5E5046

Roll No. _

Total No of Pages: 4

5E5046

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016

Electrical Engineering

5EE6.1A Optimization Techniques

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks Main: 26

Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT – I

Q.1 (a) What is optimization? Give five applications of optimization in engineering. [8]

(b) Old hens can be bought for ₹ 20 each but young ones ₹ 30 each. The old hens lay 10 eggs per week and young one 15 eggs per week, each being worth ₹ 4. A hen costs ₹ 10 per weak to feed. If a person has only ₹ 800 to spend for hens, and he cannot house more than 20 hens, formulate the mathematical model for the given problem to obtain maximum profit. [8]

OR

Q.1 (a) Write a short note on the following: [8]

(i) Objective function

(ii) Linear programming problem

(iii) Geometric programming problem

(iv) Stochastic programming problem.

(b) The data for two foods x_1 and x_2 are given below: [8]

	Per Unit		Minimum requirement
	x_1	x_2	
Price	60 paisa	21 paisa	
Calories	1000	2000	3000
Proteins	25 gms	100 gms.	100 gms.

Formulate the LPP for minimizing expenditure on food.

UNIT – II

Q.2 (a) A rectangular box of height a width b is placed adjacent to a wall. Find the length of the shortest ladder that can be made to lean against the wall. [8]

(b) Using Lagrange's multiplier method, solve the following problem: [8]

Minimize $f(x, y) = \dfrac{K}{x y^2}$

s. t. $g(x, y) = x^2 + y^2 - a^2 = 0$

OR

Q.2 (a) Minimize $f(x) = x^2 + 2y^2$ [8]

s. t. $2x + 5y - 10 \leq 0$

by using exterior penalty method and find solutions for $r = 1, 10$ and $r \to \infty$.

(b) Find the maxima and minima of: [8]

$f(x, y) = x^3 + y^3 + 9x^2 + 18y^2 + 144.$

UNIT – III

Q.3 (a) Solve the following problem graphically: [8]

Minimize $z = 2x - 10y$

s. t. $x - y \geq 0$

$x - 5y \leq -5$

and $x, y \geq 0.$

(b) Solve the LPP by simplex method: [8]

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

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

$-2x_1 + 4x_2 + 0x_3 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

and $x_1, x_2, x_3 \geq 0.$

OR

Q.3 (a) Find the dual of the following LPP: [8]

Minimize $z = x_1 + x_2 + x_3$

s. t. $x_1 - 3x_2 + 4x_3 = 5$

$2x_1 - 2x_2 \leq -3$

$2x_2 - x_3 \geq 5$

and $x_1, x_2, \geq 0$, x_3 is unrestricted in sign.

(b) solve the following LPP by simplex method: [8]

Minimize $z = x_1 + x_2$

s.t. $2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

and $x_1, x_2, \geq 0.$

UNIT – IV

Q.4 (a) Minimize $f(x) = 0.65 - \dfrac{0.75}{1+x^2} - 0.65\, x \tan^{-1}\left(\dfrac{1}{x}\right)$ in the interval [0, 3] by Fibonacci method using n = 6. [8]

(b) Use Golden Section method to find maximum of $f(x) = x(5 - x)$ given that $f(x)$ is an unimodal function in [0, 8] in which the optimum lies. [8]

OR

Q.4 Solve the following problem using Kuhn – tucker conditions. [16]

Minimize $f(x) = x_1^2 + x_2^2 + x_3^2$

s. t. $g_1(x) = 2x_1 + x_2 - 5 \le 0$

$g_2(x) = x_1 + x_3 - 2 \le 0$

$g_3(x) = 1 - x_1 \le 0$

$g_4(x) = 2 - x_2 \le 0$

$g_5(x) = - x_3 \le 0$

UNIT – V

Q.5 Minimize $f(x) = (x_1 - 1)^2 + (x_2 - 1.5)^2 - 0.25$ [16]

s. t. $x_1 + x_2 \le 4$

$1 \le x_2 \le 3$

$0 \le x_1 \le 2$

by complex method, with $x_1 = \begin{bmatrix} 0.7 \\ 1.1 \end{bmatrix}$

OR

Q.5 Minimize $f(x) = \frac{1}{3}(x_1 + 1)^3 + x_2$ [16]

Subject to $g_1(x) = 1 - x_1 \le 0$

$g_2(x) = - x_2 \le 0$