

Time : 3 hrs

Max. Marks : 100

Use of Statistical Table is permitted

Answer ALL Questions

PART - A (10 x 2 = 20 Marks)

1. List the assumptions made in the linear programming problems
2. How do the special cases identified from simplex table?
3. What is the difference between a slack variable and a surplus variable?
4. What is an unbalanced transportation problem?
5. Discuss the steps of Hungarian method.
6. Distinguish between CPM and PERT.
7. Derive the equation for Economic Order Quantity (EOQ)
8. What are the assumptions made in single channel queuing model?
9. What is meant by saddle point?
10. Differentiate between individual and group replacement.

PART - B (5 x 16 = 80 Marks)

11. Write the procedure for each of the following : i) Northwest corner method, ii) Least cost method and iii) Vogel's approximation method in transportation problem.
12. a) Solve the following LP problem using Simplex method.

$$\begin{aligned} \text{Max } Z &= 6x_1 + 8x_2 \\ \text{Subject to } &5x_1 + 10x_2 \leq 60 \\ &4x_1 + 4x_2 \leq 40 \\ &x_1 \text{ and } x_2 \geq 0 \end{aligned}$$

OR

- b) Explain with suitable examples the different kinds of sensitivity analysis carried out in simplex method.

13 a) Alpha Construction company has five crews. The skills of the crews differ from one another because of the difference in the composition of the crews. The company has five projects on hand. The times (in days) taken by different crews to complete different projects are summarized in the table. Find the best assignment of the crews to different projects such that the total time taken to complete all the projects is minimized

		PROJECT				
		1	2	3	4	5
CREW	A	20	30	25	15	35
	B	25	10	40	12	28
	C	15	18	22	32	24
	D	29	8	34	10	40
	E	35	23	17	26	45

OR

b) Consider a project involving 11 activities. Given the following set of activities, their predecessor requirements and three time estimates of completion time :

Activity	Immediate Predecessor(s)	Duration in weeks		
		a	m	b
A	none	6	7	8
B	none	1	2	9
C	none	1	4	7
D	A	1	2	3
E	A,B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E,F	4	4	4
I	E,F	4	4	10
J	D,H	2	5	14
K	I,G	2	2	8

- i) Construct the project network. (6)
- ii) Find the critical path and the expected project completion time. (5)
- iii) What is the probability of completing the project on or before 25 weeks? (5)

14 a) i) Differentiate between fixed order quantity system and period order quantity system. (6)

ii) The annual demand of an item is 7200 units. The carrying cost is Rs. 500 per unit per year, the ordering cost is Rs. 1500 per order and the shortage cost is Rs. 2000 per unit per year. Find the optimum values of economic order quantity, maximum inventory, maximum shortage quantity and cycle time. (10)

OR

b) The arrival rate of customers at a banking counter follows Poisson distribution with a mean of 45 per hour. The service rate of the counter clerk also follows Poisson distribution with a mean of 60 per hour.

i) What is the probability of having 0 customer in the system?, ii) What is the probability of having 5 customer in the system?, and iii) find L_s , L_q , W_s and W_q .

15 a) Solve the following 4x4 game using dominance property (10)

Player B

Player A	I	II	III	IV
I	2	-2	4	1
II	6	1	12	3
III	-3	2	0	6
IV	2	-3	7	1

ii) Formulate the following game into LP model with respect to player B (6)

6	8	2
8	2	10
4	10	12

OR

b) i) Derive the equation of economic life of a deteriorating item. (6)

ii) The failure rate of 1000 street bulbs in a colony is given below. The cost of replacing an individual bulb is Rs.60. The cost of replacing all the bulbs at the same time is Rs. 25 per bulb. The probability of failure of a resistor for each of its life span in terms of months is shown in the table. Determine the best replacement policy. (10)

Cumulative probability of failure of bulbs

Month i	1	2	3	4	5	6
P_i	0.05	0.20	0.40	0.65	0.85	1.00