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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER MBA DEGREE EXAMINATION (Regular), JULY 2022

(2021 Scheme)

Course Code :   **21MBA110**

Course Name: **Operations Research**

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

Statistical Table and graph sheet need to be provided

PART A

(Answer all questions. Each question carries 2 marks)

1. What are the basic components (or parts) in the general structure of an LP model?
2. What is degeneracy in transportation problems? Also, explain how to resolve degeneracy in a transportation problem.
3. List out the difference between decision-making under risk, and uncertainty in statistical decision theory.
4. Define economic life of an equipment
5. Explain the following terms:
    a)   Two-person zero-sum game
    b)   Pure strategy in game theory

PART B

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

6. Solve the following LP problem:

    Minimize $Z = 20x_1 + 10x_2$

    Subject to,

    $x_1 + 2x_2 <= 40$
    $3x_1 + x_2 >= 30$
    $4x_1 + 3x_2 >= 60$
    x_1 and $x_2 >= 0$ 10 Marks

7. Solve the following assignment problem

		Sales region			
		1	**2**	**3**	**4**
Salesman	**A**	32	26	35	38
	B	27	24	26	32
	C	28	22	25	34
	D	10	10	16	16

10 Marks

8. An organizer plans to hold a concert, and he can choose to hold it indoors or out of doors. The weather could be either good or bad. The table given below shows the predicted payoff received under each combination of alternatives and state of nature.

	Bad Weather	Good Weather
Outdoor	-$5,000	$15,000
Indoor	$8,000	$7,000

If it is known that there is a 30% chance of bad weather, what decision should be taken by the organizer if he:
   a) uses the expected value criterion

              4 marks
   b) uses the expected opportunity loss criterion

              6 marks

9. The annual demand of a product is 48,000 units. The average lead time is 3 weeks. The standard deviation of demand during the average lead time is 100 units/week. The cost of ordering is Rs. 500 per order. The cost of purchase of the product per unit is Rs. 15. The cost of carrying per unit per year is 20% of the purchase price. The maximum delay in lead time is 2 weeks and the probability of this delay is 0.30. Assume a service level of 0.90.
   a) If Q system is followed, find the reorder level

              5 marks
   b) If P system is followed, find the maximum inventory level.

              5 marks

10. Draw the network diagram and determine the critical path for the following project:

Activity	Time estimate (Weeks)
1-2	5
1-3	6
1-4	3
2-5	5
3-6	7
3-7	10
4-7	4
5-8	2
6-8	3
7-9	6
8-9	4

           10 Marks

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

11. a) Two bread factories, O1 and O2, make the daily bread in a city. The bread is delivered to the three bakeries of the city: D1, D2 and D3. The supplies of bread factories, the demands of bakeries and the per unit transportation costs are displayed in the following graph:
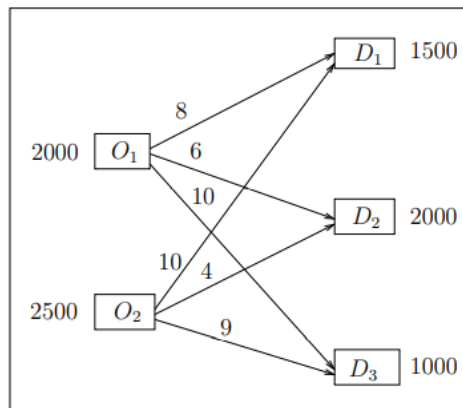
Form the cost matrix and find the basic feasible solution for the above transportation problem using the VAM method.

5 marks

b) Consider the following single-server queue: the inter-arrival time is exponentially distributed with a mean of 10 minutes and the service time is also exponentially distributed with a mean of 8 minutes, find the
   (i)   Mean number in the queue,
   (ii)   Mean waiting time in the queue,
   (iii)   Mean waiting time in the system,
   (iv)   Mean number in the system and
   (v)   Proportion of time the server is idle.

5 marks

c) Find the solution of game theory problem using graphical method

Player B Player A	B1	B2
A1	1	-3
A2	3	5
A3	-1	6
A4	4	1
A5	2	2
A6	-5	0

10 marks

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