Total No. of printed pages = 6

63/2 (SEM-3) MCA 3·4

2022

(Held in 2023)

MCA

(Theory Paper)

Paper Code : MCA 3·4

(Computer Based Optimization Technique)

Full Marks – 75

Pass Marks – 30

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+6=8

   (b) Solve the following LPP by graphical method : 7

   Maximize $Z = X_1 - 2X_2$

   Subject to $-X_1 + X_2 \leq 1$

   $6X_1 + 4X_2 \geq 24$

   $0 \leq X_1 \leq 5,\ 2 \leq X_2 \leq 4$

[Turn over

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

(b) Solve the following LPP by Simplex method : 9

Maximize $Z = 2X_1 + X_2$

Subject to $X_1 + 2X_2 \leq 10$

$X_1 + X_2 \leq 6$

$X_1 - X_2 \leq 2$

$X_1 - 2X_2 \leq 1$

$X_1 \geq 0,\ X_2 \geq 0$

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 $X_1 + X_2 \geq 5$

$X_1 + 2X_2 \geq 6$

$X_1 \geq 0,\ X_2 \geq 0$

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

(b) Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees.

	A	B	C	D	E	Available
W	7	6	4	5	9	40
X	8	5	6	7	8	30
Y	6	8	9	6	5	20
Z	5	7	7	8	6	10
Required	30	30	15	20	5	100 (Total)

12

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

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

2. 6. (a) Construct the dual of the problem

$$\text{Maximize} \quad Z = X_1 + X_2$$

$$\text{Subject to} \quad X_1 + X_2 + X_3 \le 7$$
$$X_1 \ge 5$$
$$X_2 \le 5$$
$$X_3 = 8$$
$$X_1 \ge 0,\ X_2 \ge 0,\ X_3 \ge 0.$$

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

$$\text{Maximize} \quad Z = -3X_1 - 2X_2$$

$$\text{Subject to} \quad X_1 + X_2 \ge 1$$
$$X_1 + 2X_2 \le 7$$
$$X_1 + 2X_2 \ge 10$$
$$X_2 \le 3$$
$$X_1 \ge 0,\ X_2 \ge 0.$$

3

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

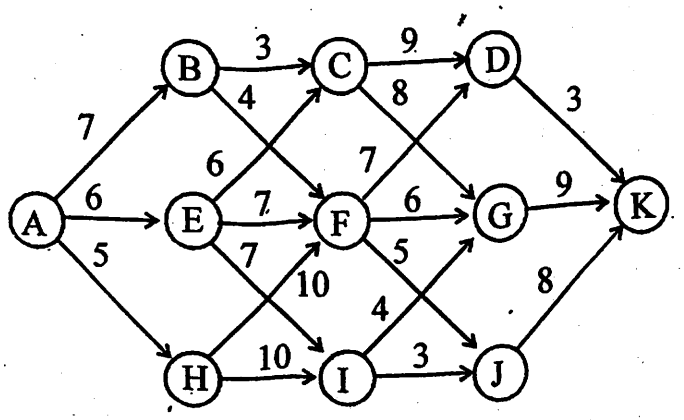
(b) Use cutting plan method to solve the following problem. 12

$$\text{Maximize} \quad Z = X_1 + X_2$$

$$\text{Subject to} \quad 3X_1 + 2X_2 \le 5$$
$$X_2 \le 5$$
$$X_1, X_2 \ge 0$$
$$X_1,\ X_2 \text{ are integers.}$$

7. (a) Explain the Bellman's Principle of Optimality. 2

(b) Find the shortest path from vertex A to B along arcs joining varivious vertices lying between A and B. Length of each path is given 13



8. A self-service store employee's one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poission distribution for arrival rate and exponential distribution for service time, find

(a) average number of customers in the system. 2.5

(b) average number of customers in the queue or average queue length. 5

(c) average time a customer's spends in the system. 2.5

(d) average time a customer waits before being served. 5