2024

(FYUGP)

(1st Semester)

ECONOMICS

(Major)

Paper Code : EC1.CC2

(Mathematical Methods for Economics—I)

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—I

1. *(a)* Define a set. What are the two ways of expressing a set? Give examples. 2+4=6

(b) If

$A = \{1, 3, 5, 7, 9\}$
$B = \{2, 3, 4, 5, 8\}$
$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

find—

(i) $A^c \cup B^c$;

(ii) $(A \cap B)^c$;

(iii) $(A - B)^c$. 3×3=9

2. (a) Define function. What are the different types of functions? Give examples. 6

(b) Draw a graph of the linear function

$$y = -2x + 3$$ 4

(c) Solve the following equation : 5

$$6x^2 - 5x - 1 = 0$$

UNIT—II

3. (a) Define rational number and irrational number with examples. 6

(b) State and explain with example the axioms of order of real number. 9

4. (a) State the laws of operations of complex number with example. 10

(b) Find the values of x and y if

$$\frac{x+4}{4+i} + \frac{y}{4-i} = i$$ 5

(Continued)

UNIT—III

5. *(a)* Define circle. Find the centre and radius of the circle

$$x^2 + y^2 + 8x + 10y - 8 = 0$$ 1+6=7

(b) Define parabola. Find the equation of the parabola whose focus is (2, 3) and directrix is $x - 2y - 6 = 0$. 2+6=8

6. *(a)* Find the equation of the straight line passing through $P(-1, -5)$ and $Q(5, 4)$. 3

(b) Find the slope of a line joining the points (3, 2) and (7, –2). 3

(c) Line through the points (–2, 6) and (4, 8) is perpendicular to the line passing through the points (8, 12) and (x, 24). Find the value of x. 5

(d) If the distance between the points (x, 10) and (1, 5) is 13 cm, find the value of x. 4

UNIT—IV

7. *(a)* Explain the different rules of differentiation with examples. 10

(b) Find $\frac{dy}{dx}$, if—

(i) $y = 10x^2 - 15x + 10$

(ii) $y = (2x + 1)(x^2 - 2x)$ 2+3=5

8. *(a)* Find the extreme value of the following function : 5

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

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

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

Find—

(i) profit maximising output;

(ii) maximum profit;

(iii) equilibrium price;

(iv) point elasticity of demand at equilibrium output. 4+2+2+2=10

UNIT—V

9. *(a)* State the different rules of integration with examples. 10

(b) Integrate the following functions : 2+3=5

(i) $\int (x^2 - 2x + 1)\,dx$

(ii) $\int \left(4x^3 + \frac{1}{\sqrt{x}} - 3\right) dx$

10. *(a)* If marginal cost function is given as

$$MC = 3Q^2 - 4Q + 6$$

find—

(i) average cost (AC);

(ii) average variable cost (AVC). 2+3=5

(b) What do you mean by consumer's surplus and producer's surplus? Calculate producer's surplus if supply function is given as $Q = \sqrt{-4 + 4P}$ and price $(P) = 10$. 4+6=10

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