Total number of printed pages – 11

63/1 (SEM–2) CC4/ECOHC2046

2025

ECONOMICS

Paper : ECOHC2046

(Mathematical Methods for Economics – I)

Full Marks : 80

Pass Marks : 32

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Choose the correct answer of the following : *(any six)* 1×6=6

   (a) If $U = \{2, 4, 6, 8, 10, 12\}$ and $A = \{4, 6, 8\}$, then the complement of $A(A^c)$ is

   (i) $\{2, 4, 6\}$

   (ii) $\{2, 4, 8\}$

   (iii) $\{2, 4, 10\}$

   (iv) $\{2, 10, 12\}$

(b) If ACB, BCA then two sets A and B are –

(i) Proper sub set

(ii) Equal set

(iii) Equivalent sets

(iv) Power set

(c) Every rational number is –

(i) Real number

(ii) Integar

(iii) Whole number

(iv) Natural number

(d) Which of the following is an irrational number ?

(i) $\sqrt{16}$

(ii) $\sqrt{12/13}$

(iii) $\sqrt{12}$

(iv) $\sqrt{100}$

(e) The limiting value of the function

$$\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$$

(i) 2

(ii) 0

(iii) 4

(iv) 1

(f) If $f(x) = x - \frac{1}{x}$, then $f(x) + f(1/x)$ is equal to

(i) 1

(ii) $2x$

(iii) $2/x$

(iv) 0

(g) If 'c' is any constant, then $\frac{dc}{dx}$

(i) c

(ii) x

(iii) $-c$

(iv) 0

(h) If $y = e^x$, then $\frac{d(e^x)}{dx}$

(i) e^{-x}

(ii) e^x

(iii) e

(iv) 0

(i) The value of $\int dx$ is

(i) $\log x + c$

(ii) $1/x + c$

(iii) $1/2 x + c$

(iv) $x + c$

(j) The *MPC* of the consumption function

$C(Y) = 50 + 0.4Y$

(i) 50

(ii) 0

(iii) 0.4

(iv) $1/2$

2. Answer the following questions : ***(any five)*** 2×5=10

(a) Define null set with example.

(b) Fill in the blanks

(i) Every set is a _____ of itself.

(ii) The _____ set it a subset of every set.

(c) Define a rational function with example.

(d) Find the limit : $\lim_{x \to -3} \frac{x^2 + x - 6}{x + 3}$

(e) Find the derivative of the function

$$y = f(x) = \frac{1}{2}\sqrt{x}$$

(f) Find the elasticity of demand of the demand function

$D = 24 - 4P$, when $P = 3$

where D and P represent demand and price.

(g) Find $\int(3x^2-2x+2)dx$

3. Answer the following questions : ***(any six)*** 5×6=30

(a) Define with example : 2+3=5

(i) Singleton set

(ii) Equal sets and Equivalent set

(b) Evaluate the limit function

$$\lim_{x\to 2}\frac{x^2-3x+2}{x^2-x-2}$$

(c) Find out the equilibrium price and quantity of the following market model.

$$Qd = 15-2P$$
$$Qs = -5+2P$$
$$Qs = Qc$$

(d) Write product rule of differentiation. If $y=(x^2+10)(x+1)$, find the value of $\frac{dy}{dx}$. 2+3=5

(e) If $y=\frac{1+\sqrt{x}}{1-\sqrt{x}}$, find the value of $\frac{dy}{dx}$.

(f) Derive the relationship between *MC* and *AC* using the product rule of differentiation.

(g) Find the second order derivative of the functions 2+3=5

(i) $f(x)=15x^3-6x^2+30x+20$

(ii) $f(x)=30+e^x+x^2$

(h) Integrate the following : 2+3=5

(i) $\int(2ax+10\sqrt{x}+e^x)dx$

(ii) $\int\frac{2x+3}{x^2+3x}dx$

5. Answer the following questions : ***(any one)*** 14×1=14

(a) (i) Define point elasticity of demand. If $TR = PQ$, where P and Q are price and quantity respectively, then show that

$$ed = \frac{AR}{AR - MR}$$

(ii) The marginal revenue function is given by $MR = 50 - 4Q$, find the point elasticity of demand when $Q = 10$.

2+7+5=14

(b) A monopolist average revenue *(AR)* and total cost *(TC)* functions are given by

$$AR = 16 - 2Q$$

$$TC = 20 + 4Q - Q^2$$

Find

(i) Profit maximizing output

(ii) Equilibrium price

(iii) Point elasticity of demand at equilibrium level of price.

8+3+3=14

(c) Define Cobweb market model. Given the demand and supply functions for Cobweb market model.

$$Q_{dt} = 18 - 3P_t$$

$$Q_{st} = -3 + 4P_{t-1}$$

Find intertemporal equilibrium price and also determine whether you will get stable equilibrium. 2+12=14

———