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

Question Paper Code: U6702

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Sixth Semester

Mechanical Engineering

21UME602-OPERATIONS RESEARCH FOR MECHANICAL ENGINEERS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. If a constraint with>=type, then_variable should be added CO1 -U

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

2. A minimization problem can be converted in to a maximization problem by changing the sign of coefficients in the_____ CO1 -U

   (a) Constraints (b) Objective Function

   (c) Both (a) and (b) (d) None of the above

3. Degeneracy in an mxn transportation problem occurs when the number of occupied cells is less than___ CO1 U

   (a) m-n-1 (b) m+n+1 (c) m+n-1 (d) 2m+3n-1

4. TSP stands for_____ CO1 U

   (a) Transportation Problem (b) Travelling Salesman Problem

   (c) Travelling Schedule Problem (d) Task Scheduling Problem

5. Indicating the predecessor and success or relationship clearly by using_____ CO1-U

   (a) Dummy row (b) Dummy column

   (c) Dummy activity (d) None of the above

6. CPM stands for_ CO1 U

   (a) Crucial path method (b) Central path method

   (c) Critical path method (d) Circular path method

7. When the demand in practical situation and is not known accurately then the model is called as CO1 U

(a) Probabilistic (b) Deterministic (c) Uniform (d) Variable

8. Which of the following is an inventory management technique? CO1-U

(a) HML analysis (b) VED analysis (c) A B C analysis (d) All the above

9. The rectangular games of (2xn) or (mx2) size with out saddle point can be solved by___ CO1 U

(a) Graphical method (c) Matrix method

(b) Arithmetic method (d) Approximation method

10. One of the methods for simplifying mxn 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 alternate solution CO1-U

12. Explain the conditions for optimal solution reached in a travelling salesman problem. CO1-U

13. Explain free float. CO1-U

14. Explain lead time. CO1-U

15. Explain zero sum games. 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) Solve the following LPP using simplex method Maximize $Z=6X_1+ 8X_2$ CO2-App (16)

subject to $30X_1+ 20X_2 \leq$

$3005X_1+ 10X_2\leq$

110

$X_1,X_2\geq 0$

17. (a) Solve the following transportation problem using VAM method. 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)

		Operator				
		1	2	3	4	5
Job	1	20	22	35	22	18
	2	4	26	24	24	7
	3	23	14	17	19	19
	4	17	15	16	18	15
	5	16	19	21	19	25

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.

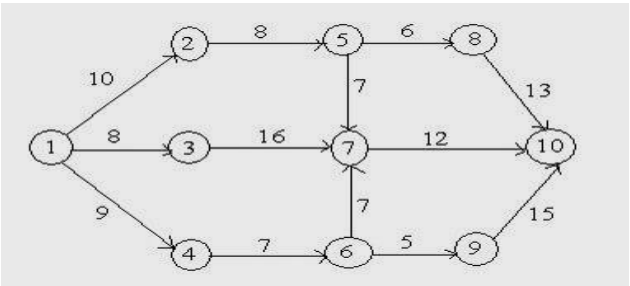
Activity (i-j)	0-1	0-2	2-1	1-3	2-4	4-3	3-5	4-5
Flow (f_{ij})	11	12	1	12	11	7	19	4
Flow (f_{ji})	-	-	-	-	-	-	-	-

Or

(b) A project network is shown below with duration in days: CO2- App (16)

(i) Find the critical path

(ii) Calculate the earliest start, earliest finish, latest start, latest finish.



19. (a) A company uses 100000 units of a particular item per year. Each item costs `2. The production engineering department estimates the holding cost as 12.5% of the value of the inventory per day. The replenishment rate is uniform at 500 units per day. Assuming 250 working days (for replenishment purpose), calculate the
(a) optimal set-up quantity;
(b) total cost on the basis of optimal policy; and
(c) Optimal number of set-ups. CO3 - App (16)

Or

(b) An Electromechanical equipment has a purchase price of Rs. 7000 its resale value and running cost are given below. Find the optimum replacement period. CO3- App (16)

Year	Running Cost (Rs)	Resale Value (Rs)
1	2000	4000
2	2100	3000
3	2300	2200
4	2600	1600
5	3000	1400
6	3500	700
7	4100	700
8	4600	700

20. (a) In a self-service store with one cashier, 8 customers arrive on an average of every 5 mins. And the cashier can serve 10 in 5 mins. If both arrival and service time are exponentially distributed, then determine
(a) Average number of customer waiting in the queue for average
(b) Expected waiting time in the queue
(c) What is the probability of having more than 6 customers In the system. CO3 - App (16)

Or

(b) The following table represents the payoff matrix with respect to player A. Solve it optimally using dominance property. CO3 - App (16)

		Player B				
		1	2	3	4	5
Player A	1	4	6	5	10	6
	2	7	8	5	9	10
	3	8	9	11	10	9
	4	6	4	10	6	4