Register No : _____

# THE KAVERY ENGINEERING COLLEGE

***(An Autonomous Institution)***

**MBA DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025**

***Second Semester***

***Master of Business Administration***

**BA4201/PMBT2421-Quantitative Techniques for Decision Making**

***Regulations -2021/2024***

***Duration : 3 Hrs*** ***Maximum : 100 Marks***

***PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)***

| *Q.No* | *Questions* | *BLT* | *CO* | *Marks* |
|---|---|---|---|---|
| 1. | Recall the types of decision making. | L1 | 1 | 2 |
| 2. | Write a note on sensitivity analysis. | L1 | 1 | 2 |
| 3. | State the condition of degeneracy in transportation problem. | L1 | 2 | 2 |
| 4. | When is an assignment problem said to be unbalanced? How an unbalanced assignment problem converted into a balanced one? | L2 | 2 | 2 |
| 5. | List the criterions by which decision is made in an uncertainty situation. | L2 | 3 | 2 |
| 6. | Relate saddle point and dominance theory. | L1 | 3 | 2 |
| 7. | Classify discount models of inventory management. | L2 | 4 | 2 |
| 8. | Distinguish between individual replacement and group replacement models. | L2 | 4 | 2 |
| 9. | Compare the characteristics of single and multiple channel models. | L2 | 5 | 2 |
| 10. | Recall any four applications of simulation techniques. | L1 | 5 | 2 |

***PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)***

| *Q.No* | | | *Questions* | *BLT* | *CO* | *Marks* |
|---|---|---|---|---|---|---|
| 11. | a | i | A garment manufacturer has a production line making two styles of shirts. Style, I needs 200 g of cotton thread, 300 g of Dacron thread and 300 g of linen thread. Corresponding requirements of style II are 200g, 200g and 100g. The net contributions are Rs.19.50 for style I and Rs.15.90 for style II. The available inventory of cotton thread, Dacron thread and linen thread are, respectively, 24 kg, 26 kg and 22 kg. The manufacturer wants to determine the number of each style to be produced with the given inventory. Formulate the LPP model. | L2 | 1 | 8 |
| | | ii | Solve the following LPP graphically: Max Z = 4x + 5y, Subject to: x + y ≤ 20, 3x + 4y ≤ 72, x, y ≥ 0. | L2 | 1 | 8 |

**Or**

| | | | | | | |
|---|---|---|---|---|---|---|
| | b | Solve the following LPP using simplex method: Maximize $Z=40x_1+30x_2$, Subject to: $x_1+x_2 \leq 122$, $x_1 + x_2 \leq 16$, $x_1 \geq 0$; $x_2 \geq 0$. | L2 | 1 | 16 |
| 12. | a | A company has three production facilities S1, S2 and S3 with production capacity of 7, 9 and 18 units (in 100s) per week of a product, respectively. These units are to be shipped to four warehouses D1, D2, D3 and D4 with requirement of 5, 8, 7 and 14 units (in 100s) per week, respectively. The transportation costs (in rupees) per unit between factories to warehouses are given in the table below: | L3 | 2 | 16 |

| | D1 | D2 | D3 | D4 | Supply (availability) |
|---|---|---|---|---|---|
| *S1* | 19 | 30 | 50 | 10 | 7 |
| *S2* | 70 | 30 | 40 | 60 | 9 |
| *S3* | 40 | 8 | 70 | 20 | 18 |
| Demand (requirement) | 5 | 8 | 7 | 14 | 34 |

Find the optimal transportation cost.

**Or**

| | | | | | | |
|---|---|---|---|---|---|---|
| | b | Five different machines can do any of the five required jobs, with different profits resulting from each assignment as shown below: | L3 | 2 | 16 |

| Job \ Machine | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | 30 | 37 | 40 | 28 | 40 |
| 2 | 40 | 24 | 27 | 21 | 36 |
| 3 | 40 | 32 | 33 | 30 | 35 |
| 4 | 25 | 38 | 40 | 36 | 36 |
| 5 | 29 | 62 | 41 | 34 | 39 |

Find the optimal maximum profit.

| | | | | | | |
|---|---|---|---|---|---|---|
| 13. | a | A company must decide whether to launch a new product. However, the market demand for the product is uncertain and can be high, moderate, or low. The company has three decision alternatives:<br>1. Invest aggressively (large-scale production)<br>2. Invest conservatively (small-scale production)<br>3. Do not invest (no production)<br>The profit outcomes (in $1000s) depend on market demand: | L3 | 3 | 16 |

| Decision | High Demand (40%) | Moderate Demand (35%) | Low Demand (25%) |
|---|---|---|---|
| Invest Aggressively | $500 | $200 | -$300 |
| Invest Conservatively | $300 | $150 | $50 |
| Do Not Invest | $0 | $0 | $0 |

Identify the best decision strategy based on different decision-making under uncertainty criteria.(alpha = 0.6)

Or

| | | | | | | |
|---|---|---|---|---|---|---|
| | b | Solve the game by graphical method: | L3 | 3 | 16 |

| | B1 | B2 |
|---|---|---|
| A1 | -2 | 0 |
| A2 | 3 | -1 |
| A3 | -3 | 2 |
| A4 | 5 | -4 |

14. a i A company sells 10,000 units of a product per year. The cost to place an order is $50, and the holding cost per unit per year is $2. The company wants to determine the optimal order quantity using the EOQ model. L5 4 8

i i A factory produces 50,000 units of a product per year. The production rate is 10,000 units per month, and the demand is 5,000 units per month. The setup cost per batch is $100, and the holding cost per unit per year is $4. Determine the optimal batch size using the EBQ model. L5 4 8

Or

b A company owns a machine that costs $10,000 and has a useful life of 5 years. The maintenance cost starts at $1,000 in the first year and increases by $500 each year. The resale value of the machine decreases as follows: L5 4 16

| Year | Resale Value ($) | Maintenance Cost ($) |
|---|---|---|
| 1 | 8,000 | 1,000 |
| 2 | 6,000 | 1,500 |
| 3 | 4,500 | 2,000 |
| 4 | 3,000 | 2,500 |
| 5 | 1,500 | 3,000 |

The company wants to determine the optimal replacement year, assuming there is no inflation, and a new machine will cost the same $10,000.

15. a A small bank has a single teller. Customers arrive at the bank following a Poisson distribution with an average rate of 6 customers per hour. The service time for each customer follows an exponential distribution with an average service rate of 8 customers per hour. The bank wants to identify the following using Queuing Theory: L4 5 16

1. The average number of customers in the system (both in the queue and being served).
2. The average time a customer spends in the system (from arrival to departure).
3. The average number of customers waiting in the queue.
4. The average time a customer spends waiting in the queue.

**Or**

b A company is evaluating a new product. The product's demand during the first year is uncertain and follows a uniform distribution between 10,000 and 20,000 units. The cost to produce each unit is $50, and the revenue generated from each unit sold is $100. The company wants to estimate the potential profit for the first year using a Monte Carlo Simulation. The company needs to: L4 5 16

1. Simulate the demand for the product based on the uniform distribution.

2. Calculate the total profit for each simulation.
3. Estimate the expected profit and determine the probability of making a profit greater than $200,000.