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M.TECH
PEPE103

1st Semester Regular/Back Examination – 2014
OPTIMIZATION TECHNIQUE
BRANCH(S): POWER ELECTRONICS,POWER ELECTRONICS & DRIVES
Time: 3 Hours
Max Marks: 70
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

a) Define basic solution and non-degenerate basic feasible solution.

b) Find the dual of the following LPP

Minimize $Z = 3x_1 + 4x_2$

Subject to

$x_1 + x_2 \geq 4$

$2x_1 - 3x_2 = 6$

and $x_1, x_2 \geq 0$

c) Write the advantages of revised simplex method over simplex method.

d) What is sensitivity analysis?

e) State Bellman's principle of optimality. What is the necessity of it?

f) Explain the concept of integer programming.

g) Write the algorithm for Sequential Quadratic Programming method.

h) What is simulated annealing?

i) Write short notes on genetic algorithm.

j) What is finite element and where it can be used?

Q2 a) Solve the following LPP by using Big-M method: (10)

Maximize $Z = 3x_1 - x_2$

Subject to $2x_1 + x_2 \leq 2$

$x_1 + 3x_2 \geq 3$

$x_2 \leq 4$

$x_1, x_2 \geq 0$

Q3 Use dual simplex method to solve the following LPP (10)

Minimize $Z = 3x_1 + 2x_2$

Subject to $3x_1 + x_2 \geq 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + x_2 \leq 3$

$x_1, x_2 \geq 0$

Q4 Solve the following LPP by using revised simplex method: (10)

Maximize $Z = 6x_1 - 2x_2 + 3x_3$

Subject to $2x_1 - x_2 + 2x_3 \le 2$

$x_1 + 4x_2 \le 4$

$x_1, x_2, x_3 \ge 0$

Q5 a) Consider $f = x_1^2 + 3x_2^2$, $x_1 = (1,2)^T$ (5)

Perform two iterations of the Fletcher-Reeves algorithm.

b) Given that $f(x) = x_1 - x_2 + x_1 x_2 + 3x_1^2 + x_2^2$ and $x_0 = (2,3)^T$ (5)

Determine the Newton's direction to minimize f at x_0.

Q6 Perform two iterations by using Karmaker's algorithm to (10)

Minimize $Z = 2x_1 + 2x_2 - 3x_3$

Subject to $-x_1 - 2x_2 + 3x_3 = 0$

$x_1 + x_2 + x_3 = 1$

$x_1, x_2, x_3 \ge 0$

Q7 Consider the function $f = U_3$ where U is determined from $K(x)U = F$ as (10)

$$\begin{pmatrix} 5x_1 & -5x_1 & 0 \\ -5x_1 & 5x_1 + 10x_2 & -5x_3 \\ 0 & -5x_3 & 5x_3 \end{pmatrix} \begin{pmatrix} U_1 \\ U_2 \\ U_3 \end{pmatrix} = \begin{pmatrix} 20 \\ 0 \\ 15 \end{pmatrix}$$

Given $x = [1.0 \quad 1.0 \quad 1.0]^T$

Determine the gradient $\frac{\partial f}{\partial x}$ using (i) the direct method

(ii) the adjoint method

Q8 Write the Box's complex method for constraints optimization problem. (10)