28

Exam.Code:1017
Sub. Code: 7781

1128

M. E. Electrical Engineering (Power Systems)
First Semester
EE-8103: Optimization Techniques

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt any five questions.

x-x-x

1. (a) Consider the following problem: (5)

$$\min \quad W = -2x - 4y - 3z$$

subject to $x + 4y + 3z \leq 240,\ 2x + y + 5z \leq 300,\ x, y, z \geq 0$
The optimal solution of this problem is given below where u and v correspond to the slack variables:

c_B	y_B	x_B	x	y	z	u	v
−4	y	180/7	0	1	1/7	2/7	−1/7
−2	x	960/7	1	0	17/7	−1/7	4/7
		$W = 2640/7$	0	0	17/7	6/7	4/7

Discuss the effect on the optimality of the solution, when a new variable is added with corresponding data as: activity vector=$(2, 2)^T$ and cost value $c = -3$.

(b) Using bounded variable technique, solve the following LPP: (5)

$$\max \quad -3x + 4y$$

subject to $x - 2y \leq 10,\quad 2x + 5y \leq 15,\quad 0 \leq x \leq 4,\quad 0 \leq y \leq 3,$

2. Find the optimal solution of following bounded variable transportation problem to minimize the transportation cost: (10)

				availability
	4	9	2	30
Cost	3	12	5	25
	11	6	2	25
Requirement	35	23	22	

such that $x_{ij} \geq 0$ and the upper bounds are given in the following matrix:

$$[u_{ij}] = \begin{bmatrix} 10 & 15 & 20 \\ 15 & 10 & 25 \\ 22 & 20 & 24 \end{bmatrix}$$

3. Use wolfe's method to solve the quadratic programming: (10)

$$\min \quad Z = -10x - 25y + 10x^2 + y^2 + 4xy$$

subject to $x + 2y \leq 10,\ x + y \leq 9,\ x, y \geq 0.$

4. (a) Check whether following functions are convex, concave, or neither convex nor concave:
(i) $f(x, y) = xy + x + y,\ (x, y) \in R^2$
(ii) $f(x, y, z) = -x^2 + 2xy + 3xz + 6yz,\ (x, y, z) \in R^3$ (2.5 + 2.5)

(b) Let $S \subseteq R^n$ be a convex set and $f : S \to R$. Then show that f is a convex function on S if and only if its epigraph is a convex set. (5)

P.T.O

5. (a) Let $\bar{x}$ be a local minimum point of the problem min $f(x)$ subject to $g_i(x) \leq 0,\ i = 1, 2, ..., 3$. Then $d^T \nabla f(\bar{x}) \geq 0$ for all $d \in D(\bar{x})$. (5)

   (b) Consider the LPP max $Z = 4x + 3y$ subject to $x + y \leq 8,\ 2x + y \leq 10,\ x, y \geq 0$. Use KKT theorem to shpw that $x = 2,\ y = 2$ can not be an optimal solution of the given problem. (5)

6. Using Lagrange multiplier method minimize the function $f(x, y, z) = 2x^2 + y^2 + 2z^2$ subject to the constraints (10)

$$x + 2y + 3z = 6, \quad x + 3y + 9z = 9$$

7. Using Newton's method find the minimum value of the function $f(x, y, z) = 2x^2 + 3y^2 + 2z^2 + 2xy$ starting with $(x = -2, y = -3, z = 1)$. (10)

8. (a) Solve the following linear fractional programming problem by the Charnes and Cooper algorithm: (5)

$$\max \quad Z = \frac{2x_1}{x_1 + x_2 + 1}$$

subject to

$$x_1 + x_2 \leq 1, \quad x_1 + 2x_2 \leq 1, \quad x_1, x_2 \geq 0$$

   (b) Let f be a positive quasiconvex function defined over a convex set $S \subseteq R^n$. Show that $g(x) = 1/f(x)$ is quasiconex function on S. (5)

x-x-x