4E4134

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B. Tech. IV Sem. (Back) Exam., May - 2019
Electronics & Comm.
4EC5A Optimization Techniques

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

 Min. Passing Marks: 26

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) Write 12 application of optimization technique in engineering. [10]

(b) A firm manufacturing two types of electric items A and B, can make a profit of ₹ 20 per unit of A and ₹ 30 per unit of B. Each unit of A requires 3 motors and 2 transformers and each unit of B requires 2 motors and 4 transformers. The total supply of these per month is restricted to 210 motors and 300 transformers. Type B is an export model requiring a voltage stabilizer which has a supply restricted to 65 units per month. Formulate the LPP for maximum profit. [6]

OR

Q.1 (a) Discuss the importance of operation research in decision making process. [10]

(b) Solve the following problem graphically: [6]

min $z = 2x_1 - 10x_2$

s.t $x_1 - x_2 \geq 0$

$x_1 - 5x_2 \leq -5$

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

UNIT- II

Q.2 (a) Solve the following LPP: [8]

max $z = 2x_1+x_2$

s.t $3x_1+5x_2 \leq 15$, $6x_1+2x_2 \leq 24$

and $x_1, x_2 \geq 0$

(b) Use duality to solve the following LPP: [8]

min $z = 2x_1+9x_2+x_3$

s.t $x_1+4x_2+2x_3 \geq 5$

$3x_1+x_2+2x_3 \geq 4$

and $x_1, x_2, x_3 \geq 0$

OR

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

max $z = x_1+2x_2$

s.t $x_1+x_2 \leq 3$, $x_1+2x_2 \leq 5$

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

(b) Solve the following LPP by big - M method: [8]

min $z = x_1+x_2$

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

$x_1+ 7x_2 \geq 7$, and $x_1, x_2 \geq 0$

UNIT- III

Q.3 (a) There are five jobs to be assigned, one each to five machines and the associated cost matrix is as follows, solve the following assignment problem: [8]

Jobs	Machines I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

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

	D_1	D_2	D_3	D_4	
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	2	5	9	20
	20	40	30	10	100

OR

Q.3 (a) Given below the unit cost array with supplies a_i, $i = 1,2,3$ and demands b_j, $j = 1, 2, 3, 4$. Find the optimal solution of the following transportation problem: http://rtuonline.com [8]

Sources	Sinks				Supply(a_i)
	1	2	3	4	
1	8	10	7	6	50
2	12	9	4	7	40
3	9	11	10	8	30
Demand (b_j)	25	32	40	23	120

(b) Five jobs are to be assigned to 4-machines, subject to the cost matrix as shown below. Make a min. cost. assignment: [8]

Jobs	Machines			
	A	B	C	D
I	9	7	6	2
II	6	6	7	6
III	5	3	4	4
IV	4	2	5	9
V	2	8	3	9

UNIT- IV

Q.4 (a) Find the minimum of the function $F(x) = (x_1-1)^3 + (x_2-5)^2$ [8]

Subject to $-x_1+1 \leq 0$

$-x_2+5 \leq 0$ by interior penalty function method.

(b) Minimize $f(x) = 2x_1^2+2x_1x_2+x_2^2+x_1-x_2$ by taking steepest descent method starting from $x_1 = \begin{pmatrix}0\\0\end{pmatrix}$. [8]

OR

Q.4 (a) Minimize $f(x,y) = 8x^2+y^2+4xy+2x-y$ by Hook and Treves method, starting from the point (0,0) and taking $\Delta x = \Delta y = 0.8$. [8]

(b) Solve by univariate search method: [8]

minimum $f = 2x_1^2-2x_1x_2+5x_2^2-6x_1+6x_2+5$

UNIT- V

Q.5 (a) Discuss the application of dynamic programming. [8]

(b) Use dynamic programming to solve the L.P.P [8]

max $z = x_1+9x2$, s.t : $2x_1+x_2 \leq 25$, $x_2 \leq 11$: $x_1x_2 \geq 0$

OR

Q.5 (a) Use Bellman's principal of optimality to minimize $z = y_1+y_2+\ldots\ldots\ldots+y_n$, subject to the constraints: [8]

$y_1y_2\ldots\ldots\ldots\ldots y_n = d$, $y_j \geq 0$ for $j = 1,2,\ldots\ldots n$.

(b) Solve the following problem using dynamic programming: [8]

min. $z = y_1^2+y_2^2+\ldots\ldots\ldots+y_n^2$

Subject to the constraints $y_1y_2y_3\ldots\ldots y_n = b$ and

$y_1, y_2\ldots\ldots\ldots\ldots y_n \geq 0$.
