

2020

(1st Semester)

ECONOMICS

(Honours)

Paper No. : ECO-102

(New Course)

[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. If $A = \{1, 2, 3, 4\}$ and $B = \{2, 3, 5, 4\}$ are two sets then, find—

- (a) the subsets of A
(b) the subsets of B
(c) $A \cap B$

(d) $B \cap A$ (e) $A \cap B$ (f) $A \cap B$

and also express (e) and (f) with the help of a Venn diagram. $3+3+1+1+3+3=14$

2. (a) Express diagrammatically of the following : $2+1+2+3=8$

(i) $X \cap Y = 1$ (ii) $Y = 5$ (iii) $X \cap Y = 6$ (iv) $Y = 5 \cap 3X$

where $3 \frac{\text{Perpendicular}}{\text{Base}}$ in the first quadrant.

- (b) Equations (1) and (2) below

$$2P + 14X = 12 \quad (1)$$

$$12P + 14X = 12 \quad (2)$$

are demand function and supply function respectively. Then find equilibrium price P and equilibrium quantity X .

6

UNIT—II

3. (a) Find the equation, slope and intercept of a line passing through (2, 6) and (5, 3).

$$2\frac{1}{2} + 2\frac{1}{2} + 2 = 7$$

(3)

- (b) What is the equation of a line with intercepts, -2 and -5 on X and Y axes respectively? 3

- (c) Find the slope of the line

$$\frac{X}{2} - \frac{Y}{3} = 1$$

when (i) X is an independent variable
and (ii) Y is an independent variable.

$$2+2=4$$

4. (a) Write short notes on the following :

$$2+2+4=8$$

- (i) Real number
- (ii) Imaginary number
- (iii) Complex number

- (b) Find the values of X and Y if

$$\frac{X}{4} - \frac{4}{i} = \frac{Y}{4} - \frac{Y}{i} = i \quad 6$$

UNIT—III

5. (a) Use 'quotient rule' to find the following derivative : 3

$$Y = \frac{5X^3}{3X^2 - 3X}$$

(4)

- (b) Use 'product rule' to find the following derivative : 3+3=6

(i) $Y = 5X^3(3X^2 - 2X)$

(ii) $Y = 5X e^{5X^2}$

- (c) Use 'generalized power function rule' to find the following derivative : 3

$$Y = (3X^3 - 2X^2)^3$$

- (d) From the given function, identify the slope and intercept : 2

$$Y = 5X - 2$$

6. (a) Find out the MR (marginal revenue) function from the given AR (average revenue) function : 4

$$AR = 100 - 0.5q$$

- (b) Given the total cost function

$$TC = 200q - 5q^2 + 0.05q^3 + 50$$

then find out—

- (i) MC (marginal cost);
- (ii) AFC (average fixed cost);
- (iii) AVC (average variable cost);
- (iv) VC (variable cost);
- (v) slope of MC. 2×5=10

(5)

UNIT—IV

7. (a) Write short notes on the following : $2 \times 2 = 4$

(i) Producer's surplus

(ii) Consumer's surplus

(b) If

$$P = 15 - D \quad (1)$$

$$P = 0 - 3D + 2 \quad (2)$$

then find producer's surplus and consumer's surplus, if (1) and (2) are demand function and supply function respectively. $5 + 5 = 10$

8. (a) If $MR = 10 - q$, then find TR. MR and TR are marginal revenue and total revenue respectively. 3

(b) Distinguish between definite and indefinite integrals. $3 + 3 = 6$

(c) Write short notes on the arbitrary constant that is used during indefinite integration. Also write why an arbitrary constant is not used during definite integration. 5

UNIT—V

9. (a) Write down the properties of a determinant. 7

(6)

(b) Write the order of the matrix given below : 1

$$B = \begin{pmatrix} 7 & 5 \\ 8 & 9 \\ 7 & 6 \end{pmatrix}$$

(c) What do you mean by an identity matrix? Write the role played by an identity matrix in a matrix multiplication, with the help of an example. 6

10. (a) Given a matrix

$$C = \begin{pmatrix} 7 & 8 & 9 \\ 3 & 2 & 1 \end{pmatrix}$$

transpose it and write the new order after it is transposed. 2

(b) If

$$A = \begin{pmatrix} 3 & 2 & 2 \\ 2 & 1 & 4 \\ 1 & 3 & 5 \end{pmatrix}$$

then find out the adjoint of A. 5

(c) Solve by using Cramer's rule : 7

$$\begin{matrix} 2X_1 & X_2 & 3X_3 & 15 \\ X_1 & 2X_2 & 5X_3 & 13 \\ 4X_1 & 3X_2 & X_3 & 11 \end{matrix}$$
