R20 Regulation *Subject code: 3P5CD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Supplementary Examinations, July 2024

OPERATIONS RESEARCH

(Mechanical Engineering)

Maximum Marks: 70 Date:26.07.2024 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

	Part-A	CO	Bloom Tx
All the following questions carry equal marks (10x2M=20 Marks)			
1	Give the matrix form of LPP.	1	2
2	What are the OR applications?	1	1
3	What is an assignment problem?	2	1
4	Explain the use of Vogel's approximate method?	2	5
5	List the assumptions made in sequencing.	3	4
6	What is the necessity of replacement?	3	1
7	What are deterministic models in Inventory?	4	1
8	What are the limitations of graphical method in Game theory?	4	1
9	Give some important applications of queuing theory?	5	3
10	List out various applications of dynamic programming.	5	1
	Part-B		
Answer All the following questions. (5X10M=50Marks)			Bloom Tx level
11	Solve the following LPP graphically: Min $Z = 5X_1 + 2X_2$ Subjected to $3X_1 + X_2 \geq 3$; $3X_1 - 2X_2 \leq 6$; $X_1 + X_2 \leq 4$; and $X_1, X_2 \geq 0$. [10M]	1	6
	OR		
12	a) State different types of models used in operation research. Explain any two in detail. [5M] b) List out various phases in OR and Explain in detail. [5M]	1	4
13	Give the generalized mathematical formulation of an assignment problem. Give a comparative study of transportation problem and assignment problem. [10M]	2	5

	OR		
14	Solve the following problem by using NWCM? 4 6 7 5 11 7 3 6 9 5 8 5 4 6 9 9 12 7 11 10 7 5 9 8 11 [10M]	2	3
15	Six jobs go first over Machine-I and then over Machine-II. The orders of completion of jobs have no significance. The following gives the machine times in hours for six jobs and the two machines. Find the Optimal total time and the idle times of the machine. Job: **1** **2** **3** **4** **5** **6** Machine I: 5 9 4 7 8 6 Machine II: 7 4 8 3 9 5 [10M]	3	1
	OR		
16	A truck owner finds from his past records that the maintenance cost per year of a truck whose purchase price is Rs.8000, are given below: Year: 1 2 3 4 5 6 7 8 Maintenance cost: 1000 1300 1700 2200 2900 3800 4800 6000 Resale Price: 4000 2000 1200 600 500 400 400 400 Determine at what time it is profitable to replace the truck? [10M]	3	5
17	Solve the following game using dominance principle. Player 'B' Player 'A': **1** **2** **3** **4** **I** 19 6 7 5 **II** 7 3 14 6 **III** 12 8 18 4 **IV** 8 7 13 -1 [10M]	4	3
	OR		

18	A small firm producing automobile brake linings estimates the steel requirementsfor the next year's production at 6000 Kg. The cost of carrying steel in inventories works out to Rs 1 per Kg. per month. The cost of ordering works out at Rs 100 per order. If the cost per kg of steel is Rs 100, find out the economic order quantity,the number of orders per year, and total cost incurred by the firm for one year. [10M]	4	2
19	A harbor has a single dock to unload the containers from the incoming ships. The arrival rate of ships at the harbor follows Poisson distribution and the unloading time for the ships follow exponential distribution and hence, the service rate also follows Poisson distribution. The arrival rate and service rate are 8 ships per week and 14 ships per week, respectively. Find the following a) Utilization factor of the dock b) Average number of waiting ships in the queue c) Average number of waiting ships in the system d) Average waiting time per ship in the queue e) Average waiting time per ship in the system [10M]	5	1
	OR		
20	Explain the Bellman's principle of optimality in dynamic programming and give a mathematical formulation of a dynamic programming problem? [10M]	5	5