**Regulation R17** **Subject code:1P7CA**

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

**B.Tech IV Year I Semester Supplementary Examinations, January 2023**

## OPERATION RESEARCH

**(Mechanical Engineering)**

***Maximum Marks: 70*** 06-01-2023 **Duration: 2 Hours**

**Note:** **1.This question paper contains two parts A and B.**
**2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.**
**3. Part B consists of 10 questions. Answer any 5 questions which carries 12M.**
**4. Each question carries 12marks and may have a, b, c, d as sub questions.**

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 List at least four types of models of operation research
2 How operation research can be applied for marketing department
3 What is basic feasible solution of linear programming
4 Define saddle point game
5 Define E.O.Q
6 What is meant by inventory control?
7 Write at least three advantages of queuing system
8 State the types of replacement policies
9 What is the advantage of top down approach over bottom up approach in case of dynamic programming
10 What is an assignment problem?

Part-B

Answer all the questions (10MX 5=50Marks)

11 Write advantages and disadvantages of operation research.

OR

12 Solve the following linear programming problem using graphical method
Maximize $Z= 4x_1+4x_2$ subject to constraints
$x_1+2x_2 \leq 10$
$6x_1+6x_1 \leq 36$
$x_1 \leq 6x_1$ , $x_2 \geq 0$

13 Four different jobs can be done on four different machines .The following matrix gives the costs

| | Machine M1 | Machine M2 | Machine M3 | Machine M4 |
|---|---|---|---|---|
| Job 1 | 5 | 7 | 11 | 6 |
| Job 2 | 8 | 5 | 9 | 6 |
| Job 3 | 4 | 7 | 10 | 7 |
| Job 4 | 10 | 4 | 8 | 3 |

OR

14 1). A travelling salesman, named plans to visit five cities 1, 2, 3, 4 & 5. The travel time (in hours) between these cities is shown below:

| | | To | | |
|---|---|---|---|---|
| **From** | **1** | **2** | **3** | **4** |
| **1** | ∞ | 5 | 8 | 4 |
| **2** | 5 | ∞ | 7 | 4 |
| **3** | 8 | 7 | ∞ | 8 |
| **4** | 4 | 4 | 8 | ∞ |
| **5** | 5 | 5 | 6 | 8 |

How should travelling sales man schedule his touring plan in order to **minimize** the total travel **time**, if he visits each city once a week?

15. Solve the following game and determine the value of game

| | | B | |
|---|---|---|---|
| | | 4 | 2 |
| A | | | |
| | | 2 | 3 |

OR

16 A manufacturing company has to supply 15000 parts per day to an automobile company. The company can produce 30000 that type of parts per day. The set up cost of production is Rs.2000 and holding a part in a stock for one year is Rs.2.How frequently production should be made?

17 In a bank 8 customers arrive at an average every 4 minutes, while the cashier can serve 9 customers in 4 minutes. Use poisson distribution for arrival rate and exponential distribution for service rate. Determine

a) Average time a customer spends in system
b) Average time a customer keeps waiting
c)Average number of customers in the system
d) Average queue length.

OR

18 Find the sequence that minimizes the total time required to perform the following jobs on three machines in the order ABC.The processing time (in hours ) are given below.

| Job | Machine A | Machine B | Machine C |
|---|---|---|---|
| 1 | 4 | 9 | 14 |
| 2 | 13 | 7 | 15 |
| 3 | 6 | 5 | 10 |
| 4 | 3 | 7 | 13 |
| 5 | 10 | 4 | 9 |
| 6 | 12 | 2 | 14 |

19 Machine A costs Rs.45000 and the operating costs are estimated at Rs.1000 for first year increasing by Rs.10000 per year in the second and subsequent years. Machine B costs Rs.50000 and operating costs are Rs. 2000 for the first year increasing by Rs. 4000 in second and subsequent years. If we now have a machine of type A, Should we replace it with B?.If so, Assume that both machines have no resale value and future costs are not discounted.

OR

20 Define dynamic programming .Write advantages ,limitations and applications of dynamic programming