

Ba/ECO-H/C2

2 0 2 3

(CBCS)

(1st Semester)

ECONOMICS

(Honours)

Paper Code : ECO-H/C2

(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 set. Describe the basic operations on sets. 2+4=6

(b) If

$$A = \{a, b\}, B = \{s, t\} \text{ and } C = \{a, t, x\}$$

prove that

$$A \times (B \cap C) = (A \times B) \cap (A \times C) \quad 4$$

(2)

(c) Solve :

5

$$\begin{aligned}x + 6y - z &= 10 \\2x + 3y + 3z &= 17 \\3x - 3y - 2z &= -9\end{aligned}$$

2. (a) Explain different types of functions and its applications. 6

(b) Construct a market demand schedule and plot the demand curve for the function $x = 10 - 2p$. 5

(c) Solve for x :

4

(i) $x^2 = k$

(ii) $3x^2 + 7 = 10$

(iii) $x^2 - 9x + 14 = 0$

(iv) $a^2 x^2 = 9$

UNIT—II

3. (a) Write short notes on the following : 2+2+2=6

(i) The axiom of closure

(ii) The axiom of identity

(iii) The inverse axiom

(b) Prove the following :

$$2\frac{1}{2} + 2\frac{1}{2} = 5$$

(i) If $a + b = b + c$, then $a = c$

(ii) If $a + b = 0$, then $b = -a$

(Continued)

(3)

(c) Show that

$$(ab)^{-1} = a^{-1}b^{-1}$$

if $a \neq 0, b \neq 0$.

4

4. (a) Graphically explain the representation of complex numbers.

7

(b) If

$$x + iy = \frac{c + id}{a + ib}$$

prove that

$$x = \frac{ac + bd}{a^2 + b^2}$$

$$y = \frac{ad - bc}{a^2 + b^2}$$

4

(c) Solve the given complex conjugate :

4

$$\left(\frac{1+2i}{2+i} \right)^2$$

UNIT—III

5. (a) If a circle has the center $(-5, 1)$ and passes through the point $(-4, -3)$, what is its radius?

4

(b) Find the equation of the straight line passing through the points $(-3, 7)$ and $(-1, 5)$. Also find its slope and intercepts.

$$5+3+3=11$$

(Turn Over)

(4)

6. (a) Define circle. Find the equation of circle with centre (2, 7) and radius = 8. $2+5=7$

- (b) Define parabola. Find the vertex, focus and directrix for the following parabola : $2+2+2+2=8$

$$y = x^2 + 4x$$

UNIT—IV

7. Find dy / dx : $5+5+5=15$

(a) $y = (4x^2 + 2x) (8x^3 + 3x^2)$

(b) $y = \frac{8 + 4x^2}{x}$

(c) $y = (2x^2 + 2x + 2)^2$

8. (a) The total cost of an output is given by

$$TC = q^3 - 61q^2 + 15q + 200$$

Find the following : $3+3=6$

(i) The marginal cost

(ii) The average cost

- (b) Find the maximum and minimum value of the following : 9

$$y = 3x^4 - 10x^3 + 6x^2 + 5$$

UNIT—V

9. (a) Integrate the following : $3+3+3+3=12$

(i) $\int \left(x - \frac{1}{x} \right)^3 dx$

(ii) $\int (x^2 - 1)^2 dx$

(iii) $\int 5a^{2x} dx$

(iv) $\int \frac{x^5 dx}{x^{12} + 1}$

(b) State and explain the power rule of integration. 3

10. (a) Given a consumer's demand $Q = \sqrt{60 - 2p}$. Find the consumers' surplus when market price is $P = 12$. 7

(b) The marginal cost function for a certain product is $5 + x^2$. Find the total cost and average cost functions if the fixed cost is 50. $4+4=8$
