2 0 1 9

(1st Semester)

ECONOMICS

(Honours)

Paper No. : ECO–102

(New Course)

[Quantitative Technique—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 the different types of sets.   1+5=6

  (b) There are 1400 students in a college. 1250 can play football, 952 can play cricket and 60 students can neither

play football nor cricket. How many students can play both cricket and football? 4

(c) Define Cartesian product. Find the Cartesian product of *XY*, if

$$X = \{x : x = 1, \ 2\}$$
$$Y = \{y : y = x, \ -1\}$$

1+3=4

2. (a) What is break-even point? 2

(b) Define a function. Explain its types. 2+6=8

(c) Solve the following by method of substitution : 4

$$x + 6y - z = 10$$
$$2x + 3y - 3z = 17$$
$$3x - 3y - 2z = -9$$

UNIT—II

3. (a) Define real number. Explain the axiomatic properties of a real number.

1+6=7

(b) Prove that

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

4

(c) Find the slope of the line passing through $(a + k, \ b + k) \ (a + m, \ b + m)$. 3

(*Continued*)

4. (a) Express $\left(\dfrac{1+i}{1-i}\right)^3$ in the form $a+ib$, where a and b are real numbers. 5

(b) Find the coordinates of $P(x, y)$ dividing the line segment joining $(1, 2)$ $(3, 4)$ externally in the ratio $5 : 4$. 4

(c) Find the standard form of the parabola $y^2 - 4y - 4x - 8 = 0$. 5

UNIT—III

5. (a) State two basic limit theorems. 2+2=4

(b) Evaluate the limit of the function

$$\lim_{x \to 3} \frac{x^2 - 2x - 3}{x^2 + x - 12}$$

4

(c) Explain the rules of differentiation. 6

6. (a) Find out the maximum and minimum value of the function

$$Y = x^3 - 9x^2 + 15x + 20$$

6

(b) Given total cost function as

$$Q^3 - 3Q^2 + 15Q + 27$$

Find AC and MC. 2+2=4

(c) A monopolist faces a demand schedule $P = 460 - 2q$ and $TC = 20 + 0.5q^2$. How much should it sell to maximize profit? 4

UNIT—IV

7. (a) Define integration. What are the basic rules of integration? 2+6=8

(b) Find the integral of the following : 3×2=6

(i) $\int \left(5x + \dfrac{2}{x} \right) dx$

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

8. (a) Suppose the producer's supply function is given by $Q = \sqrt{-4 + 4P}$ and market price is 10. Find the producer's surplus. 8

(b) Find the integral of the following : 3×2=6

(i) $\int_{-1}^{3} (2x^2 + 5) dx$

(ii) $\int_{2}^{5} (x^2 - 2x + 3)(8x - 8) dx$

UNIT—V

9. (a) Define matrix. What are the types of matrix? 2+5=7

(b) Prove $(A + B)' = A' + B'$ when

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

3½

(c) If

$$A = \begin{bmatrix} 2 & 3 & 0 \\ 5 & 1 & 2 \end{bmatrix} \qquad B = \begin{bmatrix} 4 & 1 \\ 2 & 3 \\ 1 & 5 \end{bmatrix}$$

then show that AB is not equal to BA.   3½

10. (a) Solve the equations using Cramer's rule :   7

$$3x - 2y + 3z = 8$$
$$2x + y - z = 1$$
$$4x - 3y + 2z = 4$$

(b) Solve the following system of equations by matrix inversion :   7

$$2x_1 + 3x_2 - x_3 = 15$$
$$0x_1 + 4x_2 + 2x_3 = 16$$
$$3x_1 + 2x_2 + 0x_3 = 18$$

★ ★ ★