Registration Number:

Date & Session:

ST. JOSEPH'S UNIVERSITY, BENGALURU -27
B.A. – III SEMESTER
SEMESTER EXAMINATION: OCTOBER 2023
(Examination conducted in November /December 2023)
ECA 3222: MATHEMATICAL METHODS FOR ECONOMICS

(FOR CURRENT BATCH STUDENTS ONLY)

Time: 2 Hours **Max Marks: 60**

This paper contains 2 printed pages and 3 parts

Instructions:

- ***Use Graphs only if required or instructed***
- ***Scientific or regular calculators can be used for any Mathematical operations*.**

Part A

I. ***Answer any 10 questions of the following*** **[10 x 3 =30]**

1. Given the demand and supply functions **D =10 - 5P and S = - 20 + 10P** find the equilibrium values
2. Find the Elasticity of Supply, when supply function is given as **$X = 2P^2 + 5$** at **P=1.**
3. The TC, total cost function for producing a commodity 'X' quantity is **$TC = 60 - 12X + 12X^2$,** find the AC function, and the least AC value, also find the level of output at which function is minimum.
4. Find the MU, marginal Utility of Y (only Y) at X = 2 and Y = 3 for the total Utility Function **$U = 2X^3Y + 3XY^2 + 3X + 3Y$**
5. Find out $\frac{dQ}{dL}$ and $\frac{dQ}{dK}$ for the production function **$Q = 24KL - 10L^2 - 8K^2$**
6. If MR is Rs.50 and elasticity of demand is 5, find the AR of the commodity
7. Find MR ,if P is Rs. 6 and Elasticity 2
8. Find μ If AR, the Price of the commodity is Rs. 20 and MR is Rs 10.

9. **If $U = x^3 + y^3 + z^3 - 3xyz$, prove that $x.\frac{dU}{dx} + y.\frac{dU}{dY} + z.\frac{dU}{dZ} = 3U$**

10. If the Marginal Revenue function **MR = 100 - 4Q**, find the total revenue function.

11. Compute TC, the Total Cost for the MC, the Marginal cost **$C = 2 + 6X - 4X^2$**, if Total Fixed Cost = 50

12. Find **P_1 and P_2**, the values of price by solving the following equations using the Cramer's Rule

    $2P_1 + 3P_2 = 13$

    $2P_1 + 7P_2 = 23$

PART -B

II. ***Answer any 3 questions of the following*** **[3 x 5 =15]**

13. Compute the Marginal Output of X and Y for the total Output function $\mathbf{U} = \frac{X^3+Y^3}{X^2-Y^2}$

14. Compute the marginal productivities of Labour and Capital at L= 2 and K = 3 for the production function **$U = 2L^2K + 3LK^3 + 6L + 9K$**

15. Find the AC, the average Cost and MC, the Marginal cost for the total cost function **$C = 8Q^3 + 3Q^2 - 6Q + 3$**

16. Compute TC, The total Cost, AC - the Average Cost, AVC - the average variable cost for the MC, the marginal cost function C **$= 4 + 7X - 5X^2$**, if the total Fixed cost = **40**

17. For the Demand function **P = 30 – 2Q** and the Supply function is **P = 3Q.** Find the Consumers Surplus.

PART - C

III. ***Answer any 1 question of the following*** **[1 x 15 =15]**

18. Given the following Revenue (R) and Cost (C) functions for a firm in the perfect competition Market $\mathbf{R = 20Q - Q^2}$ and $\mathbf{C = Q^2 + 8Q + 2}$, find the level of output (q), price, total revenue, total cost and profit (π)
19. Consider a Monopolist who faces a Linear Demand function **P = 100-2Q** and a Linear Total cost function **C = 50 + 2Q**. Determine the optimum level of Output, Price, Total Revenue, total cost, and profit, π.

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