2026

(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.

UNIT—I

1. *(a)* Explain the different types of matrices with examples. 10

(b) If

$$A = \begin{bmatrix} 3 \\ 5 \\ 0 \\ 2 \end{bmatrix} \text{ and } B = [6\ 4\ 2\ 0]$$

Or

2. *(a)* Find the rank of

$$A = \begin{bmatrix} 2 & 4 & 1 \\ 3 & 6 & 2 \\ 4 & 8 & 3 \end{bmatrix}$$ 5

(b) Solve the following using Cramer's rule : 10

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

UNIT—II

3. Find the partial derivatives of the following : 5×3=15

(i) $y = (x_1^2 + 2x_2)(x_1 x_2 - x_1^2 + x_2^2)$

(ii) $y = e^{(x_1 + 6x_1 x_2 - x_2^2)}$

(iii) $y = \dfrac{(x_1 - 2x_2^2)}{(x_1^2 - 4x_2)}$

Or

4. Find the total differentials of the following : 5×3=15

(i) $x^2 - 2xy + y^2$

(ii) $xy^3 - yx^3$

(iii) $\dfrac{x^2 + y^2}{x - y}$

UNIT—III

5. *(a)* Explain the substitution method for solving the problem of constrained optimization. 5

(b) Find the maximum value of

$$u = x^2 + 3xy - 5y^2$$

subject to $2x + 3y = 6$. 10

Or

6. Given the function

$$u = x^2 + y^2 + w^2$$

subject to a linear constraint of $x + y + w = 1$. Find at what point it has a maximum or a minimum value. 15

UNIT—IV

7. Examine the following functions for their maxima and minima : 5×3=15

(i) $y = 3x - 12x^2$

(ii) $y = 3x^2 - 12x + 12$

(iii) $y = \dfrac{6x}{x^2 + 4}$

Or

8. *(a)* Find the extreme values of

$$y = x^3 - 9x^2 + 15x + 20$$ 6

(b) The demand function faced by a firm is $P = 500 - 4Q$ and its cost function is $C = 500 + 125Q$, where P is the price. Find—

(i) the output at which profit of the firm is maximum;

(ii) equilibrium price charged by the firm;

(iii) maximum profit. 9

UNIT—V

9. Solve the following differential equations : 15

(i) $(x + y)\,dx + (x + 4y)\,dy = 0$

(ii) $\frac{dy}{dx} = ay$

(iii) $\frac{dy}{dx} + 2y = 10$

Or

10. (a) What is difference equation? Solve the following difference equation using the iteration method : 2+5=7

$$\Delta y_t = -0{\cdot}2y_t$$

(b) Solve the difference equation

$$y_{t+1} + 5y_t = 9$$

when $y_0 = 12$. 8