

Ba/EC1.CC2

2025
(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) Explain with examples : $2\frac{1}{2}+2\frac{1}{2}=5$
- (i) Null sets and universal sets
 - (ii) Associative and distributive properties of sets

(b) (i) Given the sets

$$A = \{1, 2, 3, 4\}$$

$$B = \{2, 4, 5, 6\}$$

$$C = \{0, 3, 4, 7, 8\}$$

Prove the De Morgan's law for union and intersection.

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(ii) Given the sets, find the Cartesian products $s_1 \times s_2$

$$s_1 = \{x / x = 1, 2, 3\}$$

$$s_2 = \{y / y = x + 2\}$$

4

2. (a) Differentiate between the following :

2+2+2=6

(i) Domain and range of a function

(ii) Explicit and implicit functions

(iii) Exponential and quadratic functions

(b) Solve the following system of equations :

6+3=9

(i) $4x + 3y = 9$

$$2x + 4y + 3 = 0$$

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

(ii) $2x - y = 12$

$$x - 2y = 48$$

UNIT—II

3. (a) Explain the different types of numbers in the number system with examples. 10

(b) Solve the following inequalities : $2+2+1=5$

(i) $|2x - 3| \leq 3$

(ii) $\left| \frac{x-3}{2} \right| \geq 5$

(iii) $|4 - x| \geq 0$

4. (a) (i) What are complex numbers? Show that the commutative and associative laws hold for complex numbers z_1, z_2, z_3 . $2+5=7$

(ii) Find the square root of the following complex number : 3

$$5 - 12i$$

(b) If $z_1 = 3 + 9i$ and $z_2 = 2 - i$, find $\left| \frac{z_1}{z_2} \right|$. 5

UNIT—III

5. (a) (i) Find the coordinates of the mid-point of the line joining $(-3, 2)$ and $(-1, 4)$. 3

(ii) Two vertices of an equilateral triangle are $(-4, 0)$ and $(4, 0)$. Find the third vertex. 4

- (b) (i) Prove that the lines $x + 2y - 9 = 0$ and $2x + 4y + 5 = 0$ are parallel. 4
- (ii) Prove that the lines $\frac{x}{a} + \frac{y}{b} = 1$ and $ax - by = 10$ are perpendicular. 4
6. (a) Write short notes on the following : $2+3=5$
- (i) Circle
- (ii) Parabola
- (b) (i) Find the equation of a circle whose centre is at the point $(-3, 4)$ and it passes through the origin. 3
- (ii) Find the centre and the radius of the following circle : 7
- $$7x^2 + 7y^2 - 4x - y = 3$$

UNIT—IV

7. (a) Define differentiation. Explain the rules of differentiation with examples. $1+9=10$
- (b) Find $\frac{dy}{dx}$, if—
- (i) $y = 7x^3 + 5x^5 - 3x^6 + 8$
- (ii) $y = \frac{(2x + 5)}{(x^2 - 3)}$ 2+3=5

8. (a) Define maxima and minima of a function. Also find the maximum and minimum value of

$$y = x^3 - 6x^2 + 9x \qquad 2+5=7$$

- (b) Find the limit of the following functions :

$$2+3+3=8$$

(i) $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$

(ii) $\lim_{x \rightarrow 2} \frac{x^2 + 3x - 10}{x^2 - 2x}$

(iii) $\lim_{x \rightarrow 4} \frac{x^3 - 64}{x - 4}$

UNIT—V

9. (a) Integrate the following functions :

$$2+4+4=10$$

(i) $\int \left(5e^x - \frac{1}{x^2} + \frac{4}{x} \right) dx$

(ii) $\int \frac{1}{\sqrt{2x-9}} dx$

(iii) $\int x^2 \cdot e^x dx$

- (b) If the marginal revenue (MR) function for output x is given by

$$MR = \frac{6}{(x+2)^2} + 5$$

find the total revenue (TR) function. 5

10. (a) Define definite integral. State the properties of definite integral. $2+3=5$

(b) Given the demand function $P_d = 36 - x^2$ and the supply function $P_s = 6 + \frac{x^2}{4}$, find the consumer surplus (CS) and producer surplus (PS). $5+5=10$

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