2019

(1st Semester)

ECONOMICS

(Honours)

Paper No. : Eco–102

[Quantitative Techniques—I (Mathematics)]

(Old Course)

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)* What do you mean by functions? Write down the different types of functions. 2+4=6

(b) Define a set. What are the two ways of expressing a set? 2+2=4

(c) Given three sets, $A = \{a, b, c, d\}$, $B = \{a, c, d\}$ and $C = \{b, d, a\}$, then find

(i) $A \cap B \cap C$

(ii) $A \cup B$

(iii) $B \cup C$

(iv) $A \cap C$ 1+1+1+1=4

2. (a) What is a Cartesian product? 2

(b) Given two coordinates (a, b) and (x, y). Under what conditions the two coordinates are equal? 3

(c) Given two coordinates, $A = (5, 6)$ and $B = (7, 8)$, then find their Cartesian product. 4

(d) Express $X + Y > 1$ and $X + Y \geq 1$ diagrammatically. 2½+2½=5

UNIT—II

3. (a) What are the uses of real and imaginary numbers in Economics? 6

(b) Given a quadratic equation $2x^2 + 32x + 96 = 0$. The number of roots it will have is _____.

(Fill in the blank) 1

(c) Given a complex number $5 + 6i$. Express it diagrammatically and find (solve) for the real number of the given complex number. 3+4=7

4. (a) If $(3, -4)$ is the centroid of a triangle whose vertices are $(6, 2)$, $(x, 3)$ and $(0, y)$, then find x and y. 5

(b) Find the equation of the path traced out by the point 'p' which remains equidistant from points $A = (3, -4)$ and $B = (-5, -1)$. 6

(c) What is the equation of a line with intercepts $(-2, 0)$ and $(0, -5)$? 3

UNIT—III

5. (a) Find the derivative of

$$y = \frac{5x}{7x^3 + 13x + 3}$$ 5

(b) What do you mean by differentiation? What are its different rules? 2+5=7

(c) Given a total revenue function $y = 5x$; then find

(i) average revenue;

(ii) marginal revenue. 1+1=2

6. (a) Given the demand function $P = 42 - 5x - x^2$ and if $P = 6$, find consumer surplus. 8

(b) Find

$$\int (5x^2 + 2x)\,dx$$ 3

(c) Find

$$\int (2x^3 + x^2 + 4x)\,dx$$ 3

UNIT—IV

7. (a) Distinguish between a row vector and a column vector. 2

(b) Explain five different types of matrix. 5

(c) Solve the following equations using Cramer's rule : 7

$$2x + y + 3z = 15$$
$$x - y + 5z = 13$$
$$4x + 3y - z = 11$$

8. (a) Solve the following linear simultaneous equation with the matrix inversion method : 8

$$2x + 3y - z = 15$$
$$4y + 2z = 16$$
$$3x + 2y = 18$$

(b) Given a matrix

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

then find the minor M_{11}, M_{12}, M_{13} and M_{31}. 1+1+1+1=4

(c) Distinguish between a singular and a non-singular matrix. 2

UNIT—V

9. (a) Minimize

$$C = 0 \cdot 6x + y$$

subject to

$$10x + 4y \geq 20$$
$$5x + 5y \geq 20$$
$$2x + 6y \geq 12$$

$$x, y \geq 0.$$

Solve graphically. 8

(b) Write short notes on—

(i) decision variables;

(ii) feasible region;

(iii) optimal feasible solution;

in the context of linear programming. 2+2+2=6

10. *(a)* If

$$A = \begin{bmatrix} 0\cdot2 & 0\cdot5 \\ 0\cdot3 & 0\cdot7 \end{bmatrix}$$

is an input matrix, then verify whether the two Howkin-Simon conditions are satisfied or not. 6

(b) Maximize

$$\Pi = 40X_1 + 30X_2$$

$$X_1 \leq 16$$

$$X_2 \leq 8$$

$$X_1, X_2 \geq 0$$ 4

(c) Distinguish between 'linear static closed model' and 'linear static open model'. 4

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