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ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
M.A. ECONOMICS- I SEMESTER
SEMESTER EXAMINATION: JANUARY 2021
EC 7418: MATHEMATICAL METHODS FOR ECONOMISTS

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

This question paper has 2 printed pages and 3 parts

Section I: Answer any 5 of the following questions **2X5 = 10**

1. Given 2*2 matrix, $A = \begin{Bmatrix} 2 & 4 \\ 3 & 1 \end{Bmatrix}$, $B = \begin{Bmatrix} 1 & 3 \\ 4 & 2 \end{Bmatrix}$
   a. $A + 4B$,
   b. $B - A$
2. Given 2*2 matrix, $A = \begin{Bmatrix} 0 & 4 \\ -1 & 3 \end{Bmatrix}$, $B = \begin{Bmatrix} 3 & -8 \\ 0 & 1 \end{Bmatrix}$
   Find A′ and B′.
3. Obtain dy/dx for $x^y = y^x$.
4. Evaluate the indefinite integral of $\int (x^2 + 2x + 1)dx$.
5. Calculate elasticity of substitution for the production function $X = 15L^{4/5}K^{1/5}$.
6. Define dominant strategy.
7. Define Nash equilibrium.

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

8. Consider the following Keynesian model with money:
   $C = 0.8Y$; $I = 102 - 0.2r$, $Md = 0.25Y - 2.5r$, $Ms = 100$,
   The equilibrium conditions are:
   $Y = C + I$, $Md = Ms$,
   where, Y (national income), C (consumption expenditure), I (investment), Md (money demand), Ms (money supply), and r (rate of interest).

   a) Write down the equations for the IS and LM curves. (5)
   b) Evaluate the equilibrium values of Y and r using Cramer's rule. (5)

9. Given $Q = AK^{\alpha}L^{1-\alpha}$, verify Euler's theorem and calculate elasticity of substitution.

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

11. A monopolist produces his product using the cost function $C = X^2 + 10X$. He sells his output in two markets and the demand functions in these markets are: $X_1 = 32 - 0.4p_1$, $X_2 = 18 - 0.1p_2$.
    a. The monopolist is able to price-discriminate between the two markets. Determine his price-quantity combination in each market. What is his total profit? **(5)**
    b. Determine the price, output and profit if price discrimination is prohibited and the monopolist charges the same price in both markets. **(5)**

12. a. The demand equation of a commodity is given as $x_1 = 300 - p_1^2/2 + p_2/50 + y/20$, where p_1 is the price of x, p_2 is the price of a related commodity and y is the income of the consumer. Find the price and income elasticity of demand for x_1 when $p_1 = 10$, $p_2 = 15$ and $y = 300$. **(5)**
    b. The demand function of a commodity is given as $p = 8 - x^3$. Find the consumer's surplus, if the commodity in question is free good. **(5)**

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

13. a) Find the demand vector D consistent with the output vector and the coefficient matrix as given by:

$$X = \begin{Bmatrix} 25 \\ 21 \\ 18 \end{Bmatrix} \text{ and the coefficient matrix, } A = \begin{Bmatrix} 0.2 & 0.3 & 0.2 \\ 0.4 & 0.1 & 0.2 \\ 0.1 & 0.3 & 0.2 \end{Bmatrix}$$

Also test whether the Hawkins-Simon conditions for the viability of the system are satisfied. **(10)**

b) Suppose, the cost function of a firm is $C = x^2 - xy + y^2$. The firm is bound to produce 10 units. Find the minimum cost the firm has to incur to keep the output contract? **(5)**

14. a) What would be the demand for x and y if the utility function is given as $U = x^2 y^2$ and the budget line is given as $96 = 4x + 8y$. **(10)**

b) Solve the game whose payoff matrix is given by:

		Player B			
		B1	*B2*	*B3*	*B4*
Player A	*A1*	3	−1	4	2
	A2	−1	−3	−7	0
	A3	4	−6	2	−9

(5)

15. a) What do you mean by Linear Programming Problem (LPP)? What are the methods used to solve the LPP? **(5)**
    b) Assume that the market demand is $P = 100 - 0.5X$ and the two colluding firms have costs given by $C_1 = 5X_1$ and $C_2 = 0.5X_2^2$. Find the cartel quantities and profit. **(10)**