K21P 2604

Reg. No. : .....

Name : .....

**V Semester M.C.A./M.C.A. (Lateral Entry) Degree (C.B.S.S. – Reg./Suppl./Imp.) Examination, November 2021**

**(2016 Admission Onwards)**

**Elective – III : MCA 5E09 : OPERATIONS RESEARCH**

Time : 3 Hours Max. Marks : 80

***Instructions*** *: 1) Answer **any ten** questions from Part – **A**. **Each** question carries **3** marks.*

*2) Answer **all** questions from Part – **B**. **Each** question carries **10** marks.*

PART – A

Answer **any ten** questions. **Each** question carries **3** marks.

1. Distinguish between PERT and CPM.
2. What do you mean by queue discipline ? Explain various queue disciplines.
3. Explain Duality in LPP.
4. Explain any five applications of Linear Programming Problem.
5. Explain the various steps involved in solving a LPP by graphic method.
6. Briefly explain Branch and Bound technique in Integer Programming Problem.
7. What are the uses of Dynamic Programming ?
8. What are the assumptions in Sequencing Problem ?
9. Explain briefly Transportation problem.
10. What is network analysis ? When it is used ?
11. Define Unbalanced Assignment Problem. How are they solved ?
12. List the characteristics of a Markov Chain. **(10×3=30)**

P.T.O.

PART – B

Answer **all** questions. **Each** question carries **10** marks.

13. a) Solve the following by Two Phase Simplex Method :

Minimize $Z = 6x_1 + 5x_2$

Subject to $2x_1 + x_2 \geq 80$, $x_1 + 2x_2 \geq 60$ and $x_1 \geq 0$, $x_2 \geq 0$.

OR

b) Solve the following by Big – M Method :

Minimize $Z = 3x_1 + 8x_2$

Subject to $x_1 + x_2 = 200$, $x_1 \leq 80$, $x_2 \geq 60$ and $x_1 \geq 0$, $x_2 \geq 0$.

14. a) Solve the following transportation problem whose cost matrix availability at each plant and requirement at each warehouse are given as follows :

| | Warehouse | | | | |
|---|---|---|---|---|---|
| **Plant** | **$W_1$** | **$W_2$** | **$W_3$** | **$W_4$** | **Availability** |
| $P_1$ | 190 | 300 | 500 | 100 | 70 |
| $P_2$ | 700 | 300 | 400 | 600 | 90 |
| $P_3$ | 400 | 100 | 600 | 200 | 180 |
| **Requirement** | 50 | 80 | 70 | 140 | |

OR

b) Use Dual Simplex Method to solve :

Maximize $Z = 3x_1 + x_2$

Subject to $x_1 + x_2 \geq 1$, $2x_1 + 3x_2 \geq 2$ and $x_1 \geq 0$, $x_2 \geq 0$.

15 a) Solve using Branch and Bound method :

Maximize $Z = 2x_1 + 2x_2$

Subject to $5x_1 + 3x_2 \leq 8$, $x_1 + 2x_2 \leq 4$, and $x_1 \geq 0$, $x_2 \geq 0$ and integers.

OR

b) By Dynamic programming technique, solve the problem :

Minimize $Z = x_1^2 + x_2^2 + x_3^2$

Subject to $x_1 + x_2 + x_3 \geq 15$, $x_1, x_2, x_3 \geq 0$.

16. a) A small maintenance project consists of the following 10 jobs. Draw network diagram (arrow diagram).

**Calculate :**

1) $T_E$ and $T_L$ values of all events.
2) EST, LST, EFT, LFT of all activities.
3) Floats of all the activities.

Also obtain :

a) critical activities
b) project duration.

| **Activity :** | 1 – 2 | 2 – 3 | 2 – 4 | 3 – 5 | 3 – 6 | 4 – 6 | 4 – 7 | 5 – 8 | 6 – 8 | 7 – 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Duration :** | 4 | 6 | 10 | 8 | 2 | 12 | 4 | 15 | 14 | 8 |

OR

b) Solve the following sequencing problem :

| Jobs | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | 19 | 8 | 8 | 3 | 11 | 24 |
| 2 | 18 | 6 | 9 | 6 | 9 | 18 |
| 3 | 12 | 5 | 8 | 5 | 7 | 15 |
| 4 | 20 | 5 | 3 | 4 | 8 | 11 |

17. a) Customers arrive at a box office window, being manned by a single individual according to a Poisson input process with a mean rate of 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 seconds. Find the average waiting time of a customer. Also determine the average number of customers in the system and average queue length.

OR

b) Use Bellman's principle of optimality to find the optimum solution :

Maximize $Z = x_1 . x_2 . x_3$

Subject to $x_1 + x_2 + x_3 = 5$, $x_1 \geq 0$, $x_2 \geq 0$, $x_3 \geq 0$. **(5×10=50)**