5E5046

B.Tech. V Semester (Main) Exam., Dec-2014

Electrical Enginnering

5EE6.1 Optimization Techniques

Time: 3 Hrs. **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 necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.)*

Unit-I

Q.1 (a) Discuss classficaton of optimization problem based on the nature of the functions involved. **[8]**

(b) A firm produces three types of dolls A, B and C for which he requires three red green and blue colored clothes. The kind of wool used in each species and his stock position is given in the following table:

	Types A	Types B	Types C	Stock in Hand
Red	2	3	0	80
Green	0	2	5	100
Blue	3	2	4	150

It he makes a profit of Rs. 30, 50 and 40 on the types. A, B and C repectiviely, formulate it as a L.P. problem and solve it graphically. **[8]**

OR

Q.2 (a) Write ten applications of optimization techniques in electrical engineering. **[8]**

(b) The following table shows all the necessary information on the available supply to each factory, the requirement of each warehouse and the unit transportation cost in rupees from each factory, the requirement of each wareshouse and the unit transportation cost in ruppes from each factor to each warehouse. **[8]**

To	W_1	W_2	W_3	W_4	Supply
From F_1	X_{11} 21	X_{12} 16	X_{13} 23	X_{14} 13	11
F_2	X_{21} 17	X_{22} 18	X_{23} 14	X_{24} 23	13
F_3	X_{21} 32	X_{32} 27	X_{33} 18	X_{34} 41	19
Demand	6	10	12	15	43

Formulate the problem as L.P. problem

Unit-II

Q.2 (a) Find the extreme point and extreme value of the function:

$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$ [8]

(b) Prove that a rectangular solid of maximum volume within a sphere is a cube. [8]

OR

Q.2 (a) Find the minimum value $x^2 + y^2 + t^2$ when $ax + by + cz = p$

(b) Assuming that the petrol burnt (per hour) in driving a motor boat varies as the cube of its velocity, show that the most economical speed when going against a current of c km km/hr is $\frac{3}{2}$ c km/hr.

Unit-III

Q.3 Solve the following L.P.P by using Big-Mmethod. [16]

Max. $Z = x_1 + 2x_2 + 3x_3 + x_4$

S.t. $x_1 + 2x_2 + 3x_3 = 15$

$2x_1 + x_2 + 5x_3 = 20$

$x_1 + 2x_2 + x_3 + x_3 = 10$

and $x_1, x_2, x_3, x_4 \leq 0$

OR

(a) Solve the following L.P.P by simplex method. [10]

Max. $Z = 4x_1 + 5x_2$

s.t $x_1 + x_2 \leq 3$

$3x_1 + 4x_2 \leq 10$

$x_1, x_2 \leq 0$ [6]

(b) Write the dual of the following L.P.P

Max. $Z = 3x_2 - 2x_3$

s.t. $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 - 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 = 10$

$x_1, x_2 \leq 0$, x_3 – unrestricted.

Unit-IV

Q.4 (a) Use the golden section search method to find the maximum of $f(x) = x\ (5-x)$, $x \in (0,8)$ (take 1 = (0.618). **[8]**

(b) Minimize $f(x) = 2x_1^2 + 2x_1x_2 + x_2^2 + x_1 - x_2$ starting from $x_1 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$, using the method of steepest descent. **[8]**

OR

Q.4 (a) Minimize $z =$ starting from $f(x) = x_1^2 + x_2^2 - 3x_2 + 3$. **[8]**

Subject to $g(x) = x_1 + 2x_2 - 4 \leq 0$, starting from $X_0 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$.

(b) Use fibonaci search metho to find Max. $f(x) = x(5-x)$, given that $f(x)$ is uni modal and when the optimal value lies in [0,8], taking $n = 7$. **[8]**

Unit-V

Q.5 (a) Minimize: $f(x_1, x_2) = \frac{1}{3}(x_1+1)^3 + x_2$ **[8]**

Subject to: $g_1(x_1, x_2) = 1 - x_1 \leq 0$

$g_2(x_1, x_2) = -x_1 \leq 0$

(use exterior penalty function method).

(b) The pareel post regulations restrict parcels in the form of a rectangular box to be such that the length plus the firth [2 (width + hwight)] must not exceed 24 units and the length must not exceed 14 units. Find the parcel of greatest volume that can be send by post. **[8]**

OR

Minimize: $Z = (x_1 - 1)^2 + \left(x_2 - \frac{3}{2}\right)^2 - \frac{1}{4}$ **[16]**