rightward along the demand curve.
   (d) the equilibrium price to rise.
8. Which of the following will always raise the equilibrium

B.Com Examination 2014

(New Syllabus)

Economics-I Solved Relevant Question Paper

Fourth Paper [C-14G] Full Marks-100

Module-I

Group-A

1. Answer the following questions: 2 × 5

(a) State any two characteristics of business economics.

Model Question Paper-1
Statistics

Full Marks-50

Group A

1. Answer the following questions: 5 × 2 = 10

(a) Type of cumulative frequency distribution in which class intervals are added in top to

Group B

2. Answer the following questions. 5 × 4 = 20

(a) What are the main sources of secondary data?

Solved CU Question Papers/Model Question Papers

Students can learn from solved previous years' University question papers and attempt the model question papers for themselves.

Road Map—University of Calcutta Syllabus

Module I: Microeconomics I

UNIT	TOPIC	DETAILS	CHAPTER
Unit I	Demand and consumer behaviour	Concept of demand, demand function, law of demand, derivation of individual and market demand curves, shifting of the demand curve; elasticity of demand. Consumer behaviour: Marshallian utility approach and indifference curve approach; utility maximization conditions; income–consumption curve (ICC) and price–consumption curve (PCC), derivation of demand curve from PCC.	1 2
Unit II	Production and cost	Production function: Short-run and long-run; relation among total product, average product and marginal product, law of returns to a variable factor, law of returns to scale; concepts of isoquant and isocost line; conditions for optimization (graphical approach). Cost: Accounting and economic costs; social and private costs; short-run and long-run costs; relation between average and marginal costs; determination of LAC curve from SAC curves, LMC.	3 4
Unit III	Perfect competition	Concept of perfectly competitive market: Assumptions, profit maximization conditions; related concepts of total revenue, average revenue and marginal revenue, short-run and long run equilibrium of a firm; determination of short-run supply curve of a firm, measuring producer surplus under perfect competition, Stability analysis—Walrasian and Marshallian, demand supply analysis including impact of taxes and subsidy.	5

Module II: Statistics

UNIT	TOPIC	DETAILS	CHAPTER
Unit I	Fundamentals	Definition of statistics, scope and limitation of statistics, attribute and variable, primary and secondary data, method of data collection, tabulation of data, graphs and charts, frequency distribution, diagrammatic presentation of frequency distribution	1
Unit II	Measures of central tendency	Meaning of central tendency, common measures – mean (AM, GM, HM), median, and mode, Partition values—quartiles, deciles, and percentiles, applications of different measures.	2
Unit III	Measures of dispersion	Meaning of dispersion, common measures—range, quartile deviation, mean deviation, and standard deviation; relative measures of dispersion, combined standard deviation, applications of different measures.	3
Unit IV	Moments, skewness, and kurtosis	Different types of moments and their relationships, meaning of skewness and kurtosis, different measures of skewness, measure of kurtosis, applications of different measures.	4
Unit V	Interpolation	Finite differences, polynomial function, Newton's forward and backward interpolation formula, Lagrange's interpolation formula.	5

CHAPTER

1

Basics of Demand

This chapter provides the ideas about the concept of demand, law of demand, factors determining demand and demand function. It discusses construction of demand schedule and derivation of individual and market demand curve. The chapter elaborates the difference between movements along the demand curve and shifting of demand curve. It states the situations of exceptions to the law of demand.

1.1 Introduction

One of the best ways to start discussing about the fundamentals of economics is to begin with the basics of demand and supply. Supply–Demand analysis is a fundamental and powerful tool that can be applied to a wide variety of important problems of economics. We try to ascertain how demand and supply curves are used to describe the market mechanism. Supply and demand come into equilibrium to determine both market price of a good and the total quantity produced. What the market price and quantity will be depends on the particular characteristics of supply and demand. We will therefore discuss the basic concepts and characteristics of supply and demand in this chapter.

1.2 Demand Function

Demand is the consumer's willingness to get goods or service in exchange for a price. In other words, demand is a quantity of a commodity the consumer wants to purchase at a given price income situation. Demand depends on many factors. The functional relationship between the quantity demanded for a commodity and its determining factors is known as the demand function.

Demand function is the behavioural relationship between quantity demanded for a good or service and all the factors that influence the demand for that good or service. The major factors affecting the demand for a certain good or service are own price of the good or service, price of a substitute or complement of the good or service, personal disposable income, tastes and preferences, and consumer's expectations about future prices and future income. The functional relationship between quantity demanded and its determinants is called the demand function.

Demand function can be written as follows:

$$Q_D = f(P, P^{/}, Y_D, T, E_P, E_y) \quad (1.1)$$

where P = own price of the good or service, $P^{/}$ = price of a substitute or complement of the good or service Y_D = personal disposable income, T = tastes and preferences, E_P = expectations about future prices, and E_y = expectations about future income. The factors affecting demand are as follows.

Own price of the good or service The basic demand relationship is between different prices of a good or service and the quantities that would be purchased at those prices. Generally, such a relationship is negative, that is, an increase in price will induce a decrease in the quantity demanded.

Price of related goods or services Related goods of the primary good are of two types, that is, complements and substitutes. Complements are goods that are used with the primary good. For example, tea and sugar are complementary goods. To consume tea, one must also consume sugar. If the price of sugar goes up, the quantity demanded for tea goes down automatically. The mathematical relationship between the price of the complement and the demand for the good in question, is negative. The other main category of related goods is substitute. Substitutes are goods that can be used in place of the primary good. For example, tea and coffee. Coffee can be consumed in place of tea. Therefore, if the price of coffee goes down, people will start consuming more coffee and automatically demand for tea will go down. The mathematical relationship between the price of the substitute and the demand for the good in question, is positive.

Consumers' income In general, the more income (income after tax) a person has, the more likely that person is willing to buy the particular good or service. Therefore, the mathematical relationship between income and the demand for the good or service in question, is positive.

Tastes and preferences How much of a particular good or service is demanded also depends on an individual's taste and preference for the item. In general, economists use the term 'tastes and preferences' as a comprehensive category for a consumer's attitude towards a product. In this sense, if due to a change in fashion, habit etc., a consumer's taste and preference for a particular good or service increases, the quantity demanded increases, and vice versa. Therefore, the mathematical relationship between tastes and preferences for a good or service and the demand for the good or service in question is positive.

Consumer's expectations about future prices and income If a consumer believes that the price of the good or service will be higher in the future, he/she is more likely to purchase the good or service now. Therefore, the mathematical relationship between the consumer's expectations about future prices of the good or service and the demand for the good or service is positive. If the consumer expects that his/her income will be higher in the future, the consumer is less likely to buy the good or service now.

In Eq. (1.1), $dQ_D/dP < 0$ (since, mathematical relationship between the price of the good and the demand for it, is negative), $dQ_D/dP^{/} > 0$ for substitute (since, mathematical relationship

between the price of the substitute and the demand for the good in question, is positive), $dQ_D/dP' < 0$ for complement (since, mathematical relationship between the price of the complement and the demand for the good in question is, negative), $dQ_D/dY_D > 0$ (since, mathematical relationship between the income of the consumer and the demand for the good, is positive), $dQ_D/dT > 0$ (since, mathematical relationship between the tastes and preferences for the good and the demand for the good, is positive), $dQ_D/dE_P > 0$ (since, mathematical relationship between expectations about future prices and the demand for the good, is positive), and $dQ_D/dE_Y < 0$ (since, mathematical relationship between expectations about future income and the demand for the good, is negative).[1]

1.3 The Law of Demand

Demand for a commodity depends on so many factors such as its own price, price of other commodities, and so on. The law of demand states that the quantity demanded for a commodity increases when its price falls and vice versa, if all other factors remain the same. The inverse relation between quantity demanded for a commodity and its own price under ceteris paribus assumption is known as the law of demand.

In other words, the law of demand states that the quantity demanded and the price of a commodity are inversely related, other things remaining constant. All the goods, for which law of demand is applicable, are called normal goods. The reason behind the inverse relationship between quantity demanded and price for a normal good is quite simple. People have limited incomes. Suppose, a consumer purchases 1 kg of apple for consumption of his/her family for 1 week. If the price of apple goes up, the weekly expenditure of the consumer for apple will also go up if he/she continues to purchase the same quantity after the rise in price. In order to maintain the weekly budget, the consumer will reduce his/her consumption for apple. The opposite thing will happen if the price of apple goes down. Therefore, it is clear, for normal goods, if price goes up, quantity demanded will go down and vice versa. The geometric representation of price quantity relationship is known as the demand curve. The law of demand suggests that the demand curve for a commodity should be negatively sloped.

However, law of demand implies that changing price would move quantity demanded up or down, but this would not change the demand itself. Change in quantity demanded and change in demand are not the same concept. Change in quantity demanded refers to the change in the amount of a commodity as a result of change in the price of it. Amount demanded rises or falls according to the fall or rise in price. In such a case, other factors influencing demand are held constant. The change takes place in the same demand curve. On the other hand, 'change in demand' means changes in demand due to the changes in the factors other than price, for example, income, taste and preference, prices of other related

[1] dQ_D/dP = Change in quantity demanded due to change in own price
dQ_D/dP' = Change in quantity demanded due to change in price of substitute or complement
dQ_D/dY_D = Change in quantity demanded due to change in disposable income
dQ_D/dT = Change in quantity demanded due to change in tastes and preferences
dQ_D/dE_P = Change in quantity demanded due to change in expectation about future price
dQ_D/dE_Y = Change in quantity demanded due to change in expectation about future income

commodities, etc. The change in demand involves 'increase' and 'decrease' of the demand for a commodity. In case of change in demand the entire demand schedule and demand curve change. With an increase in demand, the curve shifts upwards and with a decrease in demand, the curve shifts downwards.

1.3.1 Demand Schedule

A demand schedule is crucial for constructing a demand curve. A demand schedule lists prices and corresponding quantities based on the law of demand. To understand the concept of demand schedule better, let us look at the demand schedule of a popular luxury soap in Table 1.1.

Table 1.1 Demand schedule of luxury soap

Price (₹)	Quantity demanded
50	1
40	2
30	3
20	4
10	5

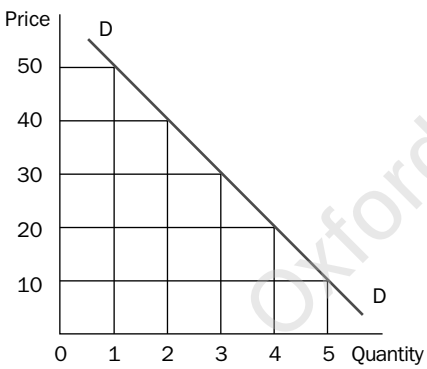

Figure 1.1 Individual demand curve

It exhibits hypothetical demand schedule of an individual for a popular luxury soap. We find that there is an inverse relationship between price and quantity demanded because a demand schedule follows the law of demand.

1.3.2 Derivation of Individual Demand Curve

We can construct the demand curve of an individual for a luxury soap based on the demand schedule, as shown in Fig. 1.1. While deriving the demand curve, we would always measure quantity along the horizontal axis and price along the vertical axis. Demand curve is the locus of all the points showing demand for a good or service at various prices of that good or service. Table 1.1 shows that when the price is ₹50, the quantity demanded is 1 unit. Similarly, when the price is ₹40, the quantity demanded is 2 units, and so on. As we can see, there is a corresponding quantity for each price. By joining all the points established by plotting all prices and their corresponding quantities on a graph, we can obtain a demand curve. Hence, the demand curve for a normal good exhibits the law of demand, that is, the relationship between two variables, namely price and quantity demanded. Since the demand curve follows the law of demand, it is negatively sloped.

1.3.3 Derivation of Market Demand Curve

The previously discussed demand schedule and demand curve are the case of an individual. The analysis can be extended to a market in the same manner. A market typically consists of many customers and different customers possess different tastes and preferences, different incomes, different expectations about future prices and future incomes. Hence, individual demand curves differ from person to person in their slopes and shapes. However, we are able to sum up all individual demand curves and derive a market demand curve. In other words, the market demand curve is the sum of all individual demand curves.

For simplicity, let us assume that the market consists of only two customers. Table 1.2 depicts the individual demand schedules of a popular luxury soap for consumer 1 and consumer

Table 1.2 Individual demand schedules of luxury soap

Price (₹)	Quantity demanded by		Market demand of luxury soap
	Consumer 1	Consumer 2	
50	1	0	1
40	2	1	3
30	3	2	5
20	4	3	7
10	5	4	9

2 and also the combined demand schedule of the luxury soap for the market. From Table 1.2, we understand that the market demand is obtained by summing up individual demands. The table shows that at price ₹50, the market demand is 1 unit; at price ₹40, the market demand is 3 units; at price ₹30, the market demand is 5 units; and so on. Since there is an inverse relationship between price and quantity demanded, it is obvious that the market demand schedule also follows the law of demand.

Similarly, we can derive the market demand curve (D) by the horizontal summation of individual demand curves ($D_1 + D_2$), as illustrated in Fig. 1.2.

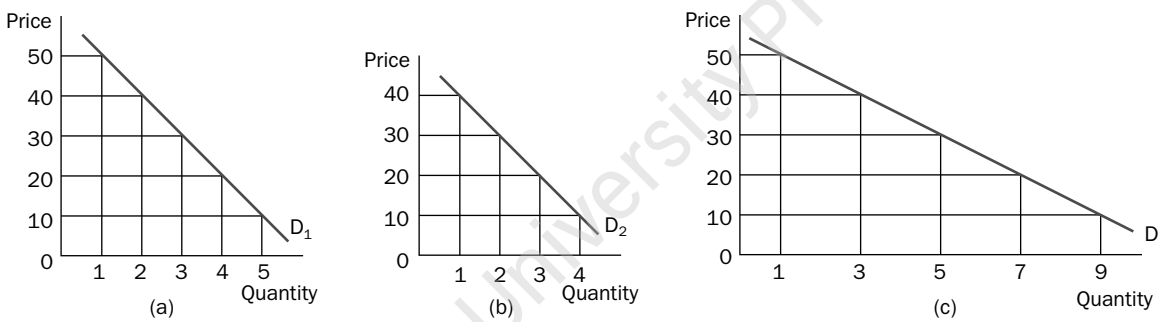

Figure 1.2 Demand curve (a) Demand curve for consumer 1 (D_1) (b) Demand curve for consumer 2 (D_2) and (c) Market demand curve ($D_1 + D_2 = D$)

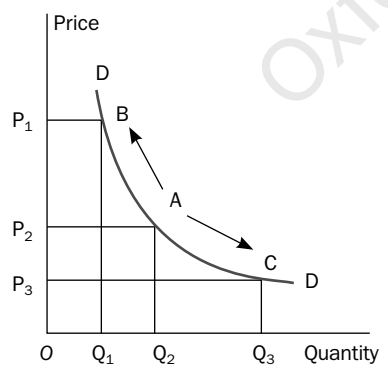

Figure 1.3 Movements along the demand curve

1.3.4 Movement along the Demand Curve

Movement along the demand curve occurs when there is a change in the own price. As we know, there is an inverse relationship between price and quantity demanded. Hence, reduction in the price causes a downward movement. This means that there is an increasing demand. Further, rise in the price causes an upward movement. This means that there is a decreasing demand. Movements along the demand curve are shown in Fig. 1.3.

In Fig. 1.3, the movement from A to C represents movement along the demand curve. At point A, the price is OP_2 and the quantity demanded is OQ_2. When there is a movement from point A to point C, price falls to OP_3 and quantity demanded increases to OQ_3. Further, when there is a movement from point A to point B, price rises to OP_1 and quantity demanded decreases to OQ_1. Here, we can notice that the movement along the demand curve occurs because of a rise or a fall in the price level.

1.3.5 Shifting of the Demand Curve

We have mentioned earlier that there are various determinants of demand for a commodity apart from its price, for example, personal disposable income of the consumer, prices of the related goods and services, preferences of the consumer, etc. A shift in the demand curve occurs when any one of those determinants change.

Income of the consumer is one of the determinants of demand. If the household income increases, there is an increase in the demand. This implies that for the same level of price, quantity demanded will be higher and hence the demand curve will shift outwards. Outward shifting of the demand curve for increase in income is shown in Fig. 1.4. Assume that the demand curve (DD) in Fig. 1.4 refers to demand for tea. Let us consider the income of the consumer as one of the determinants of demand. Suppose income of the consumer increases, then, the consumer's demand for tea for the same price increases. Therefore, the original demand curve for tea (DD) shifts to the right and forms a new demand curve (D_1D_1). In this case, quantity demanded increases from OQ_1 to OQ_2. However, the price remains unchanged at OP_1.

Figure 1.4 Shifting of demand curve due to increase in income

Suppose due to change in fashion or habit, tastes and preference of the consumers for the particular commodity increases. This implies that, for the same level of price, quantity demanded will be higher and the demand curve will shift outwards. Outward shifting of the demand curve for the change in tastes and preferences in favour of the commodity is shown in Fig. 1.5. If tastes and preferences of people have changed towards the consumption of tea, may be because drinking tea has become a new habit or new fashion, more amount of tea will be demanded at the same price level. Hence, the demand curve for tea (DD) will shift rightwards (to D_1D_1). Quantity demanded will increase from OQ_1 to OQ_2, whereas price will remain at OP_1.

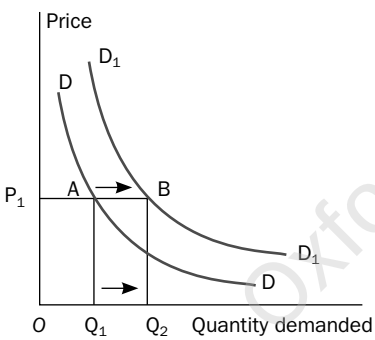

Figure 1.5 Shifting of demand curve due to increase in tastes and preferences

Assume that coffee is the substitute and sugar is the complement of tea. Now, if the price of coffee increases, people will purchase less of coffee and the demand for tea will increase. Hence, demand curve for tea will shift outwards. On the other hand, if the price of sugar increases, people will purchase less of sugar. Since tea has to consumed in combination with sugar, demand for tea will decline. Hence demand curve for tea will shift inwards. Outward shifting of the demand curve for increase in the price of the substitute good is shown in Fig. 1.6. On the other hand, shifting of the demand curve due to increase in the price of the complement good is shown in Fig. 1.7.

In Fig. 1.6, demand curve for tea (DD) will shift rightwards (to D_1D_1) as a result of increase in price of coffee. Quantity of tea demanded will increase from OQ_1 to OQ_2, whereas price will remain at OP_1.

On the other hand, demand for tea will decline for the same price level as a result of increase in the price of sugar, as shown in Fig. 1.7. Hence, demand curve for tea (DD) will shift leftwards (to D_1D_1), whereas price will remain the same (at OP_1).

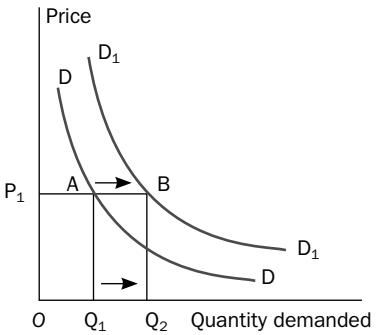

Figure 1.6 Shifting of demand curve due to increase in the price of substitute good

Figure 1.7 Shifting of demand curve due to increase in the price of complement good

1.4 Exceptions to the Law of Demand

For most of the goods and services, according to the law of demand, the quantity demanded for a good increases with a decrease in price of the good and vice versa. Such goods and services are called normal goods and services. Demand curve for a normal good or service follows the law of demand and therefore it is downward sloping. In some cases, however, this may not be true. The circumstances when the law of demand becomes ineffective are known as exceptions of the law of demand. In those cases, the demand curve does not follow the law of demand and therefore it is not downward sloping. Such situations are explained in the following subsections.

1.4.1 Giffen Goods

Some special varieties of inferior goods are termed as Giffen goods. Cheaper varieties of this category like bajra, cheaper vegetable like potato come under this category. Sir Robert Giffen from Ireland first observed that people used to spend more of their income on inferior goods like potato and less of their income on meat. However, potatoes constituted their staple food. When the price of potato increased, after purchasing potato they did not have so many surpluses to buy meat. So the rise in the price of potato compelled people to buy more potato and thus raised the demand for potato. Hence, demand curves for Giffen goods are positively sloped as shown in Fig. 1.8. This is against the law of demand. This is also known as Giffen paradox.

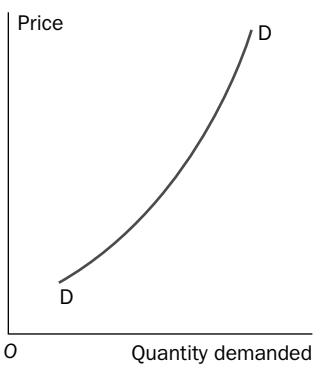

Figure 1.8 Demand curve in case of Giffen good

1.4.2 Conspicuous Consumption

This exception to the law of demand is associated with the doctrine propounded by Thorsten Veblen. A few goods like diamonds, are purchased by the rich and wealthy sections of the society. The prices of these goods are so high that they are beyond the reach of the common man. The higher the price of the diamond, the higher the prestige value of it. So when price of these goods falls, the consumers think that the prestige value of these goods comes down. So quantity demanded of

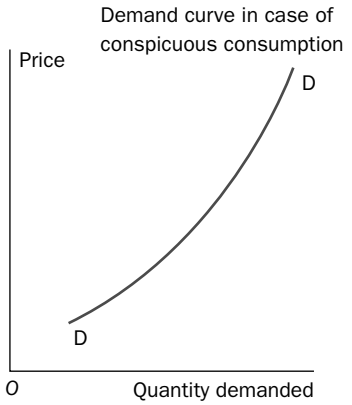

Figure 1.9 Demand curve in case of conspicuous consumption

these goods falls with fall in their price. So the law of demand does not hold good here. Here also, the demand curve is positively sloped as shown in Fig. 1.9.

1.4.3 Conspicuous Necessities

Certain things become the necessities of modern life. So we have to purchase them despite their high price. The demand for T.V. sets, automobiles, and refrigerators has not gone down in spite of the increase in their price. These things have become the symbol of status. So they are purchased despite their rising price. These can be termed as 'U' sector goods. When quantity demanded for these goods increases despite increase in price, the demand curves for such goods are positively sloped. Again, when quantity demanded for these goods remains constant despite increase in price, the demand curves for such goods are vertical. These cases are shown in Figs 1.10 and 1.11.

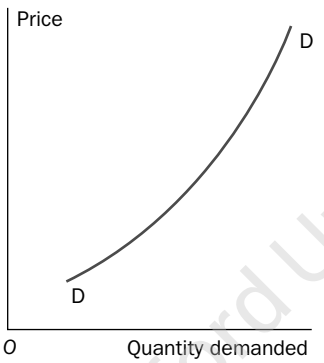

Figure 1.10 Demand curve in case of conspicuous necessities (increasing prices and increasing demand)

Figure 1.11 Demand curve in case of conspicuous necessities (increasing prices and constant demand)

Figure 1.12 Demand curve in case of ignorance about the commodity

1.4.4 Ignorance

A consumer's ignorance is another factor that at times induces him to purchase more of the commodity at a higher price. This is especially so when the consumer is haunted by the phobia that a high-priced commodity is better in quality than a low-priced one. Once again, in this case, the demand curve is positively sloped, as shown in Fig. 1.12.

1.4.5 Emergencies

Emergencies such as war and famine negate the operation of the law of demand. At such times, households behave in an abnormal way. Households make more prominent and induce further price rises by making increased purchases even at higher prices during such periods. During depression, on

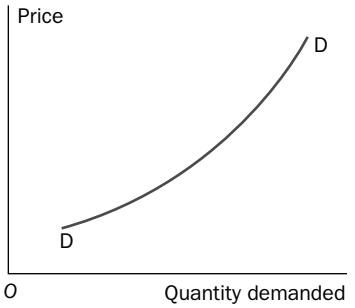

Figure 1.13 Demand curve in case of emergencies

the other hand, no fall in price is a sufficient inducement for consumers to demand more. The demand curves for all essential commodities become positively sloped under these circumstances, as shown in Fig. 1.13.

1.4.6 Future Changes in Prices

Households also act as speculators. When the prices are rising, households tend to purchase large quantities of the commodity out of the apprehension that prices may still go up. When prices are expected to fall further, they wait to buy goods in future at still lower prices. So quantity demanded falls when prices are falling. The demand curve becomes positively sloped in such situations, as shown in Fig. 1.14.

1.4.7 Change in Fashion

A change in fashion and tastes affects the market for a commodity. When a long skirt replaces a short skirt, no amount of reduction in the price of the latter is sufficient to clear the stocks, that is, demand for short skirts falls with reduction in the price of short skirts. Long skirt on the other hand will have more customers even though its price may be going up, that is demand for long skirts increases with the increase in price of long skirts. The law of demand becomes ineffective. Under these circumstances, demand curve for both the long skirt and the short skirt becomes positively sloped, as shown is Fig. 1.15.

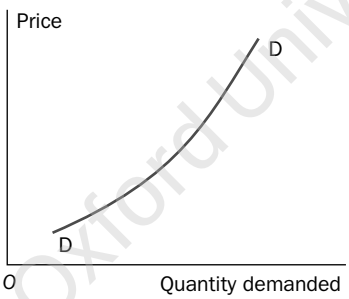

Figure 1.14 Demand curve in case of speculations about future changes in prices

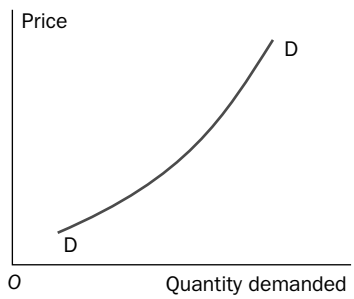

Figure 1.15 Demand curve in case of changes in fashion

1.5 Elasticity of Demand

Now, we would like to check how demand of any commodity responds to changes in its main determinants, that is, price of the commodity, price of any related commodity, and income, other things remaining the same. Rate of change in demand for any commodity due to 1 per cent change in any of the determinants of demand is called elasticity of demand. We will discuss about own price elasticity of demand, cross-price elasticity of demand, and income elasticity of demand.

1.5.1 Own Price Elasticity of Demand

Own price elasticity of demand is the percentage change in demand for any commodity due to 1 per cent change in its own price, other things remaining the same. Own price elasticity of

demand (e_p) for commodity X_1 can be expressed as follows:

$$e_p = \frac{\text{Percentage change in demand for the commodity } X_1}{\text{Percentage change in } P_1}$$

$$= \frac{\dfrac{\text{Change in demand for the commodity } X_1}{\text{Initial quantity demanded of } X_1}}{\dfrac{\text{Change in } P_1}{\text{Initial level of } P_1}}$$

If we denote change by $\varnothing$, the absolute value of own price elasticity of demand is

$$|e_p| = \frac{\dfrac{\Delta X_1}{X_1}}{\dfrac{\Delta P_1}{P_1}} = \frac{P_1}{X_1}.\frac{\varnothing X_1}{\varnothing P_1} \tag{1.2}$$

Value of own price elasticity of demand will depend upon the type of good we are talking about, as discussed here.

- If the good is a normal good, then there will be a negative relationship between quantity demand and price, that is, $\Delta X_1/\Delta P_1 < 0$, ($P_1 > 0$ and $X_1 > 0$). Therefore, own price elasticity of demand for normal good will be negative.
- In case of a normal necessity good, change in quantity demanded will be less than that in price, that is, own price elasticity of demand for normal necessity good will be negative and its absolute value will be less than one.
- In case of a normal luxury good, change in quantity demanded will be more than that in price, that is, own price elasticity of demand for normal luxury good will be negative and its absolute value will be greater than one.
- In case of an inferior good, change in quantity demanded will be less than that in price, that is, own price elasticity of demand for inferior good will be negative and its absolute value will be less than one.
- In case of a Giffen good, there will be a positive relationship between quantity demand and price, that is, $\Delta X_1/\Delta P_1 > 0$, ($P_1 > 0$ and $X_1 > 0$). Therefore, own price elasticity of demand for Giffen good will be positive.

1.5.2 Measurement of Own Price Elasticity of Demand

Own price elasticity can be measured in two ways. Firstly, when change in own price is bigger, the change of quantity demanded will be a measurable portion of the demand curve, which can be called an arc. Therefore, it is called arc elasticity of demand. Secondly, when change in price is very small, the change in quantity demanded cannot be easily measurable on the demand curve. Therefore, it is called point elasticity of demand.

Arc Elasticity of Demand

In Fig. 1.16, as price falls from P_1 to P_2, quantity demanded increases from X_1 to X_2. Equilibrium point changes from E_1 to E_2. Distance E_1E_2 is measurable and it is an arc. We have to measure

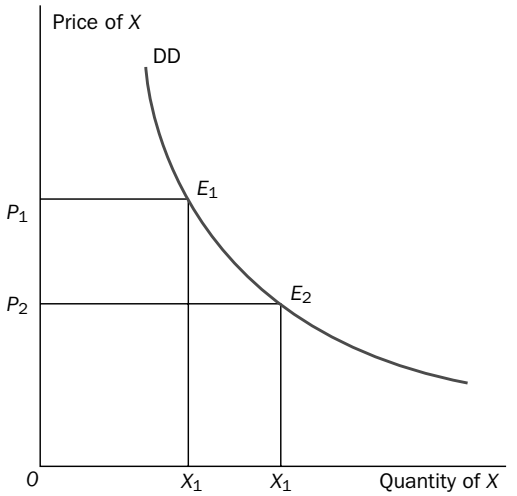

Fig. 1.16 Arc elasticity of demand

elasticity on this arc. If we consider P_1 the initial price and X_1 the initial quantity demanded, change is price is $P_2 - P_1$ and change is quantity demanded is $X_2 - X_1$. Arc elasticity of demand is

$$E_{arc} = \frac{\frac{\text{Change in quantity demanded}}{\text{Original quantity demanded}}}{\frac{\text{Change in own price}}{\text{original own price}}} = \frac{\frac{X_2 - X_1}{X_1}}{\frac{P_2 - P_1}{P_1}} = \frac{P_1}{X_1} \cdot \frac{X_2 - X_1}{P_2 - P_1} \quad (1.3)$$

If we consider P_2 the initial price and X_2 the initial quantity demanded, change is price is $P_1 - P_2$ and change is quantity demanded is $X_1 - X_2$. Arc elasticity of demand is

$$E_{arc} = \frac{\frac{\text{Change in quantity demanded}}{\text{Original quantity demanded}}}{\frac{\text{Change in own price}}{\text{Original own price}}} \quad (1.4)$$

$$\frac{\frac{X_1 - X_2}{X_2}}{\frac{P_1 - P_2}{P_2}} = \frac{P_2}{X_2} \cdot \frac{X_1 - X_2}{P_1 - P_2}$$

If we compare these two values of arc elasticity,

$$\frac{X_2 - X_1}{P_2 - P_1} = \frac{X_1 - X_2}{P_1 - P_2}$$

However,

$$\frac{P_1}{X_1} \uparrow \frac{P_2}{X_2}$$

Therefore, if we measure the arc elasticity from two opposite side, values will be different. To solve this problem, we consider the average value of both price and quantity as initial price and quantity.

Therefore,

$$E_{arc} = \frac{\frac{X_1 - X_2}{X_1 + X_2}}{\frac{P_1 - P_2}{P_1 + P_2}} = \frac{2(X_1 - X_2)}{X_1 + X_2} \cdot \frac{P_1 + P_2}{2(P_1 - P_2)} = \frac{P_1 + P_2}{X_1 + X_2} \cdot \frac{X_1 - X_2}{P_1 - P_2} \quad (1.5)$$

$$\frac{P_1 + P_2}{X_1 + X_2} > 0$$

However, $\frac{X_1 - X_2}{P_1 - P_2} < 0$

Since $P_1 - P_2 > 0$ and $X_1 - X_2 < 0$.

Therefore, $E_{arc} < 0$.

Point Elasticity of Demand

When change in price is very small, resulting change in quantity demanded is also very small. In this situation, the initial equilibrium point and the final equilibrium point come close to each other, that is, the arc becomes smaller. Ultimately, the two equilibrium points tend to coincide. As a result, the arc becomes a point. Therefore, the arc elasticity becomes point elasticity. Thus, the limiting value of arc elasticity is the point elasticity.

If we assume that we have to measure elasticity at point (P_0, X_0), then absolute value of point elasticity is

$$\text{Own price elasticity} = \frac{\frac{\text{Change in quantity demanded}}{\text{Original quantity demanded}}}{\frac{\text{Change in own price}}{\text{Original own price}}}$$

$$\left|E_P\right| = \frac{P_0}{X_0} \cdot \frac{dX}{dP} \left(\text{Change is denoted by } d, \text{ since change is very small}\right)$$

As $dX/dP < 0$, value of E_p is negative.

Our problem is to measure price elasticity at a point on the demand curve. This is illustrated in Fig. 1.17.

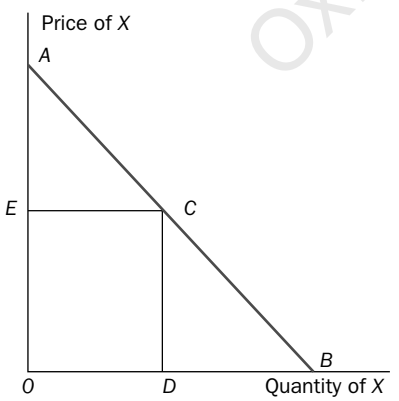

Fig. 1.17 Measurement of price elasticity at a point on the demand curve

We have to measure point price elasticity at point *C*, where price level is *OE* and quantity demanded is *OD*.

$$\text{Price elasticity} = \frac{P_0}{X_0} \cdot \frac{dX}{dP}$$

We know that,

$$\frac{P_0}{X_0} = \frac{OE}{OD}$$

Now, we have to find out, dX/dP.

We know that the demand function is $X = f(P)$.

Therefore, inverse demand function can be written as $P = F(X)$.

From the inverse demand function, we obtain the slope of the demand curve as

$$\frac{dP}{dX} = \frac{\text{Perpendicular}}{\text{Base}} = \frac{OA}{OB} = \frac{CD}{DB} = \frac{AE}{EC} = \frac{AE}{OD} \ (\text{since} EC = OD)$$

Therefore,

Point price elasticity at point $C = \frac{OE}{OD}.\frac{OD}{AE} = \frac{OE}{AE} = \frac{BD}{OD} = \frac{BC}{AC}$

If point C is the mid-point of the demand curve, $BC = AC$. Therefore, $E_p = 1$.
If the point lies on the upper half of the demand curve, $BC > AC$, therefore, $E_p > 1$.
If the point lies on the lower half of the demand curve, $BC < AC$, therefore, $E_p < 1$.
Point price elasticity at point A is ∞, since denominator = 0.
Point price elasticity at point B is 0, since numerator = 0.

1.5.3 Elastic and Inelastic Demand

The shape of any demand curve depends upon the absolute value of elasticity of demand. The shapes of different demand curves according to the absolute values of elasticity of demand are explained as follows:

- When price elasticity of demand is less than one, it is called inelastic demand, as in case of necessity goods. Such a demand curve is shown in Fig. 1.18.
- When price elasticity of demand is more than one, it is called elastic demand, as in case of luxury goods. Such a demand curve is shown in Fig. 1.19.

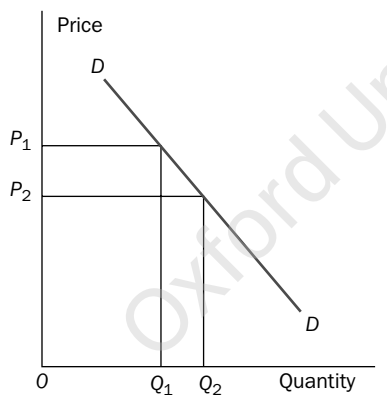

Fig. 1.18 Inelastic demand curve

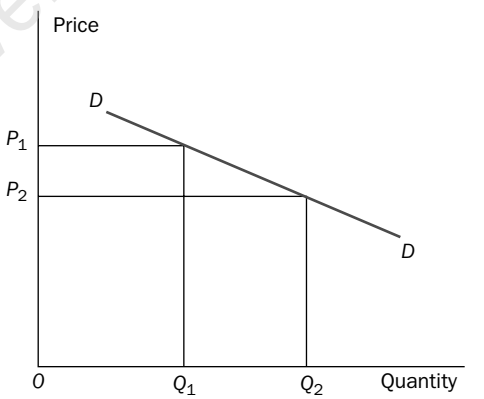

Fig. 1.19 Elastic demand curve

- When price elasticity of demand is equal to one, it is called unitary elastic demand. Such a demand curve is shown in Fig. 1.20.
- When price elasticity of demand is equal to ∞, it is called perfectly elastic demand. The shape of a perfectly elastic demand curve is horizontal. Such a demand curve is shown in Fig. 1.21.
- When price elasticity of demand is equal to 0, it is called perfectly inelastic demand. The shape of a perfectly inelastic demand curve is vertical. Such a demand curve is shown in Fig. 1.22.

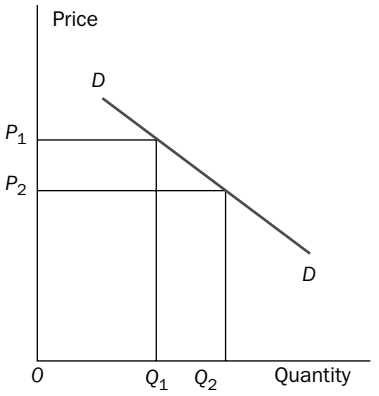

Fig. 1.20 Unitary elastic demand curve

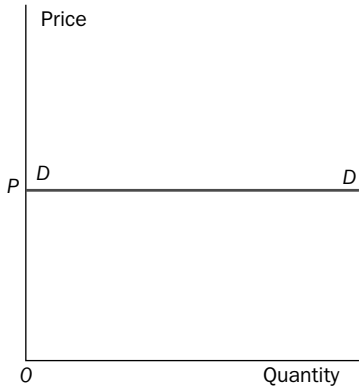

Fig. 1.21 Perfectly elastic demand curve

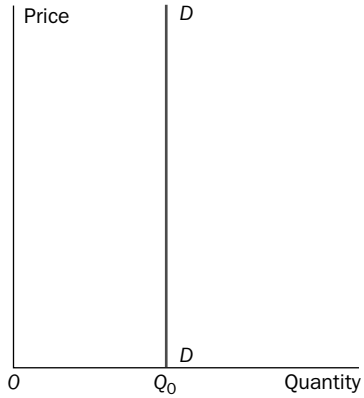

Fig. 1.22 Perfectly inelastic demand curve

1.5.4 Distinction between Slope of a Demand Curve and Elasticity of Demand

Slope of the demand curve and elasticity of demand are two different concepts.

Inverse demand function is $P = F(X)$. From this inverse demand function, we get the slope of the demand curve as dP/dX .

On the other hand, price elasticity of demand is

$$\frac{P}{X}\cdot\frac{dX}{dP} \text{ or } \frac{\frac{P}{X}}{\frac{dP}{dX}}$$

Therefore, we can say that elasticity of demand and slope of the demand curve are not the same.

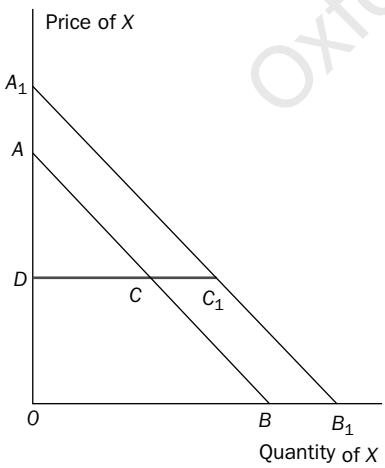

Fig. 1.23 Demand curves with same slope but different elasticities of demand

We can show that,

- Two demand curves can have the same slope but their elasticities can be different.
- Two demand curves can have different slopes but their elasticities can be same.
- The higher the slope of the demand curve, the lower will be the elasticity and vice versa.

It can be shown that two demand curves can have the same slope, but elasticities of demand can be different.

In Fig. 1.23, two demand curves AB and A_1B_1 are parallel to each other. For price level OD, we have equilibrium point C on AB and equivalent equilibrium point C_1 on A_1B_1. Since two demand curves AB and A_1B_1 are parallel to each other,

$$\frac{OA}{OB} = \frac{OA_1}{OB_1}$$

Therefore, AB and A_1B_1 have the same slope.

We have to find out the elasticity of demand for these two demand curves at two equivalent equilibrium points C and C_1.

Elasticity of demand at $C = \frac{BC}{CA} = \frac{OD}{DA}$

Elasticity of demand at $C_1 = \frac{B_1C_1}{C_1A_1} = \frac{OD}{DA_1}$

Since, $DA_1 > DA$,

$$\frac{OD}{DA_1} < \frac{OD}{DA}$$

Therefore, elasticity of demand of AB at point C is greater than that of A_1B_1 at point C_1.

It can also be shown that two demand curves can have the same elasticity of demand, but their slopes can be different.

In the first part of Fig. 1.24, we have two demand curves AB and AC with same vertical intercept. If we try to measure elasticity of demand on two equivalent points H and I, we see that

At point H, elasticity of demand is $\frac{BH}{HA} = \frac{OG}{GA}$

Again,

Elasticity of demand at point I is $\frac{CI}{IA} = \frac{OG}{GA}$

Therefore, elasticity of demand at point H is the same as elasticity of demand at point I.

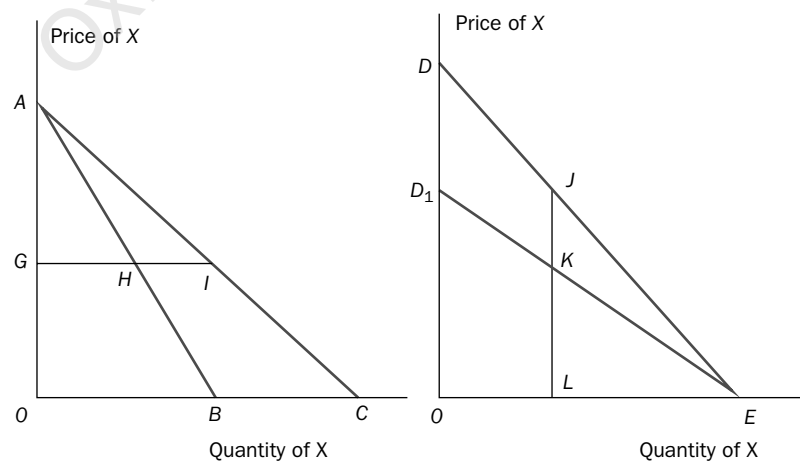

Fig. 1.24 Two demand curves with same elasticity of demand, but different slopes

On the other hand, slope of demand curve AB is OA/OB and slope of demand curve AC is OA/OC Since, $OC > OB$, slope of demand curve AB is clearly greater than that of AC.

In the second part of Fig. 1.24, we have two demand curves DE and D_1E with same horizontal intercept. If we try to measure elasticity of demand on two equivalent points J and K, we see that

At point J, elasticity of demand is

$$\frac{EJ}{JD} = \frac{EL}{LO}$$

Again, elasticity of demand at point K is

$$\frac{EK}{KD_1} = \frac{EL}{LO}$$

Clearly, elasticity of demand at two equivalent points on DE and D_1E are the same.

On the other hand, slope of demand curve DE is OD/OE and slope of demand curve D_1E is OD_1/OE . Since, $OD > OD_1$, slope of demand curve DE is clearly greater than that of D_1E.

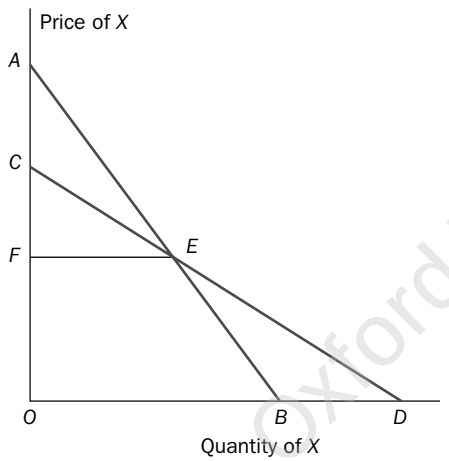

Fig. 1.25 Elasticity of demand at the point of intersection of two demand curves

We can also prove that the higher the slope of the demand curve, the lower will be the elasticity and vice versa.

In Fig. 1.25, two demand curves AB and CD intersect each other at point E. If we compare the values of elasticity of demand at their intersection point E, we get

Elasticity of demand at point E for the demand curve $AB = BE/EA = OF/FA$

Elasticity of demand at point E for the demand curve $CD = DE/EC = OF/FC$

Since $FA > FC$, elasticity of demand at point E for AB is clearly less than elasticity of demand at point E for CD.

Slope of $AB = OA/OB$ and slope of $CD = OC/OD$

It is evident that OA/OB is greater than OC/OD, that is, slope of AB is greater than that of CD.

Hence, if slope of AB is greater than that of CD, it is proved that elasticity of demand at any point on AB is less than elasticity of demand at the equivalent point on CD.

1.5.5 Cross-price Elasticity of Demand

The rate of change in demand for any commodity due to 1 per cent change in any of the determinants of demand is called elasticity of demand. The main determinants of demand are price of the commodity, price of any related commodity, income of the consumer, tastes and preferences, future expectations about prices, and future expectations about income. We have already discussed about own price elasticity of demand. Now, we would like to know how demand for a commodity responds to the changes in the price of a related commodity.

Cross-price elasticity of demand is the percentage change in demand for any commodity due to 1 per cent change in the price of a related commodity, other things remaining the same.

Cross-price elasticity of demand (e_{c1}) for commodity X_1 can be expressed as follows:

$$e_{c1} = \frac{\text{Percentage change in demand for the commodity } X_1}{\text{Percentage change in } P_2}$$

$$= \frac{\dfrac{\text{Change in demand for the commodity } X_1}{\text{Initial quantity demanded of } X_1}}{\dfrac{\text{Change in } P_2}{\text{Initial level of } P_2}}$$

If we denote change by $\varnothing$, we can write

$$e_{c1} = \frac{\dfrac{\Delta X_1}{X_1}}{\dfrac{\Delta P_2}{P_2}} = \frac{P_2}{X_1} \cdot \frac{\Delta X_1}{\Delta P_2} \tag{1.6}$$

Both P_2 and X_1 are positive. Therefore, sign of cross elasticity of demand for X_1 will depend on $\frac{\varnothing X_1}{\varnothing P_2}$. Again, sign of $\frac{\varnothing X_1}{\varnothing P_2}$ will depend upon the nature of relationship between the commodities X_1 and X_2. As price of X_2, that is, P_2, increases, demand for X_2 decreases.

- If the two commodities X_1 and X_2 are substitutes to each other, as demand for X_2 decreases, demand for X_1 increases. In short, as P_2 increases, demand for X_1 increases and vice versa. Therefore, the sign of cross elasticity of demand for X_1, that is, e_{c1}, is positive.
- If the two commodities X_1 and X_2 are complements to each other, as demand for X_2 decreases, demand for X_1 also decreases. In short, as P_2 increases, demand for X_1 decreases and vice versa. Therefore, the sign of cross elasticity of demand for X_1, that is, e_{c1}, is negative.
- If the two commodities are completely unrelated to each other, as demand for X_2 decreases, there is no change in demand for X_1. In short, as P_2 increases or decreases, demand for X_1 does not change at all. Therefore, cross elasticity of demand for X_1, that is, e_{c1}, is zero.

1.5.6 Income Elasticity of Demand

We have already discussed about own price elasticity of demand and cross-price elasticity of demand. Now we would like to know how demand for a commodity responds to the changes in the income of the consumer.

Income elasticity of demand is the percentage change in demand for any commodity due to 1 per cent change in the income (M) of the consumer, other things remaining the same.

Income elasticity of demand (e_m) for commodity X_1 can be expressed as follows:

$$e_m = \frac{\text{Percentage change in demand for the commodity } X_1}{\text{Percentage change in income } M}$$

$$= \frac{\dfrac{\text{Change in demand for the commodity } X_1}{\text{Initial quantity demanded of } X_1}}{\dfrac{\text{Change in } M}{\text{Initial level of } M}}$$

If we denote change by $\varnothing$, we can write

$$e_m = \frac{\frac{\Delta X_1}{X_1}}{\frac{\Delta M}{M}} = \frac{M}{X_1} \cdot \frac{\Delta X_1}{\Delta M} \tag{1.7}$$

Both M and X_1 are positive. Therefore, the sign of income elasticity of demand for X_1 will depend on $\varnothing X_1 / \varnothing M$.

- If X_1 is a normal good, as income increases, demand for X_1 increases. Therefore, in case of a normal good, $\Delta X_1 / \Delta M > 0$, that is, income elasticity of demand or $e_m > 0$.
- If X_1 is a normal necessity good, as income increases, demand for X_1 increases, but at a lower rate than the rate of increase in income. Therefore, in case of a normal necessity good, $\Delta X_1 / \Delta M < 1$, that is, income elasticity of demand or $e_m < 1$.
- If X_1 is a normal luxury good, as income increases, demand for X_1 increases, but at a faster rate than the rate of increase in income. Therefore, in case of a normal luxury good, $\Delta X_1 / \Delta M > 1$, that is, income elasticity of demand or $e_m > 1$.
- If X_1 is an inferior good or a Giffen good, as income increases, demand for X_1 decreases. Therefore, in case of an inferior good or a Giffen good or a Giffen good, $\Delta X_1 / \Delta M < 0$, that is, income elasticity of demand or $e_m < 0$.

1.5.7 Measurement of Income Elasticity of Demand

To measure income elasticity of demand, we have to describe the concept of Engel curve. Engel curve is the locus of different amounts of a particular commodity that the consumer purchases at different levels of income. At different points on the Engel curve, we can measure the income elasticity of demand for a commodity.

In Fig. 1.26, we measure money income of the consumer along the horizontal axis and quantity demanded of commodity X_1 along the vertical axis. AB is the Engel curve in the figure. For income level OD, demand for commodity X_1 is OX_1^0. We have to measure income elasticity of demand for X_1 at point C.

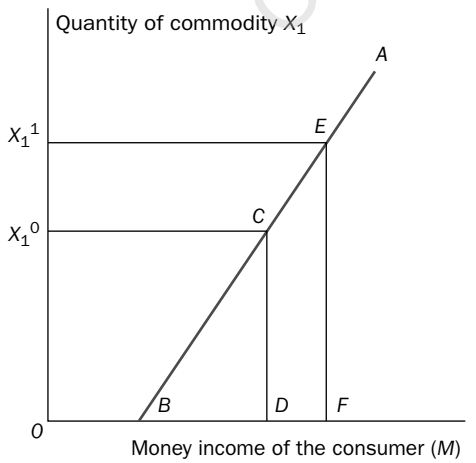

Fig. 1.26 Engel curve

At point C,

$$e_m = \frac{M}{X_1} \cdot \frac{\Delta X_1}{\Delta M}$$

Now,

$$\frac{M}{X_1} = \frac{OD}{OX_1^0} = \frac{OD}{CD}$$

Again,

$$\frac{\Delta X_1}{\Delta M} = \text{Slope of the Engel curve at point } C = \frac{\text{Perpendicular}}{\text{Base}} = \frac{CD}{BD}$$

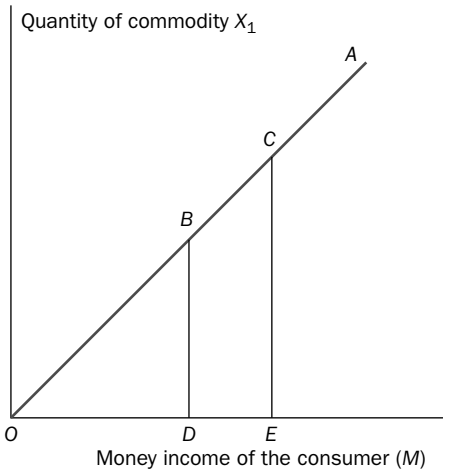

Fig. 1.27 Engel curve with zero intercept

Therefore, at point C,

$$e_m = \frac{M}{X_1}.\frac{\Delta X_1}{\Delta M} = \frac{OD}{CD}.\frac{CD}{BD} = \frac{OD}{BD}$$

Similarly, at point E,

$$e_m = \frac{M}{X_1}.\frac{\Delta X_1}{\Delta M} = \frac{OF}{EF}.\frac{EF}{BF} = \frac{OF}{BF}$$

The Engel curve AB is positively sloped. Therefore, it is clear that as income increases, consumer demand for X_1 increases. Therefore, e_m is positive. Moreover, since, Engel curve AB has a positive intercept in the horizontal axis, that is, when income is OB, the demand for commodity X_1 is zero, $OD > BD$, and also $OF > BF$. Therefore, e_m is always greater than one for commodity X_1.

In Fig. 1.27, Engel curve OA has zero intercept in the horizontal axis, that is, it passes through the origin. In other words, when income is zero, demand for commodity X_1 is also zero. Under these circumstances,

$$\frac{M}{X_1} = \frac{OD}{BD} \text{ and } \frac{\Delta X_1}{\Delta M} = \frac{BD}{OD}$$

Therefore, at point B,

$$e_m = \frac{M}{X_1}.\frac{\Delta X_1}{\Delta M} = \frac{OD}{BD}.\frac{BD}{OD} = 1$$

Similarly, at point C or at any other point on the Engel curve OA, $e_m = 1$.

In Fig. 1.28, Engel curve AB has a negative intercept in the horizontal axis, that is, when income is zero, the demand for commodity X_1 is OC, that is, positive.

Therefore, at point D,

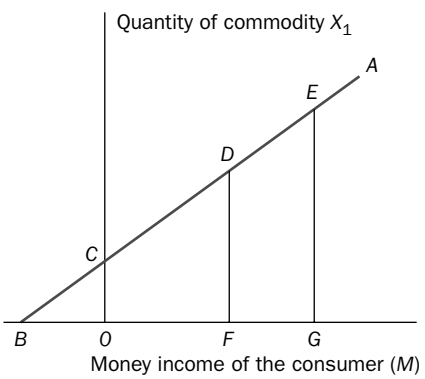

Fig. 1.28 Engel curve with negative intercept

$$e_m = \frac{OF}{BF} < 1$$

In addition, at point E,

$$e_m = \frac{OG}{BG} < 1$$

Similarly, at any other point on the Engel curve AB, $e_m < 1$.

In Fig. 1.29, Engel curve AB is an upward rising curve. To measure income elasticity of demand for X_1, at any point, say E, on the curve AB, we have to draw a tangent of the curve through point E. Slope of the curve AB at point E is the slope of the tangent CD at point E, that is, | Price o.

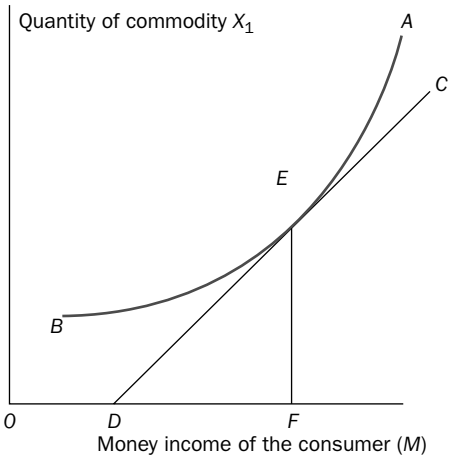

Fig. 1.29 Upward rising Engel curve

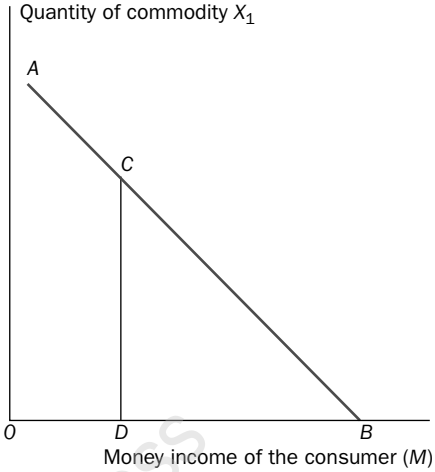

Fig. 1.30 Downward or negative slope of Engel curve

Therefore, at point E,

$$e_m = \frac{M}{X_1}.\frac{\Delta X_1}{\Delta M} = \frac{OF}{EF}.\frac{EF}{DF} = \frac{OF}{DF}$$

If the commodity X_1 is an inferior good, then as income increases, demand for commodity X_1 decreases. Therefore, Engel curve for commodity X_1 will slope negatively as shown in Fig. 1.30. In Fig. 1.30, the Engel curve AB is a negatively sloped straight line. At point C,

$$\frac{M}{X_1} = \frac{OD}{CD} \text{ and } \frac{\Delta X_1}{\Delta M} = -\frac{CD}{DB}$$

Therefore, at point C,

$$e_m = \frac{M}{X_1}.\frac{\Delta X_1}{\Delta M} = -\frac{OD}{CD}.\frac{CD}{DB} = -\frac{OD}{DB}$$

Hence, at any other point on the Engel curve AB, $e_m < 0$.

SUMMARY

- Demand is a consumer's readiness and capability to pay a price for a specific quantity of a good or service at a given point of time. The relationship between price and quantity demanded is known as the demand relationship. The law of demand states that the quantity demanded and the price of a commodity are inversely related, other things remaining constant. All the goods, for which law of demand is applicable, are called normal goods.
- Demand for certain good or service depends on a number of different factors, for example, personal disposable income of the consumer, prices of the related goods and services, preferences of the consumer, and expectations about the future prices and income.
- Demand function is the behavioural relationship between quantity demanded for a good or service and all the factors that influence the demand for that good or service.
- A demand schedule lists prices and corresponding quantities based on law of demand. We can construct the demand curve of an individual based on the demand

schedule. Demand curve is the locus of all the price–quantity combinations which follow the law of demand. Since the demand curve follows the law of demand, it is negatively sloped.

- Individual demand curves differ from person to person in their slopes and shapes. We can sum up all individual demand curves and derive a market demand curve.
- Movement along the demand curve occurs when there is a change in the own price. There are various determinants of demand for a commodity apart from its price, for example, personal disposable income of the consumer, prices of the related goods and services, preferences of the consumer, etc. A shift in the demand curve occurs when any one of those determinants change.
- The circumstances when the law of demand becomes ineffective are known as exceptions of the law of demand. In those cases, the demand curve does not follow the law of demand and therefore it is not downward sloping.
- The rate of change in demand for any commodity due to 1 per cent change in any of the determinants of demand is called elasticity of demand.
- Own price elasticity of demand is the percentage change in demand for any commodity due to 1 per cent change in its own price, other things remaining the same.
- Own price elasticity can be measured in two ways. Firstly, when change in own price is bigger, the change of quantity demanded will be a measurable portion of the demand curve, which can be called an arc. Therefore, it is called arc elasticity of demand. Secondly, when change in price is very small, the change in quantity demanded cannot be easily measurable on the demand curve. Therefore, it is called point elasticity of demand.
- The elasticity of demand and slope of the demand curve are not same.
- The cross-price elasticity of demand is the percentage change in demand for any commodity due to 1 per cent change in the price of a related commodity, other things remaining the same.
- Income elasticity of demand is the percentage change in demand for any commodity due to 1 per cent change in the income of the consumer, other things remaining the same.
- Engel curve is the locus of different amounts of a particular commodity that the consumer purchases at different levels of income. At different points on the Engel curve, we can measure the income elasticity of demand for a commodity.

EXERCISES

[According to CU syllabus of Economic-I paper for B Com Honours and General, second unit requires three lectures and four marks. Therefore, we have incorporated the short-answer type questions carrying two marks and medium-answer type questions carrying four marks in the exercise.]

SHORT-ANSWER TYPE QUESTIONS (2 MARKS)

1. What do you mean by demand?
2. What is law of demand?
3. State the law of demand. Mention any two exceptions to this law. [CU B Com (G), 2012]
4. What do you mean by a normal good?
5. Mention the factors determining demand.
6. What is the relation between demand for a good and its own price?
7. What is the relation between demand for a good and the price of its substitute?
8. What is the relation between demand for a good and the price of its complement?
9. What is the relation between demand for a good and the income of the consumer?
10. What is the relation between demand for a good and the tastes and preferences of the consumers?
11. What is the relation between demand for a good and future expectations of the consumer about the price of the good?

12. What is the relation between demand for a good and the future expectations of the consumer about his/her income?
13. What is meant by a demand function? [CU B Com (G), 2005]
14. State the demand function in its general form.
15. What do you mean by a demand schedule?
16. What is the shape of the demand curve for a normal good?
17. What is market demand?
18. How can market demand be derived from individual demand? [CU B Com (G), 2012]
19. Under what circumstances does the demand curve shift? [CU B Com (G), 2005]
20. How will the demand curve change with the increase in income of the consumer? [CU B Com (G), 2005]
21. Mention two cases where the consumer demand curve shifts upwards. [CU B Com (G), 2009]
22. What is the shape of the demand curve in case of Giffen goods?
23. What is the shape of the demand curve in case of conspicuous consumption?
24. What is the shape of the demand curve in case of conspicuous necessities?
25. What is the shape of the demand curve in case of ignorance of the consumers?
26. What is the shape of the demand curve in case of emergencies?
27. What is the shape of the demand curve in case of a future expectation of price rise?
28. What is the shape of the demand curve in case of a future expectation of fall in price?
29. What is the shape of the demand curve in case of a change in fashion?
30. What do you mean by elasticity of demand?
31. What do you mean by price elasticity of demand? [CU B Com (G), 2009]
32. What is own price elasticity of demand?
33. What is the difference between arc elasticity of demand and point elasticity of demand?
34. What will be the value of own price elasticity of demand for a normal good?
35. What will be the value of own price elasticity of demand for a normal necessity good?
36. What will be the value of own price elasticity of demand for a normal luxury good?
37. What will be the value of own price elasticity of demand for an inferior good?
38. What will be the value of own price elasticity of demand for a Giffen good?
39. What is elastic demand?
40. What is inelastic demand?
41. What is the shape of a perfectly elastic demand curve?
42. What is the shape of a perfectly inelastic demand curve?
43. At which point on a downward sloping straight line demand curve the absolute value of the price-elasticity of demand is unity? [CU B Com (G), 2007]
44. What is meant by 'cross-price elasticity of demand'? [CU B Com (G), 2010]
45. If the cross-price elasticity of two related goods is positive, what is the relationship between the aforesaid goods? [CU B Com (G), 2008]
46. If the cross-price elasticity of two related goods negative, what is the relationship between the aforesaid goods?
47. If the cross-price elasticity of two goods is zero, what is the relationship between the aforesaid goods?
48. What do you mean by income elasticity of demand?
49. What will be the value of income elasticity of demand for a normal good?
50. What will be the value of income elasticity of demand for a normal necessity good?
51. What will be the value of income elasticity of demand for a normal luxury good?
52. What will be the value of income elasticity of demand for an inferior good?
53. What will be the value of income elasticity of demand for a Giffen good?
54. What is an Engel curve?
55. If the Engel curve is upward rising with a positive intercept on the horizontal axis, what will be value of income elasticity of demand at any point on the curve?
56. If the Engel curve is upward rising with a negative intercept on the horizontal axis, what will be value of income elasticity of demand at any point on the curve?
57. If the Engel curve is upward rising passing through the origin, what will be value of income elasticity of demand at any point on the curve?

MEDIUM-ANSWER TYPE QUESTIONS (4 MARKS)

1. What is law of demand? Why does a demand curve have negative slope? [CU B Com (G), 2006]
2. Draw and explain separately an individual demand curve and market demand curve for a normal good. [CU B Com (G), 2005, 2012]
3. How is market demand curve determined from an individual demand curve? [CU B Com (G), 2005, 2012]
4. The demand schedule of pulses for a consumer is given in Table 1.3. Derive the individual demand curve for pulses from the demand schedule.

Table 1.3 Demand schedule of pulses for a consumer

Price per kg. (₹)	Quantity demanded (in kg)
50	1
40	2
30	3
20	4
10	5

5. For what reasons does a demand curve shift? Explain diagrammatically the difference between the change in demand and change in quantity demanded? [CU B Com (G), 2007, 2011]
6. The demand schedule of pulses for two consumers is given in Table 1.4. Fill up the blanks for market demand in the schedule and derive the market demand curve for pulses from the demand schedule assuming that there are only two consumers in the whole market.
7. State the law of demand. Mention two exceptions to this law. Explain the factors affecting demand. [CU B Com (G), 2009]

Table 1.4 Demand schedule of pulses for two consumers

Price per kg. (₹)	Quantity demanded by consumer 1 (in kg)	Quantity demanded by consumer 2 (in kg)	Market demand of pulses
50	1	0	
40	2	1	
30	3	2	
20	4	3	
10	5	4	

8. Mention two exceptions to the law of demand. Explain the factors affecting demand. [CU B Com (G), 2012]
9. Distinguish between 'change in demand' and 'change in quantity demanded'.
10. What do you mean by arc elasticity of demand? How can you measure own price elasticity of demand on an arc of a straight line demand curve?
11. How can you measure point price elasticity of demand on any point of a straight line demand curve?
12. Prove that on a straight line demand curve, value of point price elasticity of demand will be unity at the mid-point of the demand curve.
13. Explain the difference between slope of a demand curve and elasticity of demand.
14. Explain the concepts of income elasticity of demand and cross-price elasticity of demand. [CU B Com (G), 2011]
15. Define cross-price elasticity of demand. How are the concerned goods related to each other if the cross-price elasticity is positive? [CU B Com (G), 2012]
16. How can you measure income elasticity of demand?

LONG-ANSWER TYPE QUESTIONS (8 MARKS)

1. What is price elasticity of demand? On what factors does it depend? [CU B Com (G), 2007]
2. What is price elasticity of demand? How can the price elasticity of demand be measured at a point on a downward sloping straight line demand curve? [CU B Com (G), 2008]
3. Show that on a linear demand curve, the absolute value of elasticity of demand varies between zero and infinity.
4. What is the relation between slope of a demand curve and elasticity of demand? Show that two demand curves can have same slope but different elasticities of demand

and two demand curves can have same elasticity of demand but different slope.

5. Define the concepts of the following:
   - Income elasticity of demand
   - Cross-price elasticity of demand

   [CU B Com (G), 2009]
6. What do you mean by cross-price elasticity of demand? Show that the value of cross-price elasticity of demand depends on the relation between the concerned goods.
7. What do you mean by elasticity of supply? How can you measure elasticity of supply at any point on the supply curve?
8. What do you mean by elastic and inelastic supply? Show how shapes of the supply curve will be different for different values of elasticity of supply.