6E3093

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B. Tech. VI-Sem. (Old Back) Exam., April/May-2016

Electronics & Communication

6EC6.3 (O) Optimization Techniques

Time: 3 Hours **Maximum Marks: 80**

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 may 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) Write in brief on historical development of optimization and mention a few applications of optimization [8]

(b) A coal grassfire can use three grades of coal to produce quality K and M of producer gas. There are two processes (i.e. old and new) available to use the blended coal. For each production run the old process uses 10, 14 and 4 units of coal A, B and C to produce 12 units of K and 10 units of M. The new process uses 6, 18 and 8 units of coal A, B and C to produce 10 units of quality K and 14 units of M. Due to prior commitments, the gassifire plant must produce at least 1800 and 1600 units of K and M respectively for the next month. It has available

2000, 2500 and 1500 units of coal A, B and C respectively. For each unit of K, a revenue of `.3000 and for each unit of M, `4000 are received. Formulate this as LP problem so as to maximize the revenue. (Do not solve) [8]

OR

Q.1 (a) Write in detail on classification of optimization problems, giving examples. [8]

(b) A closed cylindrical tank is to be designed to carry at least 5 m^3 of chemicals. Metal for the top and side costs ₹ 200 per m^2 but heavier metal of the base costs ₹ 800 per m^2. Also the height of the tank cannot be more than twice its diameter. Formulate the problem as a mathematical programming problem to minimize the total cost incurred. (Do not solve it). Identify the decision variables and classify the problem formulated. [8]

UNIT-II

Q.2 (a) Solve the following LPP using simplex method. [8]

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

S.T. $x_1 + 2x_2 + 3x_3 \leq 10$

$x_1 + x_2 \leq 5$

$x_1 \leq 1, \quad x_1, x_2 \geq 0$

Find the alternate optimal solution if it exists.

(b) Solve the following LPP using revised simplex method. [8]

Max. $Z = x_1 + 2x_2$

S.T. $x_1 + x_2 \leq 3$

$x_1 + 2x_2 \leq 5$

$3x_1 + x_2 \leq 6, \quad x_1, x_2 \geq 0$

OR

Q.2 (a) Solve the dual of the following LPP by simplex method, and from the solution of dual find opt. solution of the primal. [8]

Max. $Z = 4x_1 + 3x_2$

S.T. $x_1 \leq 6, \quad x_2 \leq 8,$

$x_1 + x_2 \leq 7, \quad 3x_1 + x_2 \leq 15,$

$x_2 \geq -1, \quad x_1, \ x_2 \geq 0.$

(b) Solve the following LPP using Big-M method. [8]

Minimize $Z = -x_1 + x_2 + x_3$

S.T. $-2x_1 + x_2 + x_3 \geq 2$

$x_1 - 2x_2 + 2x_3 = 2$

$x_1, x_2, x_3 \geq 0$

Using sensitivity analysis, find how much C_2 (The coefficient of x_2 in objective function) can vary for the solution to remain optimal.

UNIT-III

Q.3 (a) Four villages D_1, D_2, D_3, D_4 are affected due to floods and food grain is to be dropped by three air craft's S_1, S_2, S_3, in these villages.

ai = number of trips Si can make in one day

bj = number of trips required to Dj in one day, and

the amount of food grain that Si can carry to Dj in one trip are given in adjoining table.

Solve the TP problem to find the number of trips that Si can make to Dj so that the total quantity of food grain dropped in a day is maximum (use VAM) [8]

	D_1	D_2	D_3	D_4	ai
S_1	10	8	6	3	60
S_2	8	10	5	3	40
S_3	2	5	9	10	50
bj	30	50	60	40	

(b) Find the minimum cost of transportation for adjoining TP where the transportation cost per unit, requirement (bj) at destination Dj and availability (ai) at source Si are given. Interpret the result obtained. [8]

	D_1	D_2	D_3	D_4	ai
S_1	1	2	1	4	30
S_2	3	3	2	1	50
S_3	4	2	5	9	20
bj	20	40	30	10	100

OR

Q.3 (a) A company has four territories 1, 2, 3 and 4 to be assigned to four salesman A, B, C and D to promote their product. Based upon their capability the company estimates the profit earned in thousands per day on assigning a territory to each salesman is given in adjoining matrix. Find the assignment using Hungarian method to have maximum profit. [8]

	1	2	3	4
A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	12	14	15

(b) Using Hungarian method, solve the adjoining problem of assigning tasks A, B, C, D to persons 1, 2, 3, 4 to minimize the total man hours taken to finish the

UNIT-IV

Q.4 Minimize $f(x_1, x_2) = 2x_1^2 + 2x_1x_2 + x_2^2 + x_1 - x_2$

starting from $X_0 = (0, 0)$ using,

(a) the method of steepest descent (complete only two iterations of the method). [8]

(b) the univariate method (complete only one cycle of movements parallel to axes). [8]

OR

Q.4 (a) Using Zoutenditk's method, find the minimum of [8]

$f(x) = f(x_1, x_2) = x_1^2 + x_2^2 - 2x_1 - 3x_2 + 3,$

subject to $x_1 + 2x_2 - 4 \leq 0$ with starting point $X_0 = (0, 0)$.

(b) By using exterior penalty method - [8]

Minimize $x_1^2 + x_2^2 = f(x_1, x_2)$

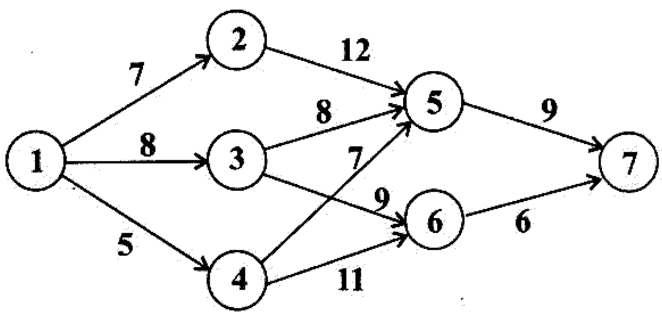
S.T. $5 - x_1 - x_2 \leq 0,$

$x_2 - x_1 \leq 0,$

and find the solutions corresponding to r = 1, 10, ∞ (r being the penalty parameter).

UNIT-V

Q.5 (a) State Belman's principle of optimality and using it solve the adjoining TSP problem to find the shortest route from city 1 to city 7. [8]



(b) Use dynamic programming to find three non-negative real numbers such that sum of squares of these is minimum with the restriction that their sum is not less than 30. [8]

OR

Q.5 (a) A vessel with capacity 4 units of weight is to be loaded with three items. Details are given in the adjoining table. Using dynamic programming, find how many units of each item should be loaded without exceeding the weight constraint 4 to have the maximum value of the loaded items. [8]

Item	wt/unit	value/unit
1	1	20
2	3	90
3	2	70

(b) Use dynamic programming to solve the following LPP [8]

Max $Z = 6x_1 + 5x_2$

S.T. $x_1 \leq 2$

$x_2 \leq 6$

$6x_1 + 2x_2 \leq 18$

$x_1, x_2 \geq 0.$
