Subject Code : V/ECO (vii)

Booklet No. A ... 44

V/ECO (vii)

2015

(5th Semester)

ECONOMICS

SEVENTH PAPER

(Quantitative Techniques—I)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Verify the distributive law of union by using the following sets : 4

$A = \{2, 3\}$

$B = \{1, 3, 4\}$

$C = \{3, 5, 7\}$

(b) Sets A and B are such that A has 27 members, B has 20 members and $A \cup B$ has 35 members. Draw a Venn diagram to represent the above situation and find the number of members in the set $A \cap B$. 1+3=4

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(c) If

$E = \{1, 2, 3, 4, 5\}$ and $A = \{1, 2, 5\}$ find the complement of A. 2

Or

(a) Distinguish between null sets and universal sets. 2

(b) If

$A = \{1, 2, 3\}$, $B = \{3, 4\}$ and

$u = \{0, 1, 2, 3, 4, 5\}$

verify that $(A \cup B)' = A' \cap B'$ 4

(c) A firm has 50 workers working in its factory premises, 30 workers working in its offices and 10 workers working in both the places. How many workers are there in the firm? 4

2. (a) Find $\frac{dy}{dx}$ of any *three* of the following : 2×3=6

(i) $y = (9x^2 - 2)(3x + 1)$

(ii) $y = \dfrac{x^2 + 4}{x + 2}$

(iii) $y = 10x + \log(x + 1) + e^x$

(iv) $y = \log(2x^2 + 5)$

(b) Find the elasticity of demand for the demand function $x = 25 - 4p + p^2$, when $p = 5$. 4

Or

(a) State the first-order and second-order conditions for optimization. 2

(b) The total revenue (R) and total cost function (C) of a firm are given by $R = 50Q - Q^2$ and $C = 30 + 5Q$ respectively, where Q is the output. Find the equilibrium output of the firm. 4

(c) Evaluate any *two* of the following : 2×2=4

(i) $\lim_{x \to 2} \dfrac{x^2 - 4}{x - 2}$

(ii) $\lim_{x \to 1} \dfrac{x^2 - 5x + 4}{x^2 + 2x - 3}$

(iii) $\lim_{x \to 2} \left(x^2 + \frac{1}{x}\right)$

3. (a) Evaluate the following : 2+2=4

(i) $\int \dfrac{x^3 + 1}{x^2} dx$

(ii) $\int x.\log x \, dx$

(b) Define consumers surplus. Find the consumer surplus when the demand law for a commodity is $p = 20 - 2x - x^2$ and $x = 3$. 1+5=6

Or

(a) Find the producer's surplus when the demand and supply functions are $P_d = 3Q^2 - 20Q + 5$ and $P_s = 15 + 9Q$ respectively. 5

(b) Define average cost. If the marginal cost for some product is $MC = 2 + 3e^x$ where x is output, find the total average cost function if the fixed cost is ₹ 500. 1+4=5

4. (a) Show that

$$A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

is an idempotent matrix. 3

(b) Given that

$$A = \begin{bmatrix} 6 & 7 \\ 8 & 9 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 \\ 9 \end{bmatrix}$$

find $B'A$. 2

(c) Solve the following equations by Crammer's rule : 5

$$x_1 - 2x_2 + x_3 = 8$$
$$2x_1 + x_2 + 3x_3 = 12$$
$$x_1 + x_2 + x_3 = 6$$

Or

(a) Define rank of matrix. Find the rank of

$$\begin{bmatrix} 3 & 3 & -2 \\ -2 & 0 & 5 \end{bmatrix}$$

1+2=3

(b) Define equality of matrices. Given

$$A = \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} b & d \\ e & f \end{bmatrix} \text{ and } C = \begin{bmatrix} 0 & 3 \\ 8 & 9 \end{bmatrix}$$

what are the values of b, d, e and f if $A - B = C$? 1+2=3

(c) Find the inverse of matrix

$$A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$$

4

5. What is feasible solution in linear programming? Solve the following graphically : 10

Minimize $C = 0 \cdot 6x_1 + x_2$

subject to

$$10x_1 + 4x_2 \geq 20$$
$$5x_1 + 5x_2 \geq 20$$
$$2x_1 + 6x_2 \geq 12$$

and $x_1, x_2 \geq 0$

Or

Discuss various basic assumptions involved for the application of linear programming problems. 10

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(5th Semester)

ECONOMICS

SEVENTH PAPER

(Quantitative Techniques—I)

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 10)

Tick (✓) the correct answer in the brackets provided : 1×10=10

1. The set of all possible pairs (a, b) where $a \in A$ and $b \in B$ is called

   (a) domain of A and B ( )

   (b) Cartesian product of A and B ( )

   (c) range of A and B ( )

   (d) associative law ( )

2. Fixed cost in the total cost function exemplifies

(a) cubic function ( )

(b) comfort function ( )

(c) linear function ( )

(d) logarithmic function ( )

3. The average cost (AC) is minimum, when

(a) MC > AC ( )

(b) MC < AC ( )

(c) MC = AC ( )

(d) AC = 0 ( )

4. The profit maximizing output of a firm is given by

(a) MC = MR ( )

(b) MC > MR ( )

(c) MC < MR ( )

(d) MC = 0 ( )

5. If 10% change in the independent variable leads to a 7% response in the dependent variable in a given range of operation, then the relation is said to be

(a) elastic ( )

(b) unitary ( )

(c) inelastic ( )

(d) perfectly elastic ( )

6. Total cost function can be obtained by integrating

(a) average cost function ( )

(b) marginal cost function ( )

(c) revenue function ( )

(d) None of the above ( )

7. If the marginal cost function of a firm is $MC = 4x + e^x + x^2$, where x is output, the total cost function will be

(a) $x^2 + e^{ax} + \frac{x^2}{2}$ ( )

(b) $4x + \log x + x^2$ ( )

(c) $2x^2 + e^x + \frac{x}{2}$ ( )

(d) $2x^2 + e^x + \frac{x^3}{3}$ ( )

8. If any two rows (or, columns) of a matrix are exactly identical, the value of the determinant

(a) is one ( )

(b) is zero ( )

(c) changes its change ( )

(d) remains unchanged ( )

9. The solution to a linear programming problem will occur

(a) at the corner point of the feasible region ( )

(b) inside the feasible region ( )

(c) outside the feasible region ( )

(d) None of the above ( )

10. The _____ of an element of a determinant is the determinant of one lower order, obtained by deleting the row and column containing that element.

(a) cofactor ( )

(b) minor ( )

(c) determinant ( )

(d) None of the above ( )

SECTION—B

(*Marks* : 15)

Answer the following questions : 3×5=15

1. Define linear equation and quadratic equation.

2. State the conditions for which the function is said to be continuous.

3. Evaluate

$$\int_0^1 (x+2)\,dx$$

4. What is a Square Matrix?

5. Formulate the dual problem of the following LPP :

$$\text{Max } f = 2p_1 + 6p_2$$

subject to

$$\begin{aligned} 4p_1 + p_2 &\le 5 \\ 3p_1 + 2p_2 &\le 7 \\ p_1 + p_2 &\le 2 \\ p_1, p_2 &\ge 0 \end{aligned}$$

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