

ST. JOSEPH’S UNIVERSITY, BENGALURU -27

BSc. ECONOMICS – I SEMESTER

SEMESTER EXAMINATION: OCTOBER 2023

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

ECS 1221: Mathematics for Economics

(For current batch students only)

**(calculators/scientific calculators are allowed)**

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

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

**PART-A**

**Answer any TEN of the following 3\*10 = 30**

1. What is Young’s theorem? Explain using an example.
2. Test the convexity of the function y = 3x2.
3. Obtain dy/dx using Chain rule of differentiation: y = (5x3 + 2)7.
4. What do you mean by linear dependence of vectors? Give examples.
5. The consumption function is given by C = 2490 + 0.9Yd, where Yd represents disposable income defined as income minus tax (Y – T). If the tax function is given by T = 400 + 0.2Y, then find the marginal propensity to consume.
6. Find the inverse of B = 4 1 -1

0 3 2

3 0 7

1. Check the homogeneity of the function: f(x, y, w) = x4 – 5yw3.
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. Test whether the matrix is non-singular:

A = 4 0 1

19 1 3

5 4 7

1. Given Z = 4x3 – 6x2y + 12y3, find fxx, fxy, fyx.
2. Find the equilibrium solution for the following model:

Qd = Qs

Qd = 3 – P2

Qs = 6P - 4.

1. Differentiate between dependent and independent variables with examples.

**PART-B**

**Answer any THREE of the following 5\*3 = 15**

1. The cost equation of the firm is C = 5x1 + 10x2, while the production function is given by q = x1x2. Find the minimum cost of producing 50 units of output.
2. The demand function for a commodity is given by:

X1 = 300 – 0.5p12 + 0.02p2 + 0.05y. Find the income elasticity of demand when p1 = 10, p2 = 15 and y = 300. Comment on the nature of the commodity.

1. What do you mean by the order and degree of a differential equation? Explain with an example.
2. Given the utility function, U(x,y) = (x + 1)a (y + 1)b, find the MRS.
3. The marginal revenue function of a competitive firm is given by MR = 15 – 3x2. What would be the demand curve of the firm in the market?

**PART-C**

**Answer any ONE of the following 15\*1 = 15**

1. The equilibrium condition for three related markets is given by:

11p1 – p2 – p3 = 31

-p1 + 6p2 - 2p3 = 26

-p1 – 2p2 + 7p3 = 24

Using Cramer’s rule, find the equilibrium price for each market.

1. 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.