(6 pages)

**DECEMBER 2022** **U/ID 32519/UEM6A**

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer any TEN questions.

1. Write any two application for the linear programming problem.

2. Find the basic solutions for the system of simultaneous equations.

   $2x + 3y + 4z = 5, 3x + 4y + 5c = 6$

3. What is transportation problem?

4. When will the assignment problem is called unbalanced?

5. How does the problem of degeneracy arises in a transportation problem?

6. Describe the processing of N jobs through two machines.

7. What are the principle assumptions made while with sequencing problems?

8. What is Two-person game?

9. What are characteristics of queuing models?

10. What is expected queue length?

11. Define a network.

12. Expand PERT.

PART B — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

13. Solve graphically Min $z = 6x_1 + 7x_2$

Subject to $3x_1 + 9x_2 \geq 36$

$6x_1 + 2x_2 \geq 24$
$2x_1 + 2x_2 \geq 16 \quad x_1, x_2 \geq 0$

14. Solve by simplex method

Min $z = x_2 - 3x_3 + 2x_5$ subject to

$x_1 + 3x_2 - x_3 + 2x_5 = 7$
$-2x_2 + 4x_3 + x_4 = 12$
$-4x_2 + 3x_2 + 8x_5 + x_6 = 10 \quad x_1, x_2 \ldots x_6 \geq 0$

15. Solve the following assignment problem.

| | $y_1$ | $y_2$ | $y_3$ | $y_4$ |
|---|---|---|---|---|
| $x_1$ | 41 | 72 | 39 | 52 |
| $x_2$ | 22 | 29 | 49 | 65 |
| $x_3$ | 27 | 39 | 60 | 51 |
| $x_4$ | 45 | 50 | 48 | 52 |

16. Find the sequence that minimized the total elapsed time required to complete the following takes on two machines.

| Task | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| $M_1$ | 2 | 5 | 4 | 9 | 6 | 3 | 7 | 5 | 4 |
| $M_2$ | 6 | 8 | 7 | 4 | 3 | 9 | 3 | 8 | 11 |

The order is $M_1 - M_2$. Find also the idle time.

17. Solve the game with pay-off matrix A as give

| A \ B | 1 | 2 |
|---|---|---|
| 1 | 2 | 5 |
| 2 | 7 | 4 |

18. Obtain the system of steady state equations.

19. Draw a network of the following project of Jobs

| Jobs : | A | B | C | D | E |
|---|---|---|---|---|---|
| Procedures by : | – | – | – | A,B | B,C |

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

20. Using Big–M method to solve the LPP

Maximize $z = x_1 + 2x_2 + 3x_3 - x_4$, subject to the constraints $x_1 + 2x_2 + 3x_3 = 50,\ 2x_1 + x_2 + 5x_3 = 20,$ $x_1 + 2x_2 + x_3 + x_4 = 10,\ x_1, x_2, x_3, x_4 \geq 0$

21. Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees.

| | $W_1$ | $W_2$ | $W_3$ | $W_4$ | $W_5$ | |
|---|---|---|---|---|---|---|
| $F_1$ | 7 | 6 | 4 | 5 | 9 | 40 |
| $F_2$ | 8 | 5 | 6 | 7 | 8 | 30 |
| $F_3$ | 6 | 8 | 9 | 6 | 5 | 20 |
| $F_4$ | 5 | 7 | 7 | 8 | 6 | 10 |
| | 30 | 30 | 15 | 20 | 5 | |

22. Solve the game

| | | Player B | | | |
|---|---|---|---|---|---|
| | | I | II | III | IV |
| Player A | I | 3 | 2 | 4 | 0 |
| | II | 3 | 4 | 2 | 4 |
| | III | 4 | 2 | 4 | 0 |
| | IV | 0 | 4 | 0 | 8 |

23. Solve the system of difference equations of M/M/S model.

24. A project has the following time schedule

| Activity | Time in weeks | Activity | Time in weeks |
|---|---|---|---|
| 1-2 | 4 | 5-7 | 8 |
| 1-3 | 1 | 6-8 | 1 |
| 2-4 | 1 | 7-8 | 2 |
| 3-4 | 1 | 8-9 | 1 |
| 3-5 | 6 | 8-10 | 8 |
| 4-9 | 5 | 9-10 | 7 |
| 5-6 | 4 | | |

Construct PERT network and compute

(a) $T_E$ and $T_C$ for each even

(b) Float for each activity

(c) Critical path and it's duration.

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