Total No. of printed pages = 4

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 difinitions of Operation Research. Write some applications of OR. 2+5=7

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

   Maximize $z = x_1 - 2x_2$

   Subject to $-x_1 + x_2 \leq 1$

   $6x_1 + 4x_2 \geq 24$

   $0 \leq x_1 \leq 5, \quad 2 \leq x_2 \leq 4$

[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 | 05 | 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

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

Maximize $z = x_1 + x_2$

Subject to

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

$x_1, x_2 \geq 0$ and are integrs.