

# Theory of Consumer Demand

⚡ Syllabus

- Cardinal utility Analysis :
  - Marginal utility and demand,
  - Consumer’s surplus,
- Indifference curve Analysis and utility function,
- Price , income and substitution effects,
- Slutsky theorem and derivation of demand curve,
- Revealed preference theory ,
- Duality and indirect utility function and expenditure function.
- Choice under risk and uncertainty.
- Simple games of complete information,
- Concept of Nash equilibrium

NO.	QUESTIONS	TOPIC	YEAR	MARKS	WORDS
		#####			
75	If the demand function is $P = (4 - 0.5q)^2$ , for what value of $q$ will the price elasticity of demand be unity?		2024	5	
76	In a two-commodity framework, what will be the shape of the indifference curve when (i) one commodity is 'bad'; (ii) one commodity is 'neutral' ? Explain your answer.		2024		

NO.	QUESTIONS	TOPIC	YEAR	MARKS	WORDS
77	State and prove the Slutsky's theorem. Derive the demand curve for a Giffen good by using this theorem.		2024	10	
78	<p>(A) Both the marginal utility approach and the indifference curve approach yield the same equilibrium position for a rational consumer. Discuss the relative advantages of the indifference curve approach over the marginal utility approach. (B) Show that demand has unitary price elastic if the price consumption curve is horizontal. (C) Suppose that a consumer in a two-commodity (<math>X, Y</math>) world has linear indifference curve with a slope equal to - Find out the equilibrium consumption when prices for both commodities equal to 2, (<math>P_x = P_y = 2</math>) and income level of the consumer is Rupees 2,000. How does equilibrium bundle change when <math>P_x = 1</math> and <math>P_y = 4</math> with the same level of income? (Assume that the consumer spends all income on these two commodities only)</p>		2024	8+7+10	
	<p>(A) Formulate the dual form of the following problem relating to production by a rational firm : Maximise <math>\pi = p'x</math> subject to <math>Ax &lt; b</math> and <math>x \geq 0</math> where <math>x</math> is the total profit <math>p'</math> is the row vector of order <math>1 \times 2</math> of output prices <math>x</math> is the column vector of order <math>2 \times 1</math> of output produced A is the coefficient matrix of order <math>2 \times 2</math> Give economic interpretations of the dual problem. Give a Lagrange's multiplier interpretation to the optimal values of the dual choice variables. (B). Consider the following utility function : <math>U = q_1 q_2</math> Derive the compensated demand function for <math>q_1</math>. Show that this demand curve is always negatively sloped.</p>		2024	4+3+3+5+3	

NO.	QUESTIONS	TOPIC	YEAR	MARKS	WORDS
3	Explain the concept of a weakly separable and a weakly additive utility function.		2023	10	
2	Differentiate between adverse selection and moral hazards in determining pricing under incomplete information.		2023	5	100
4	<p>Suppose two firms are selling a homogenous product. They can charge a high price (H) or a low price (L). The pay-offs from their actions are given in the following game matrix :</p> $  \begin{array}{cc}  & \text{Firm}_2 \\  & \begin{array}{cc} H & L \end{array} \\  \begin{array}{c} \text{Firm}_1 \\ H \\ L \end{array} & \begin{array}{cc} 8, 8 & 3, 10 \\ 10, 3 & 5, 5 \end{array}  \end{array}  $ <p>I. Find Nash Equilibrium for the given game. II. Is there any dominant strategy in this game? Explain.</p>		2023	10	
1	In a two-good world, show that both good cannot be inferior.		2023	5	100
5	<p>a) Show that the substitution effect is always negative by using the weak axiom of revealed preference theory. b) A farmer grows 70kg of <math>X_1</math> and 20 kg of <math>X_2</math>. He keeps some parts of <math>X_1</math> and <math>X_2</math> for self consumption and sells the rest in the market . His Utility Function is <math>U(X_1, X_2) = \text{Min}(2X_1, X_2)</math> and price of <math>X_1</math> and <math>X_2</math> are 2 and 3 respectively . Suppose the price of <math>X_1</math> increases to 4 and at the same time his consumption of <math>X_1</math> also increases. Explain the behaviour of the farmer using the substitution effect, income effect and endowment effect.</p>		2023	10+15	
6	Show that the ordinary demand curve will have a greater demand elasticity than the compensated demand curve.		2022	5	100

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8	<p><b>A)</b> Define Indirect Utility Function. Derive the Indirect Utility Function from the Direct Utility Function. <b>B)</b> Consider the Indirect Utility Function: <math>V = \frac{M^2}{4P_1P_2}</math> where notations have their usual meanings. Derive the demand functions for <math>x_1</math> and <math>x_2</math>. <b>C)</b> Consider the utility function and budget equation of a consumer respectively: <math>U = x_1x_2</math> s.t <math>M = p_1x_1 + p_2x_2</math> where notations have their usual meanings. Derive the expenditure function of the consumer.</p>		2022	6+6+6	200
7	<p>Solve the following <math>2 \times 2</math> game:</p> <div style="text-align: center; margin: 10px 0;"> <math display="block">  \begin{array}{cc}  &amp; \text{Player}_A \\  &amp; B_1 \quad B_2 \\  \text{Player}_B \quad A_1 &amp; 2 \quad 3 \\  &amp; A_2 \quad 4 \quad -1  \end{array}  </math> </div>		2022	5	100
10	Distinguish between pure strategies and mixed strategies		2021	5	100
9	The demand and supply functions are $P_d = (6 - x)^2$ and $P_s = 14 + x$ respectively. Find the consumer surplus under pure competitive market.		2021	5	100
11	<p><b>A)</b> Derive Slutsky equation and interpret it. <b>B)</b> Given the utility function as <math>12y = 36 - x^2</math> And the budget line as <math>M = 12x + 24y</math> Determine the utility maximising basket of the two goods. <b>C)</b> Find the value of game:</p> <div style="text-align: center; margin: 10px 0;"> <math display="block">  \begin{array}{cc}  &amp; \text{Firm}_A \\  &amp; B_1 \quad B_2 \\  \text{Firm}_B \quad A_1 &amp; 25 \quad 10 \\  &amp; A_2 \quad 5 \quad 15  \end{array}  </math> </div>		2021	5+8+5	200

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14	<p>(A) Suppose the utility function for the consumer takes one of the following forms I. <math>U = 50x + 20y</math> ii. <math>U = 20x + 50y</math> iii. <math>U = 80x + 40y</math> . The budget of the consumer is ₹ 10000. The price of good X and good Y are ₹ 50 and ₹ 20 per unit respectively. Determine the possibility of determination of the equilibrium basket in each case using diagram and comment on the nature of the solutions. (B) Outline how the production possibility frontier can be used to explain the concept of opportunity cost. Why is the production possibility frontier concave to the origin?</p>		2020	8+10	200
13	<p>A) Explain the meaning of Nash equilibrium. How does it differ from an equilibrium in dominant strategies? B) Let market demand faced by the duopolist be <math>P = 100 - 0.5Q</math>; <math>Q = Q_1 + Q_2</math> And their respective cost functions as <math>C_1 = 5Q_1</math> and <math>C_2 = 5Q_2</math> Find out Cournot Nash equilibrium.</p>		2020	12+6	200
12	<p>Explain the difference between Bandwagon effect and snob effect.</p>		2020	5	100
15	<p>(A) In a two-commodity framework, the marginal rate of substitution is everywhere equal to (B). The prices of the two goods are equal. Draw a diagram to identify the utility maximising equilibrium. B). The cost minimising demand for labour is <math>L = \frac{Q}{50} \sqrt{\frac{r}{w}}</math> and that of capital is <math>K = \frac{Q}{50} \sqrt{\frac{w}{r}}</math> where , <math>w</math> and <math>r</math> denote wage and price of capital respectively . Find the production function.</p>		2019	5+5	150
17	<p>A firm with market power faces the demand curve given by <math>P = 100 - 3Q + 4\sqrt{A}</math>, where <math>P, Q</math> and <math>A</math> denote price, quantity and expenditure on advertising respectively. The</p>		2019	8	120

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	total cost is given as $C = 4Q_2 + 10Q + A$ . Find the firm's profit maximising price.				
19	(A). The demand function $Q_1 = 50 - p_1$ intersects another linear demand function $Q_2$ at $p = 10$ . The elasticity of demand for $Q_2$ is six times larger than that of $Q_1$ at that point. Find the demand function for $Q_2$ . (B). For monopolist, the demand law is $p = (6 - X)^2$ and the marginal cost is $14 + X$ . Find consumer's surplus.		2019	7+8	200
16	1. An individual has the utility function $U = XY$ and the budget equation is $10X + 10Y = 1000$ . Find the maximum utility that she can attain 2. If the price of good X decreases to 5, find the compensating variation in income in order to maintain her level of satisfaction in part (a). 3. An individual buys two goods $X$ and $Y$ at prices $P_X$ and $P_Y$ . Check whether her behaviour satisfies the weak axiom of revealed preference, given the following information: When $(P_X, P_Y) = (1, 2), (X, Y) = (1, 2)$ When $(P_X, P_Y) = (2, 1), (X, Y) = (2, 1)$		2019	6+6+6	200
18	Write down the Slutsky equation in elasticity form and prove that the ordinary demand curve will have greater demand elasticity than the compensated demand curve for a normal commodity. How does your result change if the commodity becomes inferior?		2019	10	150
20	Explain with a diagram why the compensated demand curve is vertical if the consumer's utility function is of the form: $v(x, y) = \min[x, y]$		2018	5	100
21	A price taking consumer consumes two goods X and Y. Let X and Y denote the quantities of goods X and Y		2018	18	200

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	<p>respectively, and let <math>P_x</math> and <math>P_y</math> with the respective prices of the two goods. Assume that: i. the consumer's budget is given by <math>M, \infty &gt; M &gt; 0</math> ii. <math>P_x</math> and <math>P_y</math> are finite and positive</p> <p>a. Let the consumer's utility function be given by <math>U(x, y) = \min[x, y]</math> Define indirect utility function and derive the consumer's Indirect Utility Function. b. Suppose instead that is Utility function is given by <math>U(x, y) = xy</math> . Define expenditure function and derive the consumers compensated demand for good x using his expenditure function.</p>				
22	<p>Consider a one shot simultaneous move game with two players, player 1 and player 2. Let <math>s_i, i = 1, 2</math> designate a pure strategy of player i. Let <math>s_i \neq 0</math> be the pure strategy set for player i, and <math>\pi_i(s_1, s_2)</math> be the pay-off function for player <math>i, i = 1, 2</math>. (a) Define Nash equilibrium in pure Strategies for this game. (b) Consider the following game:</p> <div style="text-align: center; margin: 10px 0;"> <math display="block">  \begin{array}{cc}  &amp; \text{Player}_2 \\  &amp; \begin{array}{cc} S_2^1 &amp; S_2^1 \end{array} \\  \text{Player}_1 &amp; \begin{array}{cc} S_1^1 &amp; S_1^2 \end{array} \\  \begin{array}{cc} 10, 10 &amp; 0, 12 \\ 12, 0 &amp; 3, 3 \end{array}  \end{array}  </math> </div> <p>Show that the unique pure strategy Nash equilibrium is not Pareto optimal. (c) Consider two firms = Firm 1 and Firm 2 ; producing a homogenous good Q. The output of the two firms is given by <math>q_1</math> and <math>q_2</math> respectively. The market inverse demand curve is given by <math>P = A - bq</math>, where <math>A &gt; 0, P</math> is the price of the good and <math>q = q_1 + q_2</math>. Suppose that there is no fixed cost and the average cost for each firm is <math>c, \infty &gt; c &gt; 0</math>, Find the unique pure strategy Nash equilibrium of this game.</p>		2018	3+5+10	200

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23	Consider the utility function $U = x^\alpha y^\beta$ , $\alpha > 0, \beta > 0$ which is to be maximised subject to the budget constraint $m = p_x x + p_y y$ , where $m$ = income (nominal) and $p_x$ and $p_y$ are the prices respectively per unit of the goods $X$ and $Y$ . Let the consumer's utility function be given by $U(x, y) = \min[x, y]$ . Define indirect utility function and derive the consumer's Indirect Utility Function. Suppose instead that is Utility function is given by $U(x, y) = xy$ . Define expenditure function and derive the consumers compensated demand for good $x$ using his expenditure function. Derive the demand function for $X$ and $Y$ . Show that these demand functions are homogenous of degree zero in prices and income.		2018	6	75
24	Why do we need the constancy assumption of marginal utility of money in Cardinal utility analysis? Justify your answer.		2017	5	100
25	Define the method of compensating variation of income and the method of cost difference. Why is the latter method superior to the former one?		2017	5	100
26	How can you measure the price elasticity of demand at any point on a straight line demand curve?		2017	5	100
27	Compare between price elasticity at a given price and also at a given quantity for a set of parallel demand functions.		2017	5	100
28	<b>A).</b> Let the demand function for a good be $Q = Ap^\alpha y^\beta$ where $q$ = the quantity demanded, $p$ = the price per unit and $y$ = the income. What do the parameters, $\alpha$ and $\beta$ imply and what is the sum of $\alpha$ and $\beta$ ? Interpret your result. <b>B.</b> Consider the utility function $u = \log x_1 + x_2$ which		2017	8+10+7	300



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	is to be maximised subject to the budget constraint $m = p_1x_1 + p_2x_2$ , where $p_1$ and $p_2$ are the prices per unit of the goods $x_1$ and $x_2$ respectively, and $m$ is the income of the consumer. Derive the demand for $x_1$ and $x_2$ and interpret your results. C. Given the demand function and total cost function of a perfectly competitive firm as $p = 32 - X$ , $c = X^2 + 8X + 4$ , $p$ being price, $c$ being cost and $X$ = output. Find out the output, price, profit and total revenue corresponding to maximisation of total profit. Define the substitution effect. Separate income effect from				
30	Show that if the consumer is free from money illusion, the demand function is homogenous of degree zero.		2016	5	100
31	Derive the demand functions from the utility function $U = f(q_1, q_2, \dots, q_n)$ subject to budget constraint : $y = p_1q_1 + p_2q_2 + \dots + p_nq_n$ and if the demand function for a commodity: $i (i = 1, 2, \dots, n)$ is homogenous of degree zero in prices and income, then show that the sum of own and cross price elasticities of demand for the commodity equals its income elasticity of demand with negative sign.		2016	15	200
32	<b>A)</b> Distinguish between a cooperative and a non cooperative game. <b>B)</b> In a non Cooperative game, find: <b>I.</b> Saddle point in a pure strategy game. <b>II.</b> Maximum expected payoff in a mixed strategy game . <b>III.</b> Solution of a sequential game in an ‘extensive form’.		2016	5+5+5+5	300
33	Explain the situation of market equilibrium when <b>I.</b> supply and demand are not equal at a non negative price- quantity combination. <b>II.</b> supply and demand are equal at more than one non- negative price-quantity combination.		2016	10+10	300

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29	Substitution effect for a fall in the price of a Giffen type good using a suitable diagram.		2016	5	100
34	The demand function $Q_1 = 50 - P_1$ intersects another demand function $Q_2$ at price $P = 10$ . The elasticity of demand for $Q_2$ is six times larger than that of $Q_1$ at that point. Find out the demand function for $Q_2$ .		2015	5	75
35	Suppose the government as a monopolist firm produces electricity and sells it to people at price per unit 'p'. The demand function for the electricity, of the people is $q = \alpha p^{-\beta}$ . If the elasticity of demand for electricity in absolute sense is found to be 0.894 . Should the Government increase the price per unit to increase the revenue? Justify your answer.		2015	5	75
36	Define consumer's and producer's surplus. Given the demand function $p = 113 - q^2$ and the supply function $p = (q + 2)^2$ under perfect competition, find out the consumers' surplus and producers' surplus.		2015	5	75
37	Elucidate the statement that no economic rent is earned when the supply of a factor is perfectly elastic.		2015	5	75
38	Consider the utility function as $U = \sqrt{q_1 q_2}$ , where $q_1$ and $q_2$ are two commodities on which the consumer spends his entire income of the month. Let the price per unit of $q_1$ and $q_2$ be Rs. 40 and Rs. 16 respectively and the monthly income of the consumer be Rs. 4000. Find out the optimal quantities of $q_1$ and $q_2$ .		2015	15	200
39	Derive the consumption possibility locus.		2015	5	100
40	Is the following statement true or false? Explain. "If a consumer's utility function is of the form $= x_1^{\frac{1}{3}} x_2^{\frac{1}{3}}$ ; she faces		2014	5	100

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	prices $p_1$ and $p_2$ and her income is $I$ , then her indirect utility function is : $V = \frac{I^3}{(3p_1p_2)}$ ."				
44	Hrishita likes sandwiches (S) and coffee (C). Her indifference curves are bowed in toward the origin and do not intersect the axes. The price of a sandwich is Rs. 5 and the price of a cup of coffee is Rs. 3. She is spending all her income at the basket she is currently consuming, and her marginal rate of substitution of sandwiches for coffee is 2. Is she at an optimum? If so, show why. If not, should she buy fewer sandwiches and more coffee, or the reverse? Argue in favour of your opinion.		2014	15	200
45	The demand for good $X$ is estimated to be $Q = 250,000 - 500P - 1.5M - 240PR$ is the price of a related good $Y$ . The values of $P$ , $M$ and $PR$ are expected to be Rs. 200, Rs. 60,000 and Rs. 100 respectively. Calculate the price elasticity of demand, income elasticity of demand and cross price elasticity. Is the demand for $X$ elastic, inelastic or unit-elastic? How would a small increase in $P$ affect total revenue? Is the good $X$ normal or inferior? Are the goods $X$ and $Y$ substitutes or complements?		2014	15	200
46	Consider a two-person, two-commodity, pure-exchange, competitive economy. The consumers' utility functions are $U_1 = q_{11}q_{12} + 12q_{11} + 3q_{12}$ and $U_2 = q_{21}q_{22} + 8q_{21} + 9q_{22}$ Respectively (where $q_{ij}$ denotes the consumption of commodity $Q_j$ by consumer $i$ , with $i = 1, 2$ and $j = 1, 2$ ). Consumer 1 has initial endowments of 8 and 30 units of $Q_1$ and $Q_2$ respectively; consumer 2 has 10 units of each commodity. Determine the excess demand function for the		2014	25	300

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	two consumers. Determine an equilibrium price ratio for this economy.				
42	Other things equal, what happens to consumer surplus if the price of a good falls? Why? Illustrate using a demand curve.		2014	5	100
41	Define complement and substitutes. In the two commodity case, can the commodities be complements? Explain. Is your answer valid in the case of gross substitutes and complements? Explain.		2014	5	100
43	What is Nash equilibrium? Do all games have Nash equilibrium? Can a game have more than one equilibrium?		2014	5	100
47	If the law of demand is $x = ae^{-bp}$ , where $p$ is price and $x$ is quantity demanded. Express price elasticity of demand, total revenue and marginal revenue as functions of $x$ .		2013	5	50
51	Describe Von Neuman and Morgenstern utility index. Is this index unique? Explain.		2013	15	150
52	Define elasticity of goods substitution and distinguish it from cross-price elasticity of demand. Which one is a better measure of substitution and why?		2013	15	150
53	For statistically estimated demand function for the commodity X, $D_x = \frac{1547P_x^{0.2}P_y^{0.3}A^{0.4}}{P_z^{0.5}B^{0.3}}$ where $x, y, z$ are goods, A stands for advertisement outlay, B for budget of the consumer and $P_x, P_y, P_z$ are prices of goods $x, y, z$ respectively). Answer the following: . a) How are $x, y$ and $z$ related? b) Whether x is an inferior, normal or Giffen type good? c) What would be the percentage change in demand for x (i.e. $D_x$ ) and in which direction if advertisement outlay increases by 50 percent?		2013	10+10+10	300

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48	What is adverse selection in insurance markets? How the problem can be solved?		2013	5	50
50	Cardinal utility approach and Ordinal utility approach to demand suggest same decision rule for the optimising consumer (which one?). Yet, latter approach is preferred over former. Why?		2013	15	150
49	Given utility function $U = q_1q_2$ and budget constraint $Y = p_1q_1 + p_2q_2$ , derive the indirect utility function.		2013	5	50
56	Show graphically on your answer-book that if a consumer buys only two goods, both cannot be inferior at the same time.		2012	5	50
58	Compare different methods of measuring risk aversion.		2012	12	150
59	Distinguish between compensating variation and equivalent variation of the budget line. How can you measure consumer's surplus using these two concepts?		2012	12	150
60	Why is the convexity assumption so important in indifference curve analysis? In particular, would a consumer equilibrium exist, if indifference curves were concave? Explain.		2012	12	150
61	Explain the relationship between slope and elasticity of a straight line demand curve.		2012	12	150
62	What is 'Prisoner's Dilemma'? Discuss its importance and implications in Game theory.		2012	12	150
55	Suppose you have a demand function for milk of the form $x_1 = 100 + \frac{m}{100p_1}$ and your weekly income (m) is Rs. 12000 and $100p_1$ the price of milk ( $p_1$ ) is Rs. 20 per litre. Now suppose the price of milk falls from Rs. 20 to Rs. 15 per litre, then what will be the substitution effect?		2012	5	50

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57	Separate income effect from substitution effect for a price change using (i) Hicks' method (ii) Slutsky's method. Hence explain the difference between the two compensated demand curves.		2012	12	150
54	Discuss Nash equilibrium for non-collusive firms.		2012	5	50
63	Define the compensated demand curve. How does it differ from the uncompensated demand curve?		2011	5	50
64	What do you mean by corner solution? In the case of perfect complementary goods, where do you get the corner solution?		2011	5	50
66	Consider a linear demand function $q = a - bp$ , where $q$ = quantity demanded, $p$ = price per unit and $a, b > 0$ . Find out average and the marginal revenue and draw the diagram.		2011	5	50
71	If $D = 250 - 50p$ and $S = 25p + 25$ are the demand and supply functions respectively, calculate the equilibrium price and the quantity. Hence calculate both consumer's and producer's surpluses under equilibrium.		2011	5+5+5	150
69	The demand function $Q_1 = 50 - P_1$ intersects another linear demand function $Q_2$ at $P = 10$ . The elasticity of demand for $Q_2$ is six times larger than that of $Q_1$ at that point. Find the demand function for $Q_2$ .		2011	15	150
65	Define cross elasticity of demand. Based on such definition, how can you distinguish between substitute goods and complementary goods?		2011	5	50
68	Define income effect, substitution effect and price effect of any change in price. Show that the price effect can be decomposed into the income effect and the substitution effect.		2011	2+2+2+9	150

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67	In game theory, comment on the terms ‘maxi-min’ and ‘mini-max’.		2011	5	50
70	Consider the utility function as $u = \sqrt{q_1 q_2}$ , where $q_1$ and $q_2$ are two commodities on which the consumer spends his monthly income Rs. 5000. If the price per unit of $q_1$ and $q_2$ be Rs. 50 and Rs. 20 respectively, find out the optimal quantities of $q_1$ and $q_2$ .		2011	15	150
72	Define consumer’s surplus. Derive an expression for it using integral calculus.		2010	7	50
73	Derive consumer’s expenditure function by minimising total expenditure; $y = p_1 q_1 + p_2 q_2$ subject to utility constraint $u = q_1 q_2$ .		2010	15	150
75	Separate income effect from substitution effect of a price change for a Giffin type good. Use suitable diagram.		2010	15	150
74	Draw consumer’s indifference curve from Revealed Preference Theory.		2010	15	150