R18 Regulation *Subject code: 2E8EE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VIII Semester Regular/Supplementary Examinations, April 2023

Operation Research

(Computer Science and Engineering)

Maximum Marks: 70 Date:05.05.2023 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 What is Operations research?
2 What are shadow prices? What is its significance in simplex method of solving LPP?
3 How the assignment problem can be viewed as a linear programming problem?
4 What is meant by optimal solution.
5 Define the problem of sequencing.
6 Explain the possibility and working rules of maximization case in sequencing.
7 What are the characteristics of game theory?
8 Explain the rules to determine a saddle point.
9 What do you understand by a queue? Give some important applications of queuing theory?
10 What do you understand by (M/M/1) : (∞ /FCFS). Explain the terms.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 Solve the following LPP graphically:
Max $Z = 6X_1 + 9X_2$
Subjected to
$X_1 + X_2 \leq 12$
$X_1 + 5X_2 \leq 45$
$3X_1 + X_2 \leq 30$
and $X_1, X_2 \geq 0$. [10]

OR

12 Maximize $Z = 45X_1 + 70X_2$
Subject to the constraints
$2X_1 + 3X_2 \leq 70$;
$X_1 + 4X_2 \leq 100$;
$3X_1 + 5X_2 \leq 110$;
and $X_1, X_2 \geq 0$ [10]

13 Find the optimal solution for the assignment problem with the following cost matrix.

	I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

[10]

OR

14 There are three sources or origins which store a given product. These sources supply these products to four dealers. The capacities of the sources (S_i) and the demands at dealers (D_J) are as given below.

$S_1 = 150, S_2 = 40, S_3 = 80$

$D_1 = 90, D_2 = 70, D_3 = 50, D_4 = 60.$

The cost of transporting the product from various sources to various dealers is shown in the table below.

	D1	D2	D3	D4
S1	27	23	31	69
S2	10	45	40	32
S3	30	54	35	57

Find out the optimum solution for transporting the products at a minimum cost. [10]

15 Find the sequence that minimizes the total elapsed time required to complete thefollowing jobs.

		Processing times in hours					
No. of jobs	:	1	2	3	4	5	6
Machine A	:	4	8	3	6	7	5
Machine B	:	6	3	7	2	8	4

[10]

OR

16 What is sequencing problem? Explain the following terms in context of sequence problems: i) Total elapsed time and Idle time ii) no passing rule iii) processing order. [10]

17 Solve the following game graphically. [10]

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

OR

18 A. Solve the following game using dominance principle. [6]

		Player 'B'			
		1	2	3	4
Player 'A'	I	19	6	7	5
	II	7	3	14	6
	III	12	8	18	4
	IV	8	7	13	-1

B. Write the assumptions made in game theory. [4]

19 A supermarket has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes, and if people arrive in a Poisson fashion at the counter at the rate of 10 per hour, then calculate:

a) The probability of having to wait for service;
b) The expected percentage of idle time for each girl;
c) If a customer has to wait, find the expected length of his waiting time. [10]

OR

20 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: [10]

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