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B.Tech. VI Semester (Main & Back) Examination, May -June 2015

Electronics & Communication

6EC6.3 Optimization Techniques

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **Five questions**, selecting **one question from each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessery. any data you feel missing suitably be assumed and stated clearly.) Units of quantities used/ calculated must be stated clearly.*

UNIT - I

1. a) Briefly decribe the methodology of optimization techniques. **(8)**

   b) Discuss the significance and scope of Optimization Techniques in decision making with special reference to Engineering Applications. **(8)**

(OR)

1. a) Discuss various classification schemes of optimization problems **(8)**

   b) Production of a certain chemical mixture should contain 80mg. Chlorides, 28mg. nitrates and 36mg of sulphate per kilogram. The company can use two substances and a base (assume this is costless) Substance X contain 8mg. chlorides, 4mg. nitrates and 6mg. sulphates per gram. Substance Y contains 10mg. chlorides, 2mg, nitrates and 2 mg. sulphates per gram. Both substances cost Rs. 20 per gram It is require to produce the mixture using substances X and Y so that cost is minimized. Formulate the problem as mathematical programming problem. **(8)**

UNIT - II

2. a) Use simplex methods to solve the following LPP:

$$\text{Maximize} \quad Z = 4x_1 + 10x_2$$
$$\text{S.t} \quad 2x_1 + x_2 \le 50$$
$$2x_1 + 5x_2 \le 100$$
$$2x_1 + 3x_2 \le 90$$
$$x_1 \ge 0, x_2 \ge 0$$

(8)

b) Solve the following problem by Revised simplex method.

$$Min\ Z = 2x_1 + x_2$$
$$S.t\quad 3x_1 + x_2 \le 3$$
$$4x_1 + 3x_2 \ge 6$$
$$x_1 + 2x_2 \le 3$$
$$x_1, x_2 \ge 0$$

(8)

(OR)

2. a) State and prove basic duality theorem. **(8)**

b) Consider the LPP :

$$Max\ Z = -x_1 + 2x_2 - x_3$$
$$S.t\quad 3x_1 + x_2 - x_3 \le 10$$
$$-x_1 + 4x_2 + x_3 \ge 6$$
$$x_2 + x_3 \le 4$$
$$x_1, x_2, x_3 \ge 0$$

Determine the ranges for discrete change in the components b_2 and b_3 of the requirement vector so as to maintain the feasibility of the current optimum solution **(8)**

UNIT - III

3. a) Prove that in an assignment problem if we add (Or subtract) a constant to every element of a row (Or Column) of the cost matrix $[C_{ij}]$, then an assignment plan that minimizes the total cost for the new cost matrix also minimizes the total cost for the original cost matrix. **(8)**

b) A departmental head has four subordinates, and four tasks to be performed. The subordinates differ in efficiency and the task differ in their intrinsic difficulty this estimate, of the time each man would take to perform each task is given in the matrix below.

		Man		
Task	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

How should the tasks be allocated. One to a man, so as to minimize the total man hours. **(8)**

(OR)

3. Determine the optimum basic feasible solution to the following transportation problem :

		To A	To B	To C	Available
From	I	50	30	220	1
	II	90	45	170	3
	III	250	200	50	4
Required		4	2	2	

(16)

UNIT - IV

4. a) Use Dischotomous search method to find the maximum of

$f(x) = x(5-x)$ in [0,8], take $\delta = 0.001$ **(8)**

b) Solve the non linear programming problem :

Minimize $Z = 2x_1^2 - 24x_1 + 2x_2^2 - 8x_2 + 2x_3^2 - 12x_3 + 200$

Subject to constraints $x_1 + x_2 + x_3 = 11$, $x_1, x_2, x_3 \geq 0$ **(8)**

(OR)

4. Use the Kuhn-Tucker conditions to solve the following NLPP:

Minimize $Z = 2x_1 + 3x_2 - x_1^2 - 2x_2^2$

Subject to Constraints $x_1 + 3x_2 \leq 6$

$5x_1 + 2x_2 \leq 10$

$x_1, x_2 \geq 0$ **(16)**

UNIT - V

5. Use Dynamic programming to solve the following problem : **(16)**

Minimize $Z = y_1^2 + y_2^2 + y_3^2$ subject to

Constraints $y_1 + y_2 + y_3 \geq 15$ *and* $y_1, y_2, y_3 \geq 0$

(OR)

5. Use Dynamic Programming to solve the following LPP **(16)**

$$\begin{aligned} &Maximize\ Z = 3x_1 + 5x_2 \\ &Subject\ to\ constraints\ x_1 \leq 4 \\ &\qquad x_2 \leq 6 \\ &\qquad 3x_1 + 2x_2 \leq 18 \\ &\qquad x_1, x_2 \geq 0 \end{aligned}$$