

ST. JOSEPH’S UNIVERSITY, BENGALURU -27

M.A. ECONOMICS – I SEMESTER

SEMESTER EXAMINATION: OCTOBER 2023

**(Examination conducted in November /December 2023)**

 **EC 7421: Mathematical Methods for Economists**

 (For current batch students only)

**Time: 2 Hours Max Marks: 50**

**This paper contains 2 printed pages and 3 parts**

**PART-A**

**Answer any FIVE of the following 2\*5 = 10**

1. Evaluate the indefinite integral of ꭍ (5x3 + 2x2 + 3) dx.
2. Define Nash equilibrium.
3. Find the first five derivatives of the function: y = f(x) = 4x4 – x3 + 17x2 + 3x - 1.
4. Given A = 3 2 find A-1.

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1. Given z = 17y2 + 34y and y = 2x, find dz/dx using Chain rule of differentiation.
2. Define a linear programming problem with an example.
3. A demand function is given by p = axb (a,b > 0). Obtain the marginal revenue function. Comment on the likely shape of the marginal revenue function.

**PART-B**

**Answer any TWO of the following 5\*2 = 10**

1. A competitive firm sells its output (q) at a fixed price of Rs. 4 per unit. The cost function of the firm is given as: C = 0.04q3 – 0.9q2 + 10q + 5. Find the profit maximizing output level of the firm and determine the corresponding total profit, total revenue and total variable cost. Do you think the firm will continue production?
2. The demand function is given by, P = 460 – 3Q. Find the consumer’s surplus when 92 units of the commodity (Q) are sold.
3. Obtain the price elasticity of demand for the demand function q = 15p – 0.75. Show that this demand function has a constant elasticity throughout its entire range.

**PART-C**

**Answer any TWO of the following 15\*2 = 30**

1. a. Use Cramer’s rule to solve the following equation systems:

8x1 – x2 = 31

x2 + 5x3 = 1

2x1 + 3x3 = 4

b. Determine the optimum strategies for the two players X and Y and find the value of the game from the following payoff matrix:

 Player Y

Player X $\begin{matrix}3&-1&4&2\\-1&-3&-7&0\\4&-6&2&-9\end{matrix}$

1. **+ 5) = 15**
2. a. Consider a multiple-plant monopolist produces two products x1 and x2, whose revenue function is given by: R = 50x1 + 500x2 – x12 – x22 - x1x2 and the two cost functions are C1 = 3x12 + 33 and C2 = 4x22 + 44. Find the maximum profit and the quantities that the firm can make.

b. Explain the use of Input-Output model in Economics.

1. **+ 5) = 15**
2. a. What would be the demand for x and y if the utility function is given as U = x2y2 and the budget line is given as 96 = 4x + 8y?

b. Given Q = AKαL1-α , verify Euler’s theorem.

 **(10 + 5) = 15**