Reg. No.								

MBA Degree (FT/PT) III Semester End Semester University Examination- November, 2023

21-371-0301/20-371-0301/21-372-0302: MANAGEMENT SCIENCE

(Regular/Supplementary)

Time: 3 Hours **Max. Marks: 50**

Course Outcomes: On completion of the course, the student will be able to:

CO1	To recall the quantitative models used in business decisions. How to translate business situation into quantitative models for optimal decision making
CO2	To develop an understanding of basic management science techniques and their role in managerial decision-making, create a scientific approach to formulation and problem solving under competitive environment
CO3	To develop mathematical models for a real life situation and problems in Business and Management; Conducting what if analysis and Scenario analysis to find the activities to optimize cost and time
CO4	To apply various Management Science techniques for Resource, time and cost Optimization in Business and Management
CO5	Evaluate the principles of construction of mathematical models of conflicting situations and mathematical analysis methods of Management Science
CO6	Have skills to develop Management Science objectives, mathematical methods , computer systems and analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within the constraints.

BL – Bloom's Taxonomy: ***(L1- Remember, L2 - Understand, L3 – Apply, L4-Analyse, L5-Evaluate, L6-Create)***

PART A

(Answer ALL questions. Each question carries 2 marks)

Q. Nos.	Questions	Marks	BL	CO
1	Customer arrives at a one window drive in bank according to Poisson distribution with mean 10 per hour. Service time per customer is exponential with mean 5 minutes. The space in front of the windows, including that for the serviced car can accommodate a maximum of three cars. Other cars will wait outside this space. (a) What is the probability that the arriving customer will have to wait outside the indicated space? (b) How long is an arriving customer expected to wait before starting service?	2	5	CO5
2	Explain the concept of Shadow Price in Duality theory of LPP	2	2	CO2

3	Illustrate what is Alternative Optimal solution in LPP	2	3	CO3
4	Explain what is Markov Analysis with an example	2	4	CO4
5	State briefly, what is Transshipment problem?	2	1	CO1

(5X2=10 marks)

PART B

(Answer ANY FIVE Questions. Each question carries 4 marks)

Q. Nos.	Questions	Marks	BL	CO
6	Solve the following transportation problem by VAM. **Market** **Warehouses A B C D** **X** 6 1 9 3 **Y** 11 5 2 8 **Z** 10 12 4 7 Capacities are 70, 55, 70 Units and Requirements are 85, 35, 50, 45 Units respectively.	4	3	CO5
7	(a) Explain the Two-person zero sum game? (b) Obtain the optimal strategies for both players and determine the value of the game. **Player B** **B1 B2 B3** **Player A A1** 15 2 3 **A2** 6 5 7 **A3** -7 4 0	4	6	CO6
8	A small industry finds from the past data that the cost of making an item is Rs.25; the selling price of an item is Rs.30 if it is sold within a week, and it could be disposed of at Rs.20 per item at the end of the week: **Weekly Sales** | <3 | 4 | 5 | 6 | 7 | >8 **No. of weeks** | 0 | 10 | 20 | 40 | 30 | 0 Find the optimum number of items per week the industry should produce.	4	6	CO6
9	A small ink manufacturer produces a certain type of ink at a cost of Rs.3 per bottle and sells at a price of Rs.5 per bottle. The ink is produced at the week-end and is sold during the following week. According to the past experience the weekly demand has never been less than 78 and greater than 80 bottles in his place. You are required to formulate Opportunity loss table.	4	4	CO4

10	A bakery shop keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given below: **Daily demand:** 0 10 20 30 40 50 **Probability:** 0.01 0.20 0.15 0.50 0.12 0.02 Simulate the demand for next 10 days, using the following random numbers, 48, 78, 19, 51, 56, 77, 15, 14, 68, 09. Find out the stock situation, if the owner of the bakery decides to make 30 cakes every day. Also calculate the daily average demand on the basis of simulated data	4	3	CO4
11	We have 5 jobs, each of which must go through the two machines A and B in the order AB. Processing time in hours are tabulated below: **Job** 1 2 3 4 5 **M/c. A** 5 1 9 3 10 **M/c. B** 2 6 7 8 4 Determine a sequence that will minimize the elapsed time. Also, find the Idle times for machine A and machine B.	4	2	CO5
12	Explain: (a) Sensitivity Analysis in LPP (b) Duality in LPP (c) Mixed Integer Programming (d) Mixed Strategy	4	2	CO2

(5X4=20 marks)

PART C

(Answer ANY TWO questions. Each question carries 10 marks)

Q. Nos.	Questions	Marks	BL	CO
13	A small project consisting of eight activities has the following characteristics : **Job** A B C D E F G H **Pre-job** -- -- A A A B,C D E,F,G **to** 2 10 8 10 7 9 3 5 **tm** 4 12 9 15 7.5 9 3.5 5 **tp** 12 26 10 20 11 9 7 5 a) Draw the PERT network for the project. b) Determine the critical path and the expected project length. c) Calculate the variance and SD of the project length. d) If a 30 weeks deadline is imposed, what is the probability that the project will be finished in time? e) If the project manager wants to be 99%, sure that the project is completed on the schedule date, how many weeks before that data should he start the project work? Given: $z(0.41)= 0.1591$ and $z(2.33)= 0.4901$	10	5	CO5

<table>
<tr>
<td>14</td>
<td>Solve the following Assignment problem:.
<table>
<tr><th>M/c▶</th><th>M 1</th><th>M 2</th><th>M 3</th><th>M 4</th></tr>
<tr><td>Job A</td><td>18</td><td>24</td><td>28</td><td>32</td></tr>
<tr><td>Job B</td><td>8</td><td>13</td><td>17</td><td>19</td></tr>
<tr><td>Job C</td><td>10</td><td>15</td><td>19</td><td>22</td></tr>
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</td>
<td>10</td><td>3</td><td>CO3</td>
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<tr>
<td>15</td>
<td>Solve:
Minimize $Z = 20x_1 + 24x_2 + 18x_3$

Subject to: $2x_1 + x_2 + x_3 \geq 30$
$x_1 + x_2 + x_3 \geq 20$
$x_1 + 2x_2 + x_3 \geq 24$
and $x_1, x_2, x_3 \geq 0$</td>
<td>10</td><td>6</td><td>CO5</td>
</tr>
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(2x10=20 marks)

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