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

   There are 1400 students in a college.
   1250 can play football, 950 can play
   cricket and 60 students can neither

(Turn Over)

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 $\left(\frac{1+i}{1-i}\right)^3$ 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 $TC = 20 + 0 \cdot 5q^2$. 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 : $3 \times 2 = 6$

(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 : $3 \times 2 = 6$

(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

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

★ ★ ★