A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 96703

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

Sixth Semester

Mechanical Engineering

19UME603 - OPERATIONS RESEARCH

(Regulations 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Graphical method can be applied to solve a LPP when there are only -----variable CO1- U

   (a) One (b) More than One (c) Two (d) Three

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 buffer stock or safety stock. CO1- U
15. Explain why we use graphical method. CO1- U

PART – C (5 x 16= 80 Marks)

16. (a) Use Graphical method to solve the following LP problem to CO2- App (16)

Maximize $Z = 6X_1 + 14X_2$

Subject to $5X_1 + 4X_2 \geq 60$

$3X_1 + 7X_2 \leq 84$

$X_1, X_2 \geq 0$

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 $1X_1 + 4X_2 \leq 420$

$3X_1 + 2X_3 \leq 460$

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

$X_1, X_2, X_3 \geq 0$

17. (a) Solve the following transportation problem CO2- App (16)

Destination

		A	B	C	D	Supply
Source	1	11	20	7	8	50
	2	21	16	20	12	40
	3	8	12	18	9	70
Demand		30	25	35	40	

Or

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

Machines

Jobs	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
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)

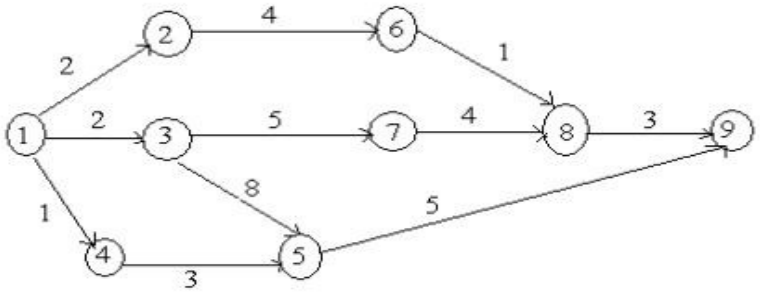
(i) Construct a project network

(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)



19. (a) A textile mill buys raw material from a vendor. The annual demand of the raw material is 9000 units. The ordering cost is Rs.100 per order and the carrying cost is 20% of the purchase price per unit month, where the purchase price per unit is Rs.1. Find (i) EOQ (ii) Time between two consecutive orders (iii) Number of orders per year (iv)Total cost w.r.t EOQ. CO3- App (16)

Or

(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) Arrivals at a telephone both are considered to be Poisson at an average time of 8 min between our arrival and the next. The length of the phone call is distributed exponentially, with a mean of 4 min. Determine CO3- App (16)

(a) Expected fraction of the day that the phone will be in use.

(b) Expected number of units in the queue Expected waiting time in the queue.

(c) Expected number of units in the system.

(e) Expected waiting time in the system

Or

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

		Player B			
		1	2	3	4
Player A	1	3	5	4	2
	2	5	6	2	4
	3	2	1	4	0
	4	3	3	5	5