Register No.: ………………………………   Name.: ………………………………………………………………

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER MBA DEGREE EXAMINATION (R), MAY 2023
(2021 Scheme)

Course Code :   **21MBA110**

Course Name: **Operations Research**

Max. Marks :   60   **Duration: 3 Hours**

Scientific calculators and statistical tables can be permitted

PART A
(Answer all questions. Each question carries 2 marks)

1. Define OR.

2. What is an unbalanced assignment problem and how we can make it into a balanced problem?

3. List down the different customer behaviors in a queue.

4. Which are the various replacement situations?

5. List any two differences between CPM and PERT.

PART B
(Answer any 3 questions. Each question carries 10 marks)

6. Solve the following problem by simplex method and comment on the solution.
   Maximize $Z = 16x_1 + 17x_2 + 10x_3$ subject to
   $x_1 + x_2 + 4x_3 \leq 2000$
   $2x_1 + x_2 + x_3 \leq 3600$;
   $x_1 + 2x_2 + 2x_3 \leq 2400$;
   $x_1 \leq 30$
   $x_1, x_2, x_3 \geq 0$

7. A company has three plants A,B,C and four warehouses D, E, F, G. The unit cost of the transportation is given in the following table. Find the optimum allocation so that the total transportation cost is minimum.

	D	E	F	G	Supply
A	21	16	25	13	11
B	17	18	14	23	13
C	32	27	18	41	19
Demand	6	10	12	15	

8. Dr. Arun has been thinking about starting his own independent hospital. The problem is to decide how large the hospital should be. The annual

returns will depend on both size of hospital and a number of marketing factors. After a careful analysis, he developed the following table.

Size of the hospital	Good Marketing	Fair Marketing	Poor Marketing
Small	50,000	20,000	-10,000
Medium	70,000	35,000	-25,000
Large	90,000	35,000	-45,000
Very Large	2,00,000	25,000	-1,20,000

What would be his decision if he follows

     a. Laplace criterion
     b. Criterion of optimism
     c. Criterion of pessimism
     d. Minimax Regret Criterion
     e. Hurwicz criterion(α=0.8)

9. The production department of a company requires 3,600 kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs 36 and the cost of carrying inventory is 25 per cent of the investment in the inventories. The price is Rs 10 per kg. Help the purchase manager to determine an ordering policy for raw material by calculating

     a. EOQ
     b. Optimal order cycle time
     c. Total Inventory cost
     d. Total cost including the purchase cost

10. a. What is a saddle point.   Marks 2
      b. Solve the game whose pay off matrix is given below   Marks 8

$$\begin{array}{c} \text{Player B} \\ \begin{array}{cccc} & B_1 & B_2 & B_3 \\ A_1 & 15 & 2 & 3 \\ \text{Player A} \quad A_2 & 6 & 5 & 7 \\ A_3 & -7 & 4 & 0 \end{array} \end{array}$$

PART C
(Compulsory question, the question carries 20 marks)

11.   a. The following table lists the activities of a project along with their time estimates. Activities are identified by their beginning(i) and ending(j) node numbers.

Activity	Estimated Duration (Weeks)		
i-j	Optimistic	Most likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

       1. Draw the project Network   (4 marks)

       2. Find the Duration of the Project   (3 marks)

       3. What is the probability that the jobs can be completed in 13 weeks or less?   (3Marks)

b. A lead draftsman has five drafting tasks to accomplish and five idle draftsmen. Each draftsman is estimated to require the following number of hours for each task.

		TASKS				
		A	B	C	D	E
DRAFTSMEN	1	10	5	13	15	16
	2	3	9	18	13	6
	3	10	7	2	2	2
	4	7	11	9	7	12
	5	7	9	10	4	12

Find the assignment of draftsmen to tasks that will result in the minimum total man-hours.

                                                   Marks (10)

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