PART – A

Answer ALL the Questions.   **(10 x 2 = 20)**

1. Define Constraints and Decision Variables.

2. When is a solution said to be Optimum?

3. What is meant by Duality in a Linear Programming Problem?

4. Explain with example how to introduce artificial variable in the constraints.

5. What is Unbalanced Transportation Problem?

6. What are the methods used to find initial basic feasible solution in Transportation Problem?

7. What is Dummy activity in Network Analysis?

8. State the three time estimates in PERT.

9. What is pure strategy and mixed strategy?

10. Define saddle point.

PART – B

Answer Any FIVE Questions.   **(5 x 8 = 40)**

11. List the steps involved in the mathematical formulation of Linear Programming Problem.

12. Solve the Linear Programming problem by dual simplex method.
    Maximize $z = -3x_1 - x_2$
    Subject to $x_1 + x_2 \geq 1$
                      $2x_1 + 3x_2 \geq 2$
                      $x_1, x_2 \geq 0$

13. Find the initial basic feasible solution to the following transportation problem using Vogel's Approximation method.(cost matrix is given)

	W1	W2	W3	W4	Availabilities
F1	48	60	56	58	140
F2	45	55	53	60	260
F3	50	65	60	62	360
F4	52	64	55	61	220
Requirements	200	320	250	210	

14. The following table gives the characteristics of a project.

Job	A	B	C	D	E	F	G	H
Predecessors	-	-	B	A,C	A,C	D	E	F,G
Duration (days)	10	5	3	4	6	6	5	5

Draw the network diagram and find the critical path.

1

15. Solve the following game using graphical method.

$$\begin{array}{c} \\ A1 \\ A2 \end{array} \begin{bmatrix} B1 & B2 & B3 & B4 & B5 \\ 2 & -2 & 3 & 7 & 6 \\ 6 & 5 & 1 & 4 & 0 \end{bmatrix}$$

16. Solve the following LPP using graphical method.

Max $Z = 30x_1 + 20x_2$

Subject to the constraints

$2x_1 + x_2 \leq 800$

$x_1 + 2x_2 \leq 1000$

$x_1, x_2 \geq 0$

17. Five jobs 1,2,3,4 and 5 are to be assigned to five persons A, B, C, D and E. The time taken (in minutes) by each of them on each job is given below.

	1	2	3	4	5
A	16	13	17	19	20
B	14	12	13	16	17
C	14	11	12	17	18
D	5	5	8	8	11
E	5	3	8	8	10

Obtain the optimum assignment schedule.

18. A Bakery store keeps stock of a popular brand of cake. The daily demand based on the past experience is given below.

Daily Demand	0	15	25	35	45	55
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Using the following random numbers 48,78,09,51,56,77,15,14,68,09 simulate the demand for the next 10 days. Find out the stock situation if the owner of the bakery decides to make 35 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data.

PART – C

Answer ANY TWO Questions. **(2 x 20 = 40)**

19. Solve the following LPP using Big 'M' method.

Minimise $z = 4x_1 + x_2$

Subject to $3x_1 + 4x_2 \geq 20$

$x_1 + 5x_2 \geq 15$

$x_1, x_2 \geq 0$

20. Solve the following transportation problem whose cost matrix, availability at each plant and requirements at each warehouse are given as follows:

Plant	Warehouse				
	W1	W2	W3	W4	Availability
P1	190	300	500	100	70
P2	700	300	400	600	90
P3	400	100	600	200	180
Requirements	50	80	70	140	340

21. The following table gives data on estimates optimistic, most likely and pessimistic duration in weeks for a project.

Activity	Estimated duration in weeks		
	Optimistic	Most likely	Pessimistic
1 – 2	1	1	7
1 – 3	1	4	7
1 – 4	2	2	8
2 – 5	1	1	1
3 – 5	2	5	14
4 – 5	2	5	8
5 – 6	3	6	15

(i) Draw the project network and identify all the paths through it.

(ii) Find the expected duration and variance for each activity.

(iii) Calculated the variance and standard deviation of the project.

22. Solve the following game

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 4 & 2 & 0 & 2 & 1 \\ 4 & 3 & 1 & 3 & 2 \\ 4 & 3 & 4 & -1 & 2 \end{bmatrix}$$

@@@@@@@

3