2025

(FYUGP)

(2nd Semester)

ECONOMICS

(MAJOR)

Paper : EC2.CC4

(Mathematical Methods for Economics—II)

Full Marks : 75
Pass Marks : 40%

Time : 3 hours

The figures in the margin indicate full marks for the questions

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

UNIT—1

1. *(a)* Define singular and non-singular matrix. Give example. 4

(b) If

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

Find AB. 5

(c) Solve the following equation system by Cramer's rule :

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

6

2. What is determinants? Explain the properties of determinants with example. 3+12=15

UNIT—2

3. (a) Find the all second-order partial derivatives of the following function : 8

$$Y = 4x_1x_2 + x_1^3 + 2x_2^2$$

(b) A consumer consumes two commodities x_1 and x_2 and the utility function is given by

$$U = x_1^2 + 3x_1x_2 + 5x_2$$

Find out marginal utilities of x_1 and x_2. 7

4. (a) Find the extreme value of the following function and determine whether they are maxima or minima : 8

$$Y = 5x_1^2 + 2x_2^2 - 2x_1x_2 - 15x_1 - 6x_2$$

(b) Cobb-Douglas production function is given as $Q = AK^{\alpha}L^{\beta}$, where $\alpha + \beta = 1$, and L = labour, K = capital, Q = output and A, α and β are constant. Find marginal productivity of L and K. 7

UNIT—3

5. What is Lagrange multiplier? Find the extreme value of the following function : 3+12=15

$$Y = x_1^2 + x_1x_2 + \frac{3}{2}x_2^2$$

subject to

$$x_1 + 2x_2 = 14$$

6. A monopolist discriminates in prices between two markets *I* and *II* and the price equations are given by—

$$P_1 = 60 - 4Q_1$$
$$P_2 = 42 - 3Q_2$$

where Q_1 and Q_2 are the outputs of markets *I* and *II* and $Q = Q_1 + Q_2$. The total cost $(TC) = 50 + 12Q$. Find—

(a) profit maximising output and prices;

(b) maximum profit;

(c) elasticity of demand of the markets *I* and *II*. 7+3+5=15

UNIT—4

7. Explain the inventory control technique in economics. 15

8. *(a)* In a perfectly competitive market the total revenue (TR) and total cost (TC) of a firm are given by

$$TR = 20Q$$

$$TC = Q^2 + 4Q + 20$$

Find profit maximizing output (Q). 7

(b) A monopolist has the following total revenue and total cost functions :

$$TR = 30q - q^2$$

$$TC = q^3 - 15q^2 + 10q + 100$$

Find—

(i) profit maximizing output (q);

(ii) maximum profit. 8

UNIT—5

9. *(a)* What is differential equation? Explain the economic implications of differential equation. 2+8=10

(b) Solve : $\frac{dy}{dx} + 2xy = 2x$ 5

10. Solve the following difference equations : 5×3=15

(a) $y_t - 2y_{t-1} = 3$ with $y_0 = 2$

(b) $y_{t-1} - y_t = 10$ with $y_0 = 5$

(c) $y_{t+1} - 5y_t = 12$ with $y_0 = 10$

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