2017

MCA

4th SEMESTER EXAMINATION

OPERATION RESEARCH

PAPER—MCA-405

Full Marks : 100

Time : 3 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer any *five* questions. 5×14

1. (a) Define : (i) Feasible Solution.
(ii) Feasible Region.
(iii) Optimal Solution.

(b) Consider a big steel roll from which steel sheets of the same lengths but different width have to be cut.

The roll is 20 inches wide and the following sizes have to be cut,

(i) 9 inches, 511 numbers.

(ii) 8 inches, 301 numbers.

(iii) 7 inches, 263 numbers.

(iv) 6 inches, 383 numbers.

Formulate the problem as a linear programming model to cut the sheets in such a way as to minimize wastage of material. 6+8

2. Solve by simplex method,

Minimize $Z = x_1 - 3x_2 + 3x_3$

Subject to $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 + 4x_2 \geq -12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0.$ 14

3. (a) Use graphical method to solve the following :

Maximize $Z = 100x_1 + 4x_2$

Subject to $5x_1 + 2x_2 \leq 10$

$3x_1 + 2x_2 \leq 9$

$x_1, x_2 \geq 0.$

(b) Construct the dual of the primal problem,

Maximize $Z = 2x_1 + x_2 + x_3$

Subject to $x_1 + x_2 + x_3 \geq 6$

$3x_1 - 2x_2 + 3x_3 = 3$

$-4x_1 + 3x_2 - 6x_3 = 1$

$x_1, x_2, x_3 \geq 0.$ 8+6

4. (a) Solve the following LPP by using big-M method :

Minimize $Z = 3x_1 + 4x_2$

Subject to $2x_1 + 3x_2 \geq 8$

$5x_1 + 2x_2 \geq 12$

$x_1, x_2 \geq 0.$

(b) During iterations of the given LPP problem, what issues gets evolved ? Explain.

Maximize $Z = 4x_1 + 3x_2$

Subject to $2x_1 + 3x_2 \leq 8$

$3x_1 + 2x_2 \leq 12$

$x_1, x_2 \geq 0.$ 9+5

5. (a) Solve the following LPP by using two-phase method,

Maximize $Z = 5x_1 + 8x_2$

Subject to $3x_1 + 2x_2 \geq 3$

$x_1 + 4x_2 \geq 4$

$x_1, x_2 \geq 0.$

(b) Find the sequence that minimizes the total required time in performing the following jobs of three machines in order ABC. Processing time (in hrs.) are given below :

Job	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

8+6

6. (a) Find the initial solutions to the following transportation problem using VAM :

		D_1	D_2	D_3	D_4	Supply
Factory	F_1	3	3	4	1	100
	F_2	4	2	4	2	125
	F_3	1	5	3	2	75
	Demand	120	80	75	25	300

(b) What happens, when you solve the following LPP problem :

Maximize $Z = 4x_1 + 3x_2$

Subject to $8x_1 + 6x_2 \leq 25$

$3x_1 + 4x_2 \leq 15$

$x_1, x_2 \geq 0.$ 10+4

7. (a) Find the optimal solution of the minimal assignment problem whose unit matrix is given below :

	1	2	3	4
J_1	5	9	3	6
J_2	8	7	8	2
J_3	6	10	12	7
J_4	3	10	8	6

(b) Consider a company making a single product. The estimated demand for the product for the next four months are 1000, 800, 1200, 900 respectively. The company has a regular time capacity of 800 per month and an overtime capacity of 200 per month. The cost of regular time is Rs. 20 per unit and the cost of over time production is Rs. 25 per unit, where as the company can carry investing to the next month

with a holding cost is Rs.3/unit/month. The demand has to be met every month. Formulate a linear programming problem for the above situation. Give atleast two formulations of the problem. 7+7

[Internal Assessment : 30 Marks]

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