

2017

( 1st Semester )

ECONOMICS

( Honours )

Paper No. : ECO-102

[ Quantitative Techniques—I (Mathematics) ]

Full Marks : 70  
Pass Marks : 45%

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

Answer **five** questions, taking **one**  
from each Unit

UNIT—I

1. (a) Define set. Explain different types of function.  
  
(b) A firm has 40 workers working in the factory premises, 30 workers working in its office and 20 workers working in both the places. How many workers are there in the firm? How many workings are in the (i) factory and (ii) office alone?

- (c) If  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ ,  $A = \{1, 2, 3, 4\}$ ,  
 $B = \{2, 4, 5, 7\}$ , find (i)  $(A \cap B)'$ ; (ii)  $A' \cup B'$   
 and show that

$$(A \cap B)' = A' \cup B'$$

- (d) If  $A = \{1, 2, 3, 4, 7\}$ ,  $B = \{2, 4, 5, 6\}$  and  
 $C = \{1, 3, 4, 6, 8\}$ , prove that

$$A - (B \cup C) = (A - B) \cap (A - C)$$

$$(1+4)+3+3+3$$

2. (a) Differentiate between equation and identity.

(b) Explain various systems of equation.

(c) Find  $p$ , given  $S = 18$  for the supply curve  
 $S = 5p + 2p^2$ .

(d) Find the Cartesian product

$$A = \{HT\}, B = \{a, b, c\}$$

$$3+6+3+2$$

## UNIT—II

3. (a) Explain various axiomatic properties of real numbers.

(b) Find the length of the line segment between the points  $(2, -1)$  and  $(-3, 4)$ .

(c) Find the coordinate of mid-point of the line joining  $(-3, 4)$ ,  $(7, -7)$ .

$$6+4+4$$

4. (a) Define complex number.

(b) Draw the graph of the parabola

$$y = x^2 + 2$$

(c) Find the multiplicative inverse of the following :

(i)  $\frac{4 + 5i}{3 + 4i}$

(ii)  $(3 + 5i)(4 + 6i)$  2+5+(4+3)

### UNIT—III

5. (a) Find the differential coefficient, if

$$y = \frac{x^2 + x + 1}{x^2 - x + 1}$$

(b) The demand function of a monopolist  $P = 15 - 2x$ , revenue function  $R(x) = x(15 - 2x)$  and cost function  $T = (x^2 + 2x)$ . Find AR, MR, AC, MC and show that  $MR = MC$ . 4+10

6. (a) Determine the maxima and minima values of  $4x^3 + 9x^2 - 12x + 13$ .

(b) Find the integral of  $x^2 - 3x + 2$ .

(c) Find the producer's surplus when

$$P_d = 3x^2 - 20x + 5$$

$$P_s = 15 + 9x$$
 6+3+5

## UNIT—IV

7. (a) Define matrix.

(b) If

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 4 & 0 & 5 \\ 1 & 2 & 0 \\ 0 & 3 & 1 \end{bmatrix}$$

verify that  $(AB)' = B' \times A'$ .

(c) Find the adjoint of the matrix

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$$

and verify the theorem

$$A(\text{Adj } A) = \text{Adj } A(A) = |A|(I) \quad 2+5+7$$

8. (a) Solve the system of equations using the following matrices :

$$2x - 3y + 5z = 11$$

$$5x + 2y - 7z = -12$$

$$-4x + 3y + z = 5$$

(b) Solve the following equations by Cramer's rule :

$$3x + 2y + z = 6$$

$$2x - 3y + 3z = 2$$

$$x + y + z = 3$$

8+6

## UNIT—V

9. (a) What do you mean by linear programming?
- (b) What are the basic assumptions of a linear programming model? Indicate its limitations. 4+(6+4)
10. (a) What are the basic assumptions of input-output analysis?
- (b) Solve the following equation through graph :

Min

$$Z = X_1 + 2X_2$$

Subject to

$$9X_1 + 2X_2 \geq 18$$

$$3X_1 + 4X_2 \geq 12$$

$$4X_1 + 5X_2 \geq 20$$

where  $X_1, X_2 \geq 0$ .

5+9

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