



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code: 3P5CD

B.Tech V Semester Regular Examinations, January 2023

OPERATIONS RESEARCH (Mechanical Engineering)

Maximum Marks: 70

Date: 18.01.2023 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 which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Define artificial variable.
- 2 What are the limitation of graphical method in LPP.
- 3 What is degeneracy in transportation problems?
- 4 Explain the difference between a transportation problem and an assignment problem.
- 5 What is no passing rule in a sequencing algorithm?
- 6 What are situations which make the replacement of items necessary?
- 7 Explain the difference between the pure strategy and mixed strategy.
- 8 What are the advantages and disadvantages of increased inventory.
- 9 Define traffic intensity in queuing theory.
- 10 Define the following dynamic programming terms.
i) State variable and ii) Decision variable

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 A. What is linear programming? What are its assumptions and limitations?
B. Solve the following LP problem graphically:

$$\begin{aligned} \text{Maximize } Z &= 3x_1 + 4x_2 \\ \text{Subject to the constraints} \\ 2x_1 + x_2 &\leq 40; 2x_1 + 5x_2 \leq 180; x_1, x_2 \geq 0. \end{aligned}$$

[6M]

OR

- 12 A. State different types of models used in operation research. Explain any two in detail.
B. Use penalty (or Big-M) method to Maximize $Z = 3x_1 - x_2$

[3M]

$$\begin{aligned} \text{Subject to the constraints} \\ 2x_1 + x_2 &\geq 2; x_1 + 3x_2 \leq 3; x_2 \leq 4; x_1, x_2 \geq 0. \end{aligned}$$

[7M]

- 13 Find the Total cost using North-west corner method. Also find the optimal solution.

	W1	W2	W3	W4	Capacity
F1	95	105	80	15	12
F2	115	180	40	30	7
F3	195	180	95	70	5
Requirement	5	4	4	11	

[10M]

OR

- 14 Give the generalized mathematical formulation of an assignment problem. Give a comparative study of transportation problem and assignment problem. [10M]
- 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

OR

- 16 Find the cost period of individual replacement of an installation of 300 lighting bulbs, given the following:

- i) Cost of replacing individual bulb is Rs. 3
 ii) Conditional probability of failure is given below:

Week number:	0	1	2	3	4
Conditional probability of Failure	0	1/10	1/3	2/3	0

[10M]

- 17 A. Solve the following game graphically.

	Player B	
Player A	1	2
	5	4
	-7	9
	-4	-3
	2	1

- B. Write the assumptions made in game theory.

OR

- 18 A. Describe the EOQ problem with one price break. [4M]
 B. A manufacturer purchases items in lots of 800 units which is a four months requirement. The cost per unit is Rs. 100 and the ordering cost is Rs. 120 per purchase order. The inventory carrying cost is estimated as 20% of the average inventory investment. i) Determine the annual variable cost managing the inventory. ii) How much saving can be obtained from the EOQ purchases? [6M]

- 19 Patients arrive at a clinic at the rate of 30 patients per hour. The waiting hall cannot accommodate more than 14 patients. It takes 3 minutes on the average to examine a patient.

- i) Find that probability that an arriving patient need not wait
 ii) Find the probability that an arriving patient finds a vacant seat in the hall
 iii) What is the expected duration of time a patient spends in the clinic?

OR

- 20 Apply Dynamic programming to $\text{Max } Z = 2x_1 + 3x_2$
 subjected to $x_1 + 2x_2 \leq 4$
 $2x_1 + x_2 \leq 3$ and $x_1, x_2 \geq 0$

[10M]