Course Code: 1950324 Roll No: **MLRS- R19**

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
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III B.Tech I Sem Supply End Examination, December 2022

Operations Research

(Mechanical)

Time: 3 Hours. **Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

PART- A

(10*2 Marks = 20 Marks)

1.	a)	Write the general structure of linear programming problem	2M	CO1	L2
	b)	Write the limitations of graphical method used for solving linear programming problem	2M	CO1	L2
	c)	List the methods used for solving the feasibility solution of transportation problem	2M	CO2	L1
	d)	Write the mathematical formulation of a Assignment Problem.	2M	CO2	L2
	e)	Explain the principle assumptions made while dealing with sequencing problems	2M	CO3	L1
	f)	Explain briefly how replacement problems are classified	2M	CO3	L1
	g)	Explain the term saddle point in game theory	2M	CO4	L1
	h)	List out the different costs used in inventory control analysis	2M	CO4	L2
	i)	What is the general structure of queuing model	2M	CO5	L2
	j)	State Bellmen's principle of optimality	2M	CO5	L2

PART- B

(10*5 Marks = 50 Marks)

2 Solve the following LPP 10M CO1 L2

Maximize $z = 4x_1 + x_2$

S.T $x_1 + x_2 \leq 1$,

$x_1 + 2x_2 \leq 2$,

and $x_1, x_2 \geq 0$

OR

3 Use Big-M to solve the following LPP 10M CO1 L3

Minimize $Z=4X_1 + 3X_2$

subject to $2X_1 + X_2 \geq 10$,

$-3X_1+2X_2 \leq 6$,

$X_1 +2X_2 \geq 6$ and

$X_1, X_2 \geq 0$

4 Find the IBFS for the following Transportation problem by VAM 10M CO2 L2

		1	2	3	4	Supply
Plants (origins)	a	5	3	6	2	19
	b	4	7	9	1	37
	c	3	4	7	5	34
Demand		16	18	31	25	

OR

5 In the modification of a plant layout of a factory four new machines M_1, M_2, M_3, and M_4 are to be installed in a machine shop. There are five vacant places A, B, C, D, and E available. Because of limited space , machine M_2 cannot be placed at C and M_3 cannot be placed at A. the cost of placing of machine i at a place j (in thousands of rupees) is as follows. 10M CO2 L3

		Locations				
		A	B	C	D	E
Machines	M_1	9	11	15	10	11
	M_2	12	9	-	10	9
	M_3	-	11	14	11	7
	M_4	14	8	12	7	8

Find the optimum assignment schedule

6 A book binder has one printing press, one binding machine and manuscripts of 5 different books. The time required for performing printing and binding operations for different books are shown below 10M CO3 L2

Book	1	2	3	4	5
Printing time (hr)	5	1	9	3	10
Binding time(hrs)	2	6	7	8	4

Decide the optimum sequence of processing of books in order to minimize the total time to bring out all the books. Also find the total elapsed time and idle time on each machine.

OR

7 A machine owner finds that from his past records that the costs per year of maintaining a machine whose purchase price is rupees 600/- are as given below. Determine at what age is its replacement is due. 10M CO3 L3

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs)	100	120	140	180	230	280	340	400
Resale value	300	150	75	37.5	20	20	20	20

8 Solve the following game 10M CO4 L3

	1	2	3	4
A	25	20	17	40
B	30	19	13	15
C	45	7	15	10
D	-10	9	16	5

OR

9 a) What are the assumptions used while deriving the E O Q formula? 4M CO4 L2

	b) The demand rate for a particular item is 12 ,000 units per year. The set up cost per run is rupees 350 and the holding cost is rupees 0.20 per unit per month. If no shortages are allowed and the replacement is instantaneous. Determine, a) The optimum run size b) Optimum scheduling period. c) Minimum total expected annual cost.	6M	CO4	L3
10	The Taj service station has five mechanics each of whom can service a scooter in 2 hours on an average. The scooters are registered at a single counter and then sent for servicing to different mechanics. Scooters arrive at the service station at an average rate of 2 scooters per hours Determine a) Utilization factor b) The probability that the system that the system shall be idle c) The probability that there shall be 3 scooters in the service centre d) Expected number of scooters waiting in the queue	10M	CO5	L3
	OR			
11	Solve the following LPP by dynamic programming approach Maximize $z= 8x_1 +7x_2$ Subject to $2x_1 + x_2 \leq 8$ $5x_1 + 2x_2 \leq 8$ and x_1, x_2 ⍰ 0	10M	CO5	L4

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CO - Course Outcome **BL - Blooms Taxonomy Levels**