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63/2 (SEM-3) MCA 3.4

2021

(held in 2022)

MCA

(Theory Paper)

Paper Code : MCA-3.4

(Computer Based Optimization Technique)

Full Marks – 75

Time – Three hours

The figures in the margin indicate full marks  
for the questions.

Answer any *five* questions : 15×5=75

1. (a) Write two definitions of Operation Research.  
Write some applications of OR. 2+5=7

(b) Solve the following LPP by graphical  
method : 8

$$\begin{aligned} &\text{Maximize } z = x_1 - 2x_2 \\ &\text{Subject to } -x_1 + x_2 \leq 1 \\ &\quad \quad \quad 6x_1 + 4x_2 \geq 24 \\ &\quad \quad \quad 0 \leq x_1 \leq 5, \quad 2 \leq x_2 \leq 4 \end{aligned}$$

[Turn over

2. (a) Explain about multiple optimal solutions, Unbounded solutions and Infeasible solution. 6

- (b) Solve the following LPP by simplex method : 9

Maximize  $z = 2x_1 + x_2$

Subject to

$$x_1 + 2x_2 \leq 10$$

$$x_1 + x_2 \leq 6$$

$$x_1 - x_2 \leq 2$$

$$x_1 - 2x_2 \leq 1$$

$$x_1, x_2 \geq 0$$

3. (a) Define slack, surplus and artificial variable. 6

- (b) Solve the following LPP by Big-M method : 9

Minimize  $z = 2x_1 + 3x_2$

Subject to

$$x_1 + x_2 \geq 5$$

$$x_1 + 2x_2 \geq 6$$

Where  $x_1, x_2 \geq 0$

4. (a) Define non-degenerate basic feasible solution for transportation problem. 3

- (b) Solve the following transportation problem where cell entries are unit costs. 12

O1 O2 O3 O4 O5 Available

A	68	35	4	74	15	18
B	57	88	91	3	8	17
C	91	60	75	45	60	19
D	52	53	24	7	82	13
E	51	18	82	13	7	13
Required	16	18	20	14	14	

5. Write the definitions of Assignment model. Solve the following Assignment problem : 3+12=15

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

6. (a) Construct the dual of the problem : 5

Maximize  $z = x_1 + x_2$

Subject to

$$x_1 + x_2 + x_3 \leq 7$$

$$x_1 \geq 5$$

$$x \leq 5$$

$$x_3 = 8$$

Where  $x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$

- (b) Solve by dual simplex method of the following LPP : 10

$$\text{Minimize } z = 2x_1 + 2x_2 + 4x_3$$

Subject to

$$2x_1 + 3x_2 + 5x_3 \geq 2$$

$$3x_1 + x_2 + 7x_3 \leq 3$$

$$x_1 + 4x_2 + 6x_3 \leq 5$$

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

7. (a) Write the importance of Integer Programming Problem (IPP). 3

- (b) Use cutting plan method to solve the following problem : 12

$$\text{Maximize } z = x_1 + x_2$$

Subject to

$$3x_1 + 2x_2 \leq 5$$

$$x_2 \leq 5$$

$$x_1, x_2 \geq 0 \text{ and are integers.}$$