



Regulation R18 **Subject code:2P7CB**
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A+' Grade)
B.Tech VII Semester Supplementary Examinations, April 2024

OPERATION RESEARCH
(Mechanical Engineering)

Maximum Marks: 70

Date:25.04.2024 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

All the following questions carry equal marks

(10X2M=20 Marks)

- 1 What is operation research?
- 2 What is its significance in simplex method of solving LPP?
- 3 When does degeneracy occur in Transportation Problem?
- 4 Formulate the travelling – Salesman problem as an assignment problem.
- 5 What is dynamic programming
- 6 Explain the characteristics of processing n jobs through two machines?
- 7 Which competitive situation is called a game?
- 8 What are the consequences of over-inventory and under-inventory situations?
- 9 What is the main limitation of graphical method of linear programming
- 10 What do you understand by (M/M/1) : (a/FCFS). Explain the terms

Part-B

Answer All the following questions.

(5X10M=50Marks)

11. Explain phases and characteristics of Operation Research. [10]

OR

12. Minimize $Z=5x_1+4x_2+3x_3$ subject to the constraints
 $x_1+x_2+x_3 = 100$; $x_1 \leq 20$; $x_2 \geq 30$; $x_3 \leq 40$ and $x_1, x_2, x_3 \geq 0$ Use big M method. [10]

13. Minimize $Z = x_1 - x_3 - 2x_3$, Subject to constraints
 $3x_1+x_2+3x_3 \leq 7$; $x_1 + 2x_2 \geq -6$; $4x_1+3x_2+5x_3 \leq 10$ and $x_1, x_2, x_3 \geq 0$ [10]

OR

14. Three jobs are to be done by 4 machines. Each job can be assigned to one machine only. The cost of each job on each machine is given in the following table. [10]

	M1	M2	M2	M4
J1	18	24	28	32
J2	8	13	17	19
J3	10	15	19	22

What are the job assignments which will minimize the total cost?

15. Explain maximin and minimax principle of game theory. [10]

OR

16. Determine the optimal sequence of jobs for the given processing times jobs on three machines. [10]

Job	M1	M2	M3
1	3	8	13
2	12	6	14
3	5	4	9
4	2	6	12
5	9	3	8
6	11	1	13

17. The annual demand for an item is 3200 units. The unit cost is Rs.6. The inventory carrying cost is 25% per annum per unit. The cost of one procurement is Rs.150. Determine (a)EOQ (b) Number of orders per year (c) Time between two consecutive orders (d) Total annual cost [10]

OR

18. Machine A cost Rs.45000 and the operating costs are estimated of Rs.1000 for the first year increasing by Rs.10000 per year in the second and subsequent years .
Machine B costs Rs.50000 and operation costs are Rs.2000 for the first year, increasing by Rs.4000 in the second and subsequent years. If we have machine of type A, should we replace it with B? If so when? Assume that both machines have no resale and future costs are not discounted. [10]

19. Define dynamic programming and write its advantages, limitations and applications. [10]

OR

20. The owner of four fruit shops has purchased 6 boxes of apple. The quantity in demand and the profits are different at these stores. The following table gives the total profit at each store for various numbers of boxes allotted. [10]

Number of boxes	Stores 1	Stores 2	Stores 3	Stores 4
0	0	0	0	0
1	4	2	6	2
2	6	4	8	3
3	7	6	8	4
4	7	8	8	4
5	7	9	8	4
6	7	10	8	4