(6 pages)

MAY 2023 **U/ID 46515/UCC5C**

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer any TEN questions.

1. What is Operation Research?

2. What are slack and surplus variables?

3. Define LPP.

4. What is Dual Program?

5. What is Assignment Problem?

6. Define the term Duality.

7. What are canonical form of LPP?

8. What is two phase method?

9. What do you mean by unbalanced Transportation Problem?

10. Define Artificial Variable.

11. What is Network and CPM?

12. Define Random Numbers.

PART B — (5 × 5 = 25 marks)

Answer any FIVE questions.

13. Minimize $Z = 3x_1 + 2x_2$ solve graphically

Subject to $5x_1 + x_2 \geq 10$

$x_1 + x_2 \geq 6$
$x_1 + 4x_2 \geq 12$

$x_1, x_2 \geq 0$.

14. Use graphical method to solve the following L.P problem

Maximize $z = x_1 + x_2 + 3x_3$

Subject to $3x_1 + 2x_2 + x_3 \leq 3$

$2x_1 + x_2 + 2x_3 \leq 2$

$x_1, x_2 \geq 0$.

15. Obtain the dual of the following primal problem.

Min $z = 3x_1 - 2x_2 + x_3$

Subject to $2x_1 - 3x_2 + x_3 \leq 5$

$$4x_1 - 2x_2 \geq 9$$
$$-8x_1 + 4x_2 + 3x_3 = 8$$

$x_1, x_2 \geq 0, x_3$ is unrestricted.

16. Draw the Network for the following activities and find the critical path:

Activity	Duration (Day)
1-2	20
1-3	25
2-3	10
2-4	12
3-4	5
3-5	10

17. Pay off matrix is as follows:

Act	Pay-off in Rs.	
	Cold weather	Hot weather
Sell cold drinks	50	100
Sell hot drinks	120	40

The probability for hot weather is 0.8. Prepare opportunity loss table and select the best act.

18. The following game have saddle point solution. Determine the points and optimum strategy.

		B	
A	1	4
	–1	–4
	–3	–2

19. Given below is a pay-off table from it form a regret opportunity loss table.

	Pay-off		
States of Nature	A1	A2	A3
E1	156	153	150
E2	156	158	155
E3	156	158	160

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

20. Solve graphically

Maximize $z = x_1 + 3x_2$

Subject to $x_1 \leq 3$

$4x_1 + 3x_2 \geq 15$

$x_1, x_2 \geq 0$

21. The cost of Assigning each mass to each Job is given below. You are required to assign men to jobs such that the total cost of assignment is a minimum.

		Jobs			
		1	2	3	4
Men	A	20	25	22	28
	B	15	18	23	17
	C	19	17	21	24
	D	25	23	24	24

22. Draw the Network from the activity below and find the critical path and its duration.

Activity	Immediate predecessor	Duration
A	–	10
B	–	9
C	A	9
D	A	8
E	B	7
F	B	11
G	D, E	5

23. In a car manufacturing plant, a loading crane takes exactly 10 minutes to load a car into a wagon and again. Come back to the position of loading another car. If the arrival of cars is a Poisson stream at an average of one for every 20 minutes. Calculate the Average Waiting Time of a car.

24. Solve the following game.

		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