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4E4134

Roll No. _____

Total No of Pages: **4**

4E4134

B.Tech. IV-Sem (Main & Back) Exam; June-July 2016

Electronics & Communication

4EC5A Optimization Techniques

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks (Main & Back): 26

Min. Passing Marks (Old 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) Define the following: [8]

- (i) Design vector,
- (ii) Objective function,
- (iii) Design constraints
- (iv) Constraint surface

(b) Define optimization problem. Explain it with physical example. [8]

OR

Q.1 Write a short note on the classification of optimization problems based on various parameters. [16]

UNIT-II

- Q.2 (a) Using Simplex method, show that the following linear programming problem has an unbounded solution: [10]

$$\text{Minimize } f = -3x_1 - 2x_2$$

$$\text{Subject to } x_1 - x_2 \leq 1$$

$$3x_1 - 2x_2 \leq 6$$

$$\text{and } x_1, x_2 \geq 0$$

- (b) Write the dual of the following linear programming problem: [6]

$$\text{Minimize } Z = x_1 + x_2 + x_3$$

$$\text{Subject to } x_1 - 3x_2 + 4x_3 = 5$$

$$2x_1 - 2x_2 \leq -3$$

$$2x_2 - x_3 \geq 5$$

$$\text{and } x_1, x_2 \geq 0, x_3 \text{ is unrestricted in sign}$$

OR

- Q.2 (a) Use Revised Simplex Method to solve the following linear programming problem: [8]

$$\text{Minimize } Z = x_1 + 2x_2$$

$$\text{Subject to } 2x_1 + 5x_2 \geq 6$$

$$x_1 + x_2 \geq 2$$

$$\text{and } x_1, x_2 \geq 0$$

- (b) Find the optimal solution of the following linear programming problem: [8]

$$\text{Max } Z = 15x_1 + 45x_2$$

$$\text{Subject to } x_1 + 16x_2 \leq 240$$

$$5x_1 + 2x_2 \leq 162$$

$$x_2 \leq 50$$

$$\text{and } x_1, x_2 \geq 0$$

Further, if $\text{Max } Z = \sum C_j x_j$, $j = 1, 2$ and C_2 is kept fixed at 45, determine how much C_1 can be changed without affecting the above solution?

UNIT-III

- Q.3 A company has factories at A, B and C which supply warehouses at D, E, F and G. Unit shipping costs (in ₹) are given in the following table. Determine the optimum distribution for this company to minimize shipping costs by Vogel's Approximation Method. [16]

From	← To →				Capacity
↓	D	E	F	G	
A	42	48	38	37	160
B	40	49	52	51	150
C	39	38	40	43	190
Demand	80	90	110	160	500 440

OR

- Q.3 Four different jobs can be done on four different machines. The setup and take down time cost are assumed to be prohibitively high for change overs. The matrix below gives the costs in rupees of producing job i on machine j: [16]

Jobs	Machine			
	M ₁	M ₂	M ₃	M ₄
J ₁	5	7	11	6
J ₂	8	5	9	6
J ₃	4	7	10	7
J ₄	10	4	8	3

How should the jobs be assigned to various machines, so that the total cost is minimized?

UNIT-IV

- Q.4 (a) Prove that $L_k = (0.618)^{k-1} L_0$, where k is the number of experiments performed and L_k is the length of the interval of uncertainty remaining at the end of k^{th} experiment performed in Golden Section Method. [8]
- (b) Define the unimodal function and give an example of it. Also draw the Flowchart for Fibonacci search method. [8]

OR

- Q.4 (a) Minimize $f(x_1, x_2) = 2x_1^2 + x_2^2$ by steepest descent Method with the initial point $(1, 2)^T$. (up to three iterations). [8]
- (b) Minimize $f(x, y) = x^2 + 2y^2$. Subject to $2x + 5y - 10 \leq 0$, by using Exterior Penalty Method. [8]

UNIT-V

- Q.5 Divide a quantity b into n parts so as to maximize their product. Let, $f_n(b)$ denote this product, then show that

$$f_1(b) = b \text{ and } f_n(b) = \max_{0 \leq z \leq b} [z f_{n-1}(b-z)].$$

Hence find the $f_n(b)$ and the division that maximize it and z is one part of b . [16]

OR

- Q.5 Solve the following linear programming problem by Dynamic programming Approach: [16]

$$\text{Max } Z = 2x_1 + 5x_2$$

$$\text{Subject to } 2x_1 + x_2 \leq 43$$

$$2x_2 \leq 46$$

$$\text{and } x_1, x_2 \geq 0$$