4E4134

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B.Tech. IV Semester (Main/Back) Examination May - 2018
Electronic & Comm.
4EC5A Optimization Techniques

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

Min. Passing Marks : 26

*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. Graph Paper

Unit - I

1. a) Discuss the classification of optimization, problem's with proper example's. **(8)**

b) Solve the following LPP by graphical method

Max $Z = 8000x_1 + 7000x_2$

s.t. $3x_1 + x_2 \le 66$ **(8)**

$x_1 + x_2 \le 45$

$x_1 \le 20$

$x_2 \le 40$

$x_1, x_2 \ge 0$

OR

1. a) Formulate the following balance transportation problem as a linear programming problem. **(8)**

Warehouses →

		W_1	W_2	W_3	W_4	Availability
Factory ↓	F_1	C_{11}	C_{12}	C_{13}	C_{14}	a_1
	F_2	C_{21}	C_{22}	C_{23}	C_{24}	a_2
	F_3	C_{31}	C_{32}	C_{33}	C_{34}	a_3
Requirements		b_1	b_2	b_3	b_4	

b) Discuss the applications of optimization in the field of Engineering. **(8)**

Unit - II

2. a) Use Big - M method to solve the LPP **(12)**

Minimize $Z = 2x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 4$

$x_1, x_2 \geq 0$

b) Obtain the dual of the following LPP

Maximize $Z = x_1 + 2x_2$

Subject to, $x_1 + x_2 \leq 5$

$3x_1 + x_2 \leq 11$

$x_1 \leq 6$

$x_2 \leq 8$

$x_2 \geq 2$

and $x_1, x_2 \geq 0$ **(4)**

OR

2. a) Use Revised simplex method to solve the following LPP **(8)**

Maximize $Z = 2x_1 + 6x_2$

Subject to, $-x_1 + x_2 \leq 1$

$2x_1 + x_2 \leq 2$

$x_1, x_2 \geq 0$

b) Solve the following LPP

Maximize $Z = 3x_1 + 5x_2$

Subject to, $3x_1 + 2x_2 \leq 18$

$x_1 \leq 4$

and $x_1, x_2 \geq 0$

Discuss the effect on the optimal solution by adding new constraint $x_2 \leq 9$ **(8)**

Unit - III

3. a) Solve the assignment problem for minimization, whose effectiveness matrix is as follows : **(8)**

(Job's)

(Machines)	J_1	J_2	J_3	J_4	J_5
M_1	7	5	9	8	11
M_2	9	12	7	11	10
M_3	8	5	4	6	9
M_4	7	3	6	9	5
M_5	4	6	7	5	11

b) Solve the following transportation problem for minimizing the transportation cost.

To/From	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

(8)

OR

3. a) Discuss the following terms for the transportation problem **(8)**

i) Basic Feasible solution

ii) Non Degenerate Basic Feasible solution

iii) Optimal solution

iv) Optimility condition

b) A captain of a cricket team has to allot five middle order batting position to five batsmen. The average runs scored by each batsmen at these positions given in the table

(Batting Position)

Batsman	III	IV	V	VI	VII
A	40	40	35	25	50
B	42	30	16	25	27
C	50	48	40	60	50
D	20	19	20	18	25
E	58	60	59	55	53

Make the assignment so that the expected total average run's scored by these batsman are maximized.

Unit - IV

4. a) Minimize $Z = x_1^2 + 2x_1x_2 + x_2^2 + x_1 - x_2$ by Hooks & Jeenes method, starting from

$x_1 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ Take $\Delta x_1 = \Delta x_2 = 0.8$ **(8)**

b) Minimize $Z = \frac{1}{3}(x_1 + 1)^3 + x_2$

Subject to $-x_1 + 1 \le 0$
$-x_2 \le 0$

Using interior penalty method. **(8)**

OR

4. a) 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 steepest discent method. **(8)**

b) Solve the following problem by variable transformation techniques.

Maximize $Z = x_1x_2x_3$

Subject to , $x_1 + x_2 + x_3 \le 60$
$x_1 \le 36$

and $x_1, x_2, x_3 \ge 0$ **(8)**

Unit - V

5. a) State the Bellman's Principle of optimality and discuss the applications of Dynamic programming. **(8)**

b) Use dynamic programming to solve **(8)**

Minimize $Z = y_1^2 + y_2^2 + y_3^2$

Subject to, $y_1y_2y_3 = 27$
$y_1, y_2, y_3 \ge 0$

OR

5. a) Use dynamic programming to solve the LPP

Maximize $Z = 3x_1 + 4x_2$

Subject to , $2x_1 + x_2 \le 40$
$2x_1 + 5x_2 \le 180$
$x_1, x_2 \ge 0$ **(8)**

b) Use dynamic programming to show that

$Z = p_1 \log p_1 + p_2 \log p_2 + p_3 \log p_3$

Subject to, $p_1 + p_2 + p_3 = 1$ is minimum when $p_1 = p_2 = p_3 = \frac{1}{3}$ **(8)**