

ANURAG Engineering College

(An Autonomous Institution)

III B.Tech II Semester Regular/Supplementary Examinations, June/July-2024

OPERATION RESEARCH

(MECHANICAL ENGINEERING)

Time: 3 Hours**Max.Marks:75****Section – A (Short Answer type questions)****(25 Marks)****Answer All Questions**

	Course Outcome	B.T Level	Marks
1. Explain the limitations of operation research.	CO1	L1	2M
2. Explain the advantages and limitations of linear programming.	CO1	L1	3M
3. Define slack and surplus variables with respect to linear programming problems.	CO2	L2	2M
4. How profit maximization problem can be solved in the assignment technique?	CO2	L2	3M
5. Explain degeneracy in transportation problems.	CO3	L2	3M
6. Discuss group replacement policy with a suitable example.	CO3	L2	2M
7. Explain 'zero-sum' in the context of game theory.	CO4	L1	3M
8. Write the important assumptions of "Game Theory".	CO4	L1	2M
9. Define Reneging and Jockeying.	CO5	L1	2M
10. What are the various performance measures of a queuing system? Discuss in brief.	CO5	L1	3M

Section B (Essay Questions)**Answer all questions, each question carries equal marks.****(5 X 10M = 50M)**

11. A) Solve the following problem with the graphical method.
- Maximize $Z = 3X_1 + 9X_2$
 Subject to $X_1 + 4X_2 \leq 8$,
 $X_1 + 2X_2 \leq 4$ and
 $X_1, X_2 \geq 0$

OR

- B) Using the Simplex method of Linear programming technique, solve the following problem.
- Maximize $Z = 5X_1 + 4X_2$
 Subject to $X_1 - 2X_2 \leq 1$,
 $X_1 + 2X_2 \geq 3$ and
 $X_1, X_2 \geq 0$.

12. A) A company manufacturing air coolers has two plants located in Mumbai and Kolkata with a capacity of 200 units and 100 units per week respectively. The company supplies the air cooler to its four showrooms located at Ranchi, Delhi, Lucknow, and Kanpur which have a maximum demand of 75, 100, 100, and 30 units respectively. Due to the differences in raw material cost and transportation cost, the profit per unit in rupees differs which is given below. Solve the transportation problem to maximize the profit.

	Ranchi	Delhi	Lucknow	Kanpur
Mumbai	90	90	100	110
Kolkata	50	70	130	85

OR

B) Is the given solution to the assignment problem correct as per the criterion of the traveling salesman problem? If not, then modified it.

CO2 L3 10M

	I	II	III	IV	V
I	M	5	15	30	0
II	20	M	0	30	0
III	20	15	M	0	15
IV	40	0	5	M	5
V	0	10	0	35	M

13. A) There are seven jobs, each of which has to go through machines A and B in the order AB. Processing time in hours is as follows:

CO3 L3 10M

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time T. Also find T and idle times for machines A and B.

OR

B) Running cost and resale value of the bike whose purchase price is ₹ 60,000, given in the table, find the age of replacement.

CO3 L3 10M

Year	1	2	3	4	5	6	7
Resale value	30000	15000	7500	3750	2000	2000	2000
Running cost	10000	12000	14000	18000	23000	28000	34000

14. A) In a game of matching coins with two players, player A wins ₹1 when there are two heads, wins nothing when there are two tails, and loose ₹1/2 when one head and one tail. Determine the payoff matrix, strategies and value of game.

CO4 L3 10M

OR

B) Solve the following 4 X 4 game using rule of dominance.

CO4 L3 10M

		Player B			
		I	II	III	IV
Player A	I	3	5	4	2
	II	5	6	2	4
	III	2	1	4	0
	IV	3	3	5	2

15. A) At a bank counter, customers arrive at a rate of 30 customers per day. Assuming that the inter-arrival time follows an exponential distribution and service time distribution is also exponential with an average of 36 minutes. Calculate the Expected queue size probability that the queue size exceeds 10.

CO5 L3 10M

OR

B) A cafe keeps stock of a popular brand of coffee daily demand based on past experience is given below:

CO5 L3 10M

Daily Demand	0	15	25	35	45	50
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Consider the following sequence of random numbers 48,78,9,51,56,77,15,14,68, and 9.

- i) Using the sequence simulates the demand for the next 10 days.
- ii) Find the stock situation if the owner of the cafe decides to make 35 coffee every day.

