A

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Any feasible solution which optimizes (minimizes or maximizes) the objective function of the LPP is called its _____   CO1- U

   (a) Optimal solution   (b) Non basic variable

   (c) Solution   (d) Basic feasible solution

2. If a constraint with <= type, then _____ variable should be added   CO1- U

   (a) Slack   (b) Surplus   (c) Artificial   (d) Decision

3. For solving an assignment problem, which method is used   CO1- U

   (a) MODI   (b) Hungarian   (c) German   (d) American

4. MODI method also called as _____   CO1- U

   (a) North West Corner rule   (b) Least Coast method

   (c) U-V method   (d) Stepping Stone method

5. In which model, all the nodes must be connected with minimum distance?   CO1- U

   (a) Shortest path   (b) Maximal flow

   (c) Minimal spanning tree   (d) Critical path

6. Which method is a probabilistic approach?   CO1- U

   (a) CPM   (b) PERT   (c) PRIM'S   (d) DIJKSTRA'S

7. The inventory may be categorized as   CO1- U

   (a) Raw materials inventory   (b) In-process inventory

   (c) Finished goods inventory   (d) All the above

8. The inventory needs to be maintained to decrease the _____ CO1- U

   (a) Shortage costs   (b) Setup costs   (c) Loss of goodwill   (d) All the above

9. If a rectangular game has no saddle point, then the strategies of players are   CO1- U

   (a) Pure strategies   (b) Mixed strategies

   (c) Unique strategies   (d) Specific strategies

10. One of the methods for simplifying m x n game with mixed strategy is   CO1- U

    (a) Dominance   (b) Graphical   (c) Saddle   (d) Minimax

PART – B (5 x 2= 10 Marks)

11. Explain the term operation research.   CO1- U

12. Explain unbalanced transportation problem. How do you balance it?   CO1- U

13. Explain network with an example.   CO1- U

14. Explain individual replacement and group replacement with an example.   CO1- U

15. Explain why we use graphical method.   CO1- U

PART – C (5 x 16= 80 Marks)

16. (a) Solve the following LPP using graphical method   CO2- App   (16)

     Maximize $Z = 2X_1 + 5X_2$

     subject to $1X_1 + 4X_2 \leq 24$

                 $3X_1 + 1X_2 \leq 21$

                 $1X_1 + 1X_2 \leq 9$

                 $X_1, X_2 \geq 0$

Or

   (b) Use Simplex method to solve the following LP problem to   CO2- App   (16)

     Maximize $Z = 3X_1 + 2X_2 + 5X_3$

     Subject to $1X_1 + 4X_2 \leq 420$

                 $3X_1 + 2X_3 \leq 460$

                 $1X_1 + 2X_2 + X_3 \leq 430$

                 $X_1, X_2, X_3 \geq 0$

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17. (a) Solve the following TP problem using Least Cost method for initial feasible solution and MODI method for optimal solution.   CO2- App   (16)

	To				Supply
	5	2	4	3	22
From	4	8	1	6	15
	4	6	7	5	8
Demand	7	12	17	9	

Or

(b) Solve the following assignment problem.   CO2- App   (16)

Machines

|		I	II	III	IV	V
	1	11	17	8	16	20
	2	9	7	12	6	15
Jobs	3	13	16	15	12	16
	4	21	24	17	28	26
	5	14	10	12	11	15

18. (a) Consider the details of a distance network as shown below.   CO2- App   (16)
   (i) Construct a project network
   (ii) Determine the maximal flow from node 1 to 5

Arc $(i - j)$	Flow	
	f_{ij}	f_{ji}
0-1	11	--
0-2	12	--
1-3	12	--
2-1	1	--
2-4	11	--
3-4	7	--
3-5	19	--
4-5	4	--

Or

(b) Find the critical path and calculate the earliest start, earliest finish, latest start, latest finish, total float, free float and independent float.   CO2- App   (16)

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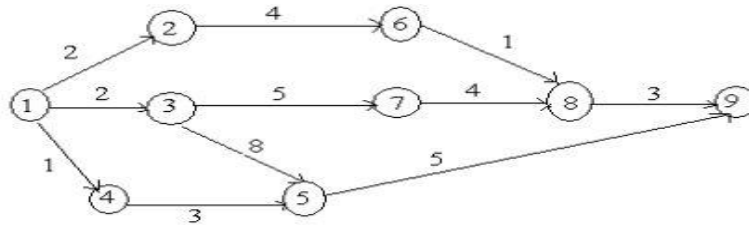
19. (a) A factory needs 36000 units annually of a component that cost Rs.2 per unit. Cost of each order placing is Rs. 25 and inventory carrying cost is Rs. 10 per year. Find   CO3- App   (16)
   (i) Economic order quantity
   (ii) Number of orders per year
   (iii) Time between the orders
   (iv) Optimal total inventory cost

<div align="center">Or</div>

(b) The cost of a bike is Rs. 3000. The salvage value (resale value) and the running cost are given as under. Find the most economical replacement age of the bike.   CO4- App   (16)

Year	1	2	3	4	5	6	7
Running Cost	600	700	800	900	1000	1200	1500
Resale Value	2000	1333	1000	750	500	300	300

20. (a) Consider a box office ticket window being manned by a single server. Customer arrives to purchase ticket according to Poisson input process with a mean rate of 30/hr. the time required to serve a customer has an ED with a mean of 90 seconds determine: CO3- App   (16)
(a) Mean queue length.
(b) Mean waiting time in the system.
(c) The probability of the customer waiting in the queue for more than 10min.
(d) The fraction of the time for which the server is busy.

<div align="center">Or</div>

(b) Solve the following game.   CO3- App   (16)

<div align="center">Player B</div>

		I	II	III
	I	1	7	2
Player A	II	6	2	7
	III	6	1	6

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