



Register Number:

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ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
M.A. ECONOMICS- I SEMESTER
SEMESTER EXAMINATION: OCTOBER 2018
EC 7418: MATHEMATICAL METHODS FOR ECONOMISTS

Time: 2.5 Hours

Maximum Marks-70

This paper has TWO printed pages and THREE parts

Part A: Answer any FIVE of the following:

2X5 = 10

1. Given $A = \begin{pmatrix} 7 & -1 \\ 6 & 9 \end{pmatrix}$, $B = \begin{pmatrix} 0 & 4 \\ 3 & -2 \end{pmatrix}$ and $C = \begin{pmatrix} 8 & 3 \\ 6 & 1 \end{pmatrix}$

Find out

- $4B + 2C$,
- $C - A$

2. Test whether the following matrices are non-singular:

$$A = \begin{pmatrix} 4 & 0 & 1 \\ 19 & 1 & -3 \\ 7 & 1 & 0 \end{pmatrix}, B = \begin{pmatrix} -4 & 9 & 5 \\ 3 & 0 & 1 \\ 10 & 8 & 6 \end{pmatrix}$$

What can you conclude about the rank of each matrix?

- Given $Z = e^{2x+2y}$, show that $f_{xy} - f_{yx} = 0$.
- Evaluate the indefinite integral of $\int (x^2 + 2x + 1) dx$.
- Find the elasticity of substitution for the production function, $q = 10 - 1/K - 1/L$.
- Define dominant strategy.
- 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).

- Write down the equations for the IS and LM curves.
 - Evaluate the equilibrium values of Y and r using Cramer's rule.
9. a) A consumer has the utility function $U = x^\alpha y^\beta$, such that $0 < \alpha < 1$ and $0 < \beta < 1$. Show that (i) there is diminishing marginal utility to increased consumption of either commodity, (ii) the indifference curves are downward sloping.

- b) 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 $y = 300$.
10. Given $Q = AK^\alpha L^{1-\alpha}$, verify Euler's theorem and calculate elasticity of substitution.
11. a) 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.
 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 constant?
12. Suppose A and B both harvest fish on a big lake. They can either co-operate with each other by limiting their fishing fleet to one ship per day, or they can act non-co-operatively by sending out three ships per day. If they co-operate and send out only one ship they can each earn net profits of \$ 300. But if A sends out three ships while B only sends out one, A can increase his net profit to \$ 400 by capturing a disproportionate share of the rents. B would only earn net profit of \$ 100. B has the same incentive: if A co-operates and B does not, B can earn net profits of \$ 400 while A only earns \$ 100. If both fall for the incentive to act non-cooperatively by sending out three ships, they overfish big lake and their net profit fall to \$ 150 each. Find out the equilibrium combination.

Part C. Answer any TWO of the following:

15 X 2 = 30

13. a) If the production function is of the form $q = 8x_1^{1/2} + 20x_2^{1/2}$ and if $r_1 = 1$, $r_2 = 5$, derive the equation of the expansion path.
 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.
14. Let the technological coefficient matrix (A) and the final demand vector (D) are given by:

$$\text{The coefficient matrix, } A = \begin{pmatrix} 1/8 & 1/3 & 1/4 \\ 1/2 & 1/6 & 1/4 \\ 1/4 & 1/6 & 1/4 \end{pmatrix} \text{ and the final demand vector, } D = \begin{pmatrix} 10 \\ 28 \\ 14 \end{pmatrix}$$

Find the total output of the three sectors. What will be the total output if the final demand for sector 1 has increased by 1?

15. a) A carpenter produces two products: chairs and tables. Processing of these products is done on two machines A and B. A chair requires 2 hours on machine A and 6 hours on machine B. A table requires 5 hours on machine A and no time on machine B. There are 20 hours of time per day available on machine A and 30 hours on machine B. Profit gained by the carpenter from a chair and a table is Re. 1 and Rs. 5 respectively. Using Simplex method, find, what should be the daily production of each of the two products?
 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