



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code:3P5CD

B.Tech V Semester Supplementary Examinations, June/July 2023

OPERATIONS RESEARCH

(Mechanical Engineering)

Maximum Marks: 70

Date:01.07.2023 Duration: 3 hours

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Define slack, surplus and artificial variables.
- 2 What is an optimal solution?
- 3 List the difference between transportation and assignment problem.
- 4 Give the consequence of degeneracy and how it is overcome?
- 5 What is sequencing?
- 6 What are the situations which make the replacement of items necessary?
- 7 State the applications of game theory.
- 8 Mention the types of inventory.
- 9 List the characteristics of dynamic programming.
- 10 State Bellman's principle of optimality.

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 Solve the following linear programming problem.
Minimize $Z = 20x + 40y$, Subject to the constraints: $36x + 6y \leq 108$, $3x + 12y \leq 36$ (10 marks)

OR

- 12 Discuss the following (a) Tools and techniques of operations research (6 marks)
(b) Applications of operations research (4 marks)

- 13 Solve the following transportation problem starting with the initial solution obtained by VAM. (10 marks)

	D1	D2	D3	D4	Supply
O1	2	2	2	1	3
O2	10	8	5	4	7
O3	7	6	6	8	5
Required	4	3	4	4	15

OR

Solve the following travelling salesman problem.

(10 marks)

14

∞	3	6	2	3
3	∞	5	2	3
6	5	∞	6	4
2	2	6	∞	6
3	3	4	6	∞

- 15 Explain the replacement procedure for the items that deteriorate with time with an example. (10 marks)

OR

- 16 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 time of machines. (10 marks)

Job	1	2	3	4	5	6
Machine-I	5	9	4	7	8	6
Machine-II	7	4	8	3	9	5

- 17 Use the graphical method in solving the following game and find the value of the game. (10 marks)

	Player B			
Player A	B1	B2	B3	B4
A1	2	2	3	-2
A2	4	3	2	6

OR

- 18 A company purchases 9000 parts of a machine for its annual requirement, ordering one month's usage at a time. Each part cost Rs.20. The ordering cost per order is Rs.15 and the carrying charges are 15% of the average inventory per year. You have been asked to suggest a more economical purchasing policy for the company. What advice would you offer and how much would it save the company per year? (10 marks)
- 19 Use dynamic programming to solve the following LPP : Maximize $Z = x_1 + 9x_2$
Subject to the constraints: $2x_1 + x_2 \leq 25$, $x_2 \leq 11$, $x_1, x_2 \geq 0$ (10 marks)

OR

- 20 A patient goes to a single doctor clinic for a general check-up with 4 phases. The doctor takes on average 4 minutes for each phase of the check up and time taken for each phase is exponentially distributed. If the arrivals of the patient at the clinic are approximately Poisson ratio at the average of 3 per hour. What is the average time spent by the patient (a) In the examination (b) Waiting in the clinic? (10 marks)