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ST. JOSEPH’S COLLEGE (AUTONOMOUS), BENGALURU-27

MA Economics - I SEMESTER

SEMESTER EXAMINATION: OCTOBER 2021

(Examination conducted in March 2022)

**EC 7421: Mathematical Methods for Economists**

**Time: 2.5 Hours Maximum Marks-70**

**This question paper has 2 printed pages and 3 parts**

**Part A: Answer any 5 of the following questions 2X5 = 10**

1. Given 2\*2 matrix, A = , B = , and C = calculate,
2. B + 2A,
3. C – B
4. Integrate the following:
5. Given z = x2 + y2 + 2x2y + 2y2x + 2xy, find the second order partial derivatives and also check the Young’s theorem.
6. Find the relative extrema of the function: y = 3x – 12x2.
7. What is linear programming?
8. Define Nash equilibrium.
9. Given y = (2x3 + 3x2)3, find dy/dx using Chain rule of differentiation.

**Part B. Answer any three of the following: 10 X 3 = 30**

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

2x1 + 4x2 =2

4x1 +6x2 +3x3 =1

-6x1 -10x2 = -6

1. a) Given the demand function, P = 1 – q, find the value of elasticity when q = ¼. (5)

b) Write the Cobb-Dauglas production function and check the homogeneity of it. (5)

1. Show that both Walrasian and Marshallian static stability condition holds if the demand and supply functions are given as D (p) = 100 - 4p and supply function S (p) = 40 + 2p.

1. A monopolist produces his product using the cost function C = X2 + 10X. He sells his output in two markets and the demand functions in these markets are: X1 = 32 – 0.4p1, X2 = 18 – 0.1p2.
2. The monopolist is able to price-discriminate between the two markets. Determine his price-quantity combination in each market. What is the total profit?

b. Determine the price, output and profit if price discrimination is prohibited and the monopolist charges the same price in both markets.

1. A sitar manufacturer can sell x sitars per week at p rupees each, where, 5x = 375 – 3p. The cost of production is {500 + 13x + 1/5 x2} rupees. Find how many sitars he should manufacture for maximum profit and what is the profit?

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**Part C. Answer any two of the following: 15 X 2 = 30**

1. Suppose the inter-industry flows of the products of two industries are given as follows:

X Y Final Demand Total output

X 20 40 60 120

Y 15 15 30 60

1. Find the technology matrix and test Hawkins-Simon conditions for the viability of the system and find the value of gross output for X and Y. **(8)**
2. If the final demand changes to 80 and 40 units respectively, what should be the gross output of X and Y in order to meet the new demands? **(7)**
3. a) Find the optimum commodity purchased by a consumer (x & y) whose utility function and budget constraint are the following:

U = 4xy – 2x and 46 = 2x + 4y respectively. (**7)**

b) Find out the saddle point of the following game involving strategies A1 and A2 for player A and B1, B2, B3 and B4 by player B and having the following pay off matrix for player A

(8)

1. Assume that in a duopoly market, the demand and cost functions of the duopolists (Firm A and B) are:

P = 100 – 0.5(X1 + X2)

C1 = 5X1

C2 = 0.5X22

1. If firm A is acting as a leader and firm B as a follower, what would be profit maximising quantities for both the firms and also what is the amount of profit for both the firms in this situation? **5**
2. If firm B is now acting as a leader and firm A as a follower, what would be profit maximising quantities for both the firms and also what is the amount of profit for both the firms in this situation? **5**
3. Compare the profit maximising quantities and also the amount of profit in the previous two scenarios, (a) and (b). 5