2024

(CBCS)

(2nd Semester)

ECONOMICS

(Honours)

Paper No. : 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)* Define multiplication matrix. If

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

show that $AB \neq BA$. 2+5=7

(b) Obtain the inverse of the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 5 \\ 1 & 5 & 12 \end{bmatrix}$$ 8

OR

2. (a) Evaluate : 5

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$$

(b) Solve the following system of equations by Cramer's rule : 10

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

UNIT—II

3. (a) Find the first-order partial derivatives of

$$y = \frac{2x_1 - x_2^2}{x^2 + 3x_2}$$ 10

(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 the marginal utilities of x_1 and x_2. 5

OR

4. Find the total differentials of the following functions : 4+4+7=15

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

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

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

UNIT—III

5. (a) A firm operates with the production function $Q = 4K^{0 \cdot 6}L^{0 \cdot 5}$ and can buy K at ₹ 15 a unit and L at ₹ 8 a unit. Using Lagrange's multiplier method, find what input combination will minimize the cost of producing 200 units of output. 7½

(b) Solve for consumer equilibrium if the utility function is $u = xy$, price of commodity $x =$ ₹ 4 and of $y =$ ₹ 10 respectively, given consumer's income = ₹ 200. 7½

OR

6. A firm buys the four inputs K, L, R and M at per unit prices of ₹ 50, ₹ 30, ₹ 25 and ₹ 20 respectively, and operates with the production function $Q = 160 K^{0 \cdot 3} L^{0 \cdot 25} R^{0 \cdot 2} M^{0 \cdot 25}$. What is the maximum output can it make for a total cost of ₹ 30,000? 15

UNIT—IV

7. Examine the following functions for maxima or minima : 5+5+5=15

   (i) $y = x^2 - 4x$

   (ii) $y = 20 - 2x^2$

   (iii) $y = 2x^2 - 16x + 50$

OR

8. A monopolist has the following total revenue (R) and total cost (C) functions :

$$R = 30q - q^2$$
$$C = q^3 - 15q^2 + 10q + 100$$

Find—

(a) profit maximization output;

(b) maximum profit;

(c) equilibrium price. 10+2½+2½=15

UNIT—V

9. Illustrate how the solution of first-order differential equation enables us to obtain the conditions for dynamic stability of equilibrium market price in the long-run. 15

OR

10. *(a)* Solve the following first-order difference equations : 4+4=8

   (i) $y_{t+1} + 3y_t = 2$ and $y_0 = 5$

   (ii) $y_t = 3y_{t-1} + 5$ if $y_0 = 2$ and $t = 2$

   (b) Solve the difference equation

$$y_{t+2} - 6y_{t-1} + 8y_t = 2$$

   with the initial conditions $y_0 = 1$ and $y_1 = 4$. 7

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