

1128
M. E. (Mechanical Engineering)
Third Semester
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 company has three operational departments (weaving, processing and packing) with capacity to produce three different types of cloths namely, suitings, shirtings and woollens yielding the profit of Rs. 2, Rs. 4 and Rs. 3 per meter respectively. One metre suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minute in packing. One meter of shirting requires 4 minutes in weaving, 1 minute in processing and 3 minutes in packing, while one meter woollen requires 3 minutes in each department. In a week, total run time of each department is 60, 40 and 80 hours of weaving, processing and packing departments respectively. Formulate the L.P problem to find the product mix to maximize the profit and solve. (10)

2. Use the Big M- method to

$$\text{Maximize } Z = X_1 + 2X_2 + 3X_3 - X_4$$

$$\text{Subject to } X_1 + 2X_2 + 3X_3 = 15,$$

$$2X_1 + X_2 + 5X_3 = 20,$$

$$X_1 + 2X_2 + X_3 + X_4 = 10,$$

$$X_1, X_2, X_3, X_4 \geq 0 \quad (10)$$

3. Solve the non linear programming problem using Kuhn-Tucker conditions:

$$\text{Maximize } Z = 7X_1^2 + 6X_1 + 5X_2^2$$

$$\text{Subject to } X_1 + 2X_2 \leq 10,$$

$$X_1 - 3X_2 \leq 9,$$

$$X_1, X_2 \geq 0 \quad (10)$$

4. (a) How to find that function is convex, concave or neither. Explain using suitable example.(5)

(b) Explain the Penalty function approach used for the transformation of constrained optimization problem into unconstrained ones. (5)

PART-B

5. Solve the following integer problem by cutting plane algorithm:

Maximize $Z = 7X_1 + 10X_2$

Subject to $-X_1 + 3X_2 \leq 6,$

$7X_1 + X_2 \leq 35,$

$X_1, X_2 \geq 0$ and integer

(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. What are differences between population based optimization techniques and point - to - point based techniques. Explain their advantages and limitations. (10)

8. Write Short note on:

- (a) Heuristic models (3)
- (b) Genetic algorithm (3)
- (c) Branching & Bounding in Integer Programming (4)

x-x-x