63/2 (SEM-1) ECO 1˙3

2021

(held in 2022)

ECONOMICS

(Theory Paper)

Paper Code : ECO-1˙3

(Mathematical Economics – I)

Full Marks – 80

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following questions :   2×4=8

   (a) Explain the term optimization.

   (b) State the conditions of minima in case of single explanatory variable.

   (c) What is adjoint of a matrix ?

   (d) What is Hawkins-Simons condition ?

2. Answer the following questions : 5×4=20

(a) What do you mean by razor's edge ?

(b) Suppose that when an industrial machine is t years old, it generates revenue at the rate of $R'(t) = 6025 - 8t^2$ rupees per year and results in costs the accumulate at the rate of $C'(t) = 4681 + 13t^2$ rupees per year. For how many years is the use of machine profitable ? What are the net earnings generated by the machine during its period of profitability ?

(c) Find the inverse of $A = \begin{matrix} 7 & 7 \\ 3 & -1 \end{matrix}$

(d) What is the economic essence of a duality problem ?

3. Answer any *two* of the following questions : 10×2=20

(a) Define produce's surplus. Assuming perfect competition, find producer's surplus

$Pd = 3x^2 - 20x + 5$

$Ps = 15 + 9x$

(b) Analyze the effect of lump-sum Tax and Ad Valorem on Profit and output of a monopolist firm.

(c) Explain the procedure to find pivot element for a maximisation LP problem ?

(d) Formulate a transportation problem using Linear programming.

4. Answer the following questions : 16×2=32

(a) Explain the equilibrium condition of profit maximization of a firm. A monopolist has the following function : ·

$TR = 30q - q^2$ and $TC = q^3 - 15q^2 + 10q + 100.$

Find profit maximizing output, maximum profit and point elasticity of demand.

Or

(b) Find the final output goals of each industry to satisfy the specified bill of final consumption. Given the technological coefficient matrix, find also the total labor requirement. ... 12+4=16

	X	Y	Z	Bill of final consumption
X	0.3	0.2	0.2	80
Y	0.2	0.1	0.5	30
Z	0.2	0.4	0.2	50
Labour	0.4	0.3	0.1	

(c) Derive consumer surplus mathematically. The demand function of a monopolist is x = 210 − 3p and his average cost function is AC = x + 6 + 10/x, where p and x refer to the price and quantity of the commodity respectively. Determine consumer surplus at the price and quantity which the monopoly would like to fix.

Or

(d) Given that, Food A costs Rs. 2/kg and Food B costs Rs. 3/kg. A kg of A yields 2 units of vitamins, 10 units of starch, 6 units of protein. A kg of food B yields 6 units of vitamins, 2 units of starch and 4 units of protein. The minimum requirement of each ingredient is 178, 200 and 240 respectively. What combination of A and B will give an adequate diet with least cost ? Solve via duality of the above linear programming problem.

4+12=16