

1129  
M.E. (Mechanical Engineering)  
Third Semester  
Elective – III  
MME-302(e): Optimization Techniques

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, selecting atleast two questions from each Part.

x-x-x

PART-A

1. A farmer has 1000 acres of land on which he can grow Corn, Wheat and Soyabeans. Each acre of corn costs Rs. 100 for preparation, requires 7 man-days of work and yields profit of Rs. 30. An acre of wheat costs Rs. 120 to prepare, requires 10 man-days of work and yields a profit of Rs. 40. An acre of soyabeans costs Rs 70 to prepare, requires 8 man-days of work and yields a profit of Rs 20. If the farmer has Rs 1,00,000 for preparation and can count on 8,000 man-days work, Formulate the L.P problem to allocate the number of acres to each crop to maximize the total profit and solve. (10)

2. Use the Big M- method to

$$\text{Maximize } Z = 6X_1 - 3X_2 + 2X_3,$$

$$\text{Subject to } 2X_1 + X_2 + X_3 \leq 16,$$

$$3X_1 + 2X_2 + X_3 \leq 18,$$

$$X_2 - 2X_3 \geq 8,$$

$$X_1, X_2, X_3 \geq 0$$

(10)

3. Solve the non linear programming problem: ..

$$\text{Maximize } Z = 2X_1 - X_1^2 + X_2,$$

$$\text{Subject to } 2X_1 + 3X_2 \leq 6,$$

$$2X_1 + X_2 \leq 4,$$

$$X_1, X_2 \geq 0$$

(10)

4. (a) Describe the significance of formulating Hessian matrix in NLPP.\*

(5)

(2)

(b) Give the Kuhn-Tucker conditions for both maximization & minimization non-Linear programming problem with one inequality constraint. (5)

**PART-B**

5. Solve the following mixed integer problem by the branch and bound technique:

$$\begin{aligned} \text{Minimize} \quad & Z = 10X_1 + 9X_2, \\ \text{Subject to} \quad & X_1 \leq 8, \\ & X_2 \leq 10, \\ & 5X_1 + 3X_2 \geq 45, \\ & X_1, X_2 \geq 0, X_2 \text{ integer} \end{aligned} \quad (10)$$

6. A sales girl is scheduled to visit six different cities P, Q, R, S, T and U. The distance matrix in kilometers for all cities is given below:

		To					
		P	Q	R	S	T	U
From	P	-	139	112	110	132	112
	Q	139	-	122	105	109	110
	R	112	122	-	117	126	108
	S	110	105	117	-	134	111
	T	132	109	126	134	-	118
	U	112	110	108	111	118	-

She plans to start her journey from City P and to return back to this city after visiting all the cities without visiting any city more than once. Find the sequence of the cities for her visit programme for minimum total distance travelled. What is total distance travelled. (10)

7. (a) How Heuristic models are better as compared to traditional optimization techniques to solve real world problems. (5)

(3)

(b) What are differences between Population based optimization techniques and point to point optimization techniques. (5)

8. Write Short note on: (3)

(a) Different genetic operators (4)

(b) Cutting plane algorithm (3)

(c) Fitness function

x-x-x