SIXTH SEMESTER BA DEGREE EXAMINATION, APRIL 2024

(Regular/Improvement/Supplementary)

ECONOMICS

GECO6B12T: MATHEMATICAL ECONOMICS

Time: 2 ½ Hours **Maximum Marks: 80**

SECTION A: Answer the following questions. Each carries *two* marks.

(Ceiling 25 Marks)

1. Total cost is given by $C=4000 +1000\ Q - 500\ Q^2 + \frac{2}{3}Q^3$. Find Marginal and Average Cost function. Also find the expression for the slope of the marginal cost curve.
2. What is consumption function? Explain how MPC is defined in a consumption function?
3. State the necessary and sufficient conditions for $y = f(x)$ to have a maximum, a minimum and a non-stationary point of inflection.
4. Suppose $Z = f(x, y) = \frac{x}{y} + \frac{y}{x}$. Find the degree of homogeneity of the function.
5. If AR equals 30, and price elasticity is 4, Find MR. Also prove that when elasticity equals 1, MR=0.
6. What is meant by constraint optimization?
7. Find elasticity of demand (e_d) of the function $X = 25 - 4P + P^2$ at Price P=8.
8. Explain the concept of Marginal Rate of Substitution.
9. Examine the nature of Cross elasticity of demand for substitutes.
10. Write a note on 'Dual' of a Linear Programming Problem.
11. Assume that the production function is given by $= 10L^{\frac{4}{9}}K^{\frac{5}{9}}$. Find the elasticity of substitution.
12. What is meant by feasible region?
13. What are Hawkin-Simon Conditions?
14. The monopolist's demand curve is given by $P = 100 - 2Q$. What is the relationship between the slopes of the AR and MR curves? At what price Marginal Revenue is Zero?
15. Explain second degree price discrimination.

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 35 Marks)

16. What is mathematical economics? Explain the main steps involved in mathematical representation of economic model.
17. How a cost function is defined? Mathematically prove the relation between Average and Marginal Costs.
18. Find equilibrium x and y if the objective function is

$$f(x,y) = 20xy(x^2 + y^2)$$

subject to the constraint

$$g(x,y);\ 2x + 5y = 400$$

(PTO)

19. Write a note on production possibility curve.

20. In an economy, of two industries X_1 and X_2, the input-output transactions and final demand are given as

		Input requirements		Final Demand
		X_1	X_2	
Industries	X_1	18	8	10
	X_2	9	24	15

Construct the technological coefficient matrix showing direct requirements. Does a solution exist for this system?

21. What is Cobb-Doulas production function? Explain and prove its important properties.

22. A perfectly competitive firm has the following revenue and cost function. Find profit maximizing output and equilibrium price. $R = 50 - 30Q - Q^2$ and $C = Q^3 - 15Q^2 + 10Q + 100$.

23. Explain the relationship between AR, MR and Price elasticity under monopoly market structure. Prove that for a straight line AR curve, the rate of fall of Marginal revenue curve is twice the slope of AR.

SECTION C: Answer any *two* questions. Each carries *ten* marks.

24. 'Optimum input combination of the producer is the point where slope of isoquant equals the slope of iso-cost line' Mathematically explain the concept producer's equilibrium where cost is minimised.

25. Give an outline of Leontief's analysis of inter-industry relations. Distinguish between closed and open input-output model.

26. A firm produces two products X_1 and X_2. Per-unit profit, the producer can earn from his products X_1 and X_2 are Rs. 40 and Rs.50 respectively. The production requirement of the products X_1 and X_2 are given below.

	X1	X2
Raw Material 1:	2	0.5
Raw Material 2:	4	2
Labour Hours:	3	1
Capital Hours:	1	4

Total available inputs with the firm are 60 units of raw material 1, 200 units of raw material 2, 300 units of labour hours and 80 units of capital hours.

Write out the complete linear programming formulation of the problem in terms of profit maximisation and find out the optimum feasible solution.

27. The demand curve faced by a monopolist in two separate markets Market 1 and Market 2 are $P_1 = 16 - 2X_1$ $P_2 = 29 - X_2^2$ respectively. The cost function of the monopolist firm is $C = 8X_1 + 2X_2 + 9$. Determine the quantities and prices that maximize the profit of the monopolist and also find the maximum profit.

(2 x 10 = 20 Marks)