6E3093

B. Tech. VI Semester (Main/Back) Exam. May/June, 2013

ELECTRONICS & COMMUNICATION ENGINEERING # 4EC6.3

OPTIMIZATION TECHNIQUES

Time : 3 Hours **Min. Passing Marks : 24** **Maximum Marks : 80**

Instruction 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

1. (*a*) Discuss the various phases in solving an operation research problem. [8]

(*b*) A toy company manufactures two types of doll, a basic version-doll A and a deluxe version doll B. Each doll of type B takes twice time as long to produce as one of the type A, and the company would have time to make a maximum of 2000 per day. The supply of plastic is sufficient to produce 1500 dolls per day (both A and B combined). The deluxe version requires a fancy dress of which there are only 600 per day available. If the company makes a profit of Rs. 3 and Rs. 5 per doll, respectively on doll A and B, then how many of each doll should be produced per day in order to maximize the total profit. Formulate this problem. [8]

OR

1. (a) What is optimization technique? Write engineering application of optimization. [8]

(b) Consider the following problem faced by a production planner of a soft drink plant. He has two bottling machines A and B. A is designed for 8-ounce bottles and B for 16-ounce bottles. However each can also be used for both types of bottles with some loss of efficiency. The following data is available.

Machine	8-ounce Bottles	16-ounce Bottles
A	100/minutes	40/minutes
B	60/minutes	75/minutes

The machines can be run for 8 hours per day, 5 days per week. The profit on an 8-ounce bottle is 15 paise and on a 16-ounce bottle is 25 paise. Weekly production of the drink cannot exceed 3,00,000 bottles and the market can absorb 25,000 eight ounce bottles and 7,000 sixteen ounce bottles per week. The planner wishes to maximize his profit, of course, to all the production and marketing restriction. Formulate this as liner programming problem. [8]

UNIT-II

2. (a) Consider the L.P.P.

Maximize $z = 2x_1 + x_2 + 4x_3 - x_4$

s.t. $x_1 + 2x_2 + x_3 - 3x_4 \le 8$, $-x_2 + x_3 + 2x_4 \le 0$,

$2x_1 + 7x_2 - 5x_3 - 10x_4 \le 21$ and $x_1, x_2, x_3, x_4 \ge 0$

The optimum solution to this problem is contained in the following simplex table:

C_B	y_B	X_B	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7
2	y_1	8	1	0	3	1	1	2	0
1	y_2	0	0	1	−1	−2	0	−1	0
0	y_3	5	0	0	−4	2	−2	3	1
		$Z_j - C_j$	0	0	1	1	2	3	0

If b_2 becomes 11, then make the necessary corrections in the optimum table and solve the resulting problem. [8]

(b) Using the dual, solve the following L.P.P.

Maximize $z = 3x_1 - 2x_2$

s.t., $x_1 \le 4, x_2 \le 6, x_1 + x_2 \le 5, -x_2 \le -1$

and $x_1, x_2 \ge 0$ [8]

OR

2. (a) Solve the following LP problem using simple method

Maximize $z = 16x_1 + 17x_2 + 10x_3$

s.t. $x_1 + x_2 + 4x_3 \le 2000$

$2x_1 + x_2 + x_3 \le 3600$

$x_1 + 2x_2 + 2x_3 \le 2400$

$x_1 \le 30$ and $x_1, x_2, x_3 \ge 0$ [8]

(b) Solve the following LPP using revised simplex method

Maximize $z = x_1 + x_2 + x_3$

s.t. $x_1 - x_4 - 2x_6 = 5$

$x_2 + 2x_4 - 3x_5 + x_6 = 3$

$x_3 + 2x_4 - 5x_5 + 6x_6 = 5$

and $x_j \ge 0, j = 1, 2, ..., 6$ [8]

UNIT-III

3. (a) A Salesman has to visit five cities, C_i, i = 1, 2,..., 5. He should start from C_1, his headquarter, visit each city once and only once, and return to C_1. The cost of going from C_i to C_j is given in the following table (blank indicates that the journey is not possible). Find how he should travel to minimize the cost. [8]

Cities	C_1	C_2	C_3	C_4	C_5
C_1	-	20	4	15	-
C_2	6	-	5	-	10
C_3	7	4	-	6	8
C_4	11	5	8	-	12
C_5	-	13	9	6	-

(b) Solve the following transportation problem. [8]

		To			Supply
		1	2	3	
From	1	2	7	4	5
	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
Demand		7	9	18	34

OR

3. (a) A department of a company has five employees with five jobs to be performed. The time (in hours) that each man takes to perform each job is given in the effectiveness matrix.

Jobs \ Employees	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man hours? [8]

(b) In the modification of a plant layout of a factory four new machines M_1, M_2, M_3, M_4 are to be installed in a machine shop. There are five vacant places A, B, C, D and E available. Because of limited space, machine M_2 cannot be placed at C and M_3 cannot be placed at A. The cost of locating a machine at a place (in hundred rupees) is as follows

Machine \ Location	A	B	C	D	E
M_1	9	11	15	10	11
M_2	12	9	-	10	9
M_3	-	11	14	11	7
M_4	14	8	12	7	8

Find the optimal assignment schedule. [8]

UNIT-IV

4. (a) Perform two iteration of method of steepest decent to find the point of minima of the function

$$f(x) = x_1^2 + 3x_2^2 - 2x_1x_2 - 4x_2 + 5.$$

Take starting point X_1 as (4.2, – 2.0), ϵ = 0.01 and M = 100. [8]

(b) Use four iterations of Fibonacci search method to find the point of minima of the function $f(x) = x^2 + 2.6x + 2$, in the interval $-2 < x < 3$. [8]

OR

4. Solve the following problem up to three iterations using Zoutendijk's method.

Maximize

$$z = 2x_1^2 + 2x_2^2 - 2x_1x_2 - 4x_1 - 6x_2$$

s.t. $x_1 - 5x_2 \le 5$

$2x_1^2 - x_2 \le$

$-x_1 \le 0$

$-x_2 \le 0$ [16]

UNIT-V

5. Solve the following LP problem using dynamic programming approach [16]

Maximize $z = 10x_1 + 8x_2$

s.t. $2x_1 + x_2 \le 25$

$3x_1 + 2x_2 \le 45$

$x_2 \le 10$

and $x_1, x_2 \ge 0$

Varify your solution by solving it graphically.

OR

5. Determine

Maximize $z = x_1^2 + x_2^2 + x_3^2$

s.t. $x_1 x_2 x_3 \le 6$

Where x_1, x_2, x_3 are positive integers. [16]