

2022

**Economics**

**[HONOURS]**

**(CBCS)**

**(B.Sc. First Semester End Examination-2022)**

**PAPER-CC2**

**[Mathematical Methods in Economics-I]**

*Full Marks: 60*

*Time: 03 Hrs*

*The figures in the right hand margin indicate marks*

*Candidates are required to give their answers in their own words as far as practicable*

*Illustrate the answers wherever necessary*

**Group-A**

**1. Answer any ten questions of the following: 10x2= 20**

a) How many subsets can be obtained from the following set?

$$S = \{x, y, z\}$$

b) Examine whether the equation  $x^2-3x+10$  has real roots or not

c) Given the utility function  $U = x_1^2 + x_2^2$  find out the slope of the indifference curve.

d) If  $MR=40$ ,  $AR=60$ ; find out the elasticity of demand.

e) Write the next four terms of the following sequence:0,3,8,15,.....

f) For two sets A & B if  $B \subseteq A$  then what will be  $B-A$ ?

g) Distinguish between local maxima and global maxima of a function.

h) Find the point of maxima on the curve  $y = x^3 - 6x^2 + 9x - 2$

(2)

- i) Find the elasticity of demand for the demand function  $Q = 33 - 4P^2$  at  $P = 3$
- j) If  $AR = 46 - 3Q^2$ , find MR when  $Q = 2$
- k) Evaluate  $\int_2^5 e^{2x} dx$
- l) Define null set.
- m) If  $A = \{1, 2, 3, 4\}$   $B = \{3, 4, 5, 6\}$   $C = \{6, 1, 8\}$   
Find  $A \cup (B \cap C)$
- n) Define range and domain of a function
- o) Define continuity of a function.

**Group-B**

Answer any four questions of the following: **4x5 = 20**

2. Average cost function (AC) of a firm is given by  $AC = x^2 - 6x + 7$ . The maximum production capacity of the firm is 50 units. Find the ranges of output for which AC is increasing.
3. Show that  $\lim_{x \rightarrow \infty} \frac{a_1x + b_1}{a_2x + b_2} = \frac{a_1}{a_2}$
4. The demand curve of a consumer is given by  $P^{-\alpha} = \frac{\beta}{q}$ , where  $\alpha$  &  $\beta$  are two constants. Prove that elasticity of demand is equal to  $-\alpha$

(3)

5. The marginal cost (MC) function of a company is given by  $MC = 75 + 20x - 3x^2$ . Find out the total cost function when fixed cost is 1000
6. Discuss the nature of time path  $y_t = 5\left(-\frac{1}{10}\right)^t + 4$
7. Find the intertemporal equilibrium price and whether equilibrium is stable  
 $Q_d = 19 - 6P + Q_s = 6p_{t-1} - 5$
8. The demand function of a good is given by  $P = 8 - q^3$ . Find out the consumers surplus if it is told that the commodity is a free good.

**Group -C**

Answer any two questions: **2x10 = 20**

9. Define first and second order conditions of maximisation of a function  $y=f(x)$ . The revenue  $R(Q)$  and cost  $C(Q)$  functions of a firm are given by  $R = 1200Q - 2Q^2$  &  $C = Q^3 - 16.25Q^2 + 1528.5Q + 2000$ . Find out maximum profit maximising output. Also find out maximum profit. **2+4+4**
10. Distinguish between a difference equation and a differential equation. Given  $D_t = 40 - 10P_t$  &  $S_t = 2 + 9P_{t-1}$  find the intertemporal equilibrium price. Comment on the stability **2+6+2**

(4)

11. i) Given  $f(x) = -\sqrt{(5+x)(5-x)}$  prove that

$$\lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x - 1} = \frac{1}{2\sqrt{6}}$$

ii) In a competitive market demand and supply are given by  $P^d = 3 - 4q$  &  $P^s = 4 + 3q$  Find equilibrium price quantity. Also comment on economic significance of the equilibrium. 5+5

12. Give  $Y = -\frac{L^3}{3} + 2L^2 + 12L$  where  $Y$  = production &  $L$  = labour employed, find the maximum amount of labour beyond which average return from labour starts falling. 10

-----