



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

| WINTER-2025 | |
|---------------------------------|---------------------|
| Exam Seat No.: | |
| Academic Year:2025-2026 | Semester:I |
| Class:PG-I | Program:MBA |
| Branch Code: 10 | Pattern:2024 |
| Name of Course:Decision Science | Course Code:2410506 |
| Max. Marks:60 | Duration:2.30 Hrs. |

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 5 pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

- 1a) Discuss about the different types of quantitative models used in business. (6) CO1

Question No. 2

- 2a) An airline Co. has drawn-up a new flight schedule involving five flights. To assist in allocating five pilots to the flights it has asked them to state their preference scores by giving each flight a number out of 10. The higher the number, the greater is the preference. Certain of these flights are unsuitable to some pilots owing to some domestic reasons. These have been marked with x. What should be the allocation of the pilots to flights in order to meet as many preferences as possible. (6) CO2

| | Flight Number | | | | | |
|-------|---------------|----|---|----|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| PILOT | A | 8 | 2 | X | 5 | 4 |
| | B | 10 | 9 | 2 | 8 | 4 |
| | C | 5 | 4 | 9 | 6 | X |
| | D | 3 | 6 | 2 | 8 | 7 |
| | E | 5 | 6 | 10 | 4 | 3 |

Question No. 3

- 3a) Goods have to be transported from sources S1, S2, and S3 to destinations D1, D2, and D3. The transportation cost per unit, capacities of the sources, and the requirements of the destinations are (8) CO3

given in the following table:

| | D1 | D2 | D3 | D4 | Supply |
|---------------|-----------|-----------|-----------|-----------|---------------|
| S1 | 2 | 3 | 11 | 7 | 6 |
| S2 | 1 | 0 | 6 | 1 | 1 |
| S3 | 5 | 8 | 15 | 9 | 10 |
| Demand | 7 | 5 | 3 | 2 | |

Determine the initial feasible solution (NWC, LCM, VAM) so that cost is minimized.

OR

- 3b) Explain the concept of Queuing theory - System, Terminologies and Formulas. (8) CO3
- 3c) A company has factories at $F1$, $F2$, and $F3$ that supply products to warehouses at $W1$, $W2$ and $W3$. (8) CO3
The weekly capacities of the factories are 7, 9 and 18 units, respectively. The weekly warehouse requirements are 5, 8, 7 and 14 units, respectively. The unit shipping costs (in rupees) are as follows:

| | | <i>Factory</i> | | | |
|------------------|-----------|----------------|-----------|-----------|-----------|
| | | W1 | W2 | W3 | W4 |
| <i>Warehouse</i> | F1 | 19 | 30 | 50 | 10 |
| | F2 | 14 | 8 | 18 | 60 |
| | F3 | 26 | 24 | 16 | 20 |

Determine the optimal distribution for this company in order to minimize its total shipping cost.

OR

- 3d) i) In a railway marshalling yard, goods train arrive at a rate of 30 trains per da. Assuming that the interval time follows an exponential distribution and the service time distribution is also exponential with an average of 36 minutes. Calculate: (8) CO3
- Expected queue size (Line length).
 - Calculate the waiting time for the customer in queue.
- ii) Discuss the importance of Transportation Problem and Queuing Theory in management field with examples.

Question No. 4

- 4a) A project has been defined to contain the following list of activities along with their required time of completion. (8) CO4

| Activity | A | B | C | D | E | F | G | H | I |
|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|

| | | | | | | | | | |
|------------------------------|---|---|---|---|---|---|------|---|------|
| Time in Days | 1 | 4 | 3 | 7 | 6 | 2 | 7 | 9 | 4 |
| Immediate Predecessor | - | A | A | A | B | C | E, F | D | G, H |

- I. Draw the network diagram.
- II. Show early start time and early finish time.
- III. Identify critical path.
- IV. What would happen if duration of activity F is taken as four days instead of two?

OR

- 4b) The three estimates of time in weeks for activities of a project are given below: (8) CO4

| Activity | 1-2 | 1-3 | 1-4 | 2-5 | 3-5 | 4-6 | 5-6 |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|
| Pessimistic Time | 7 | 7 | 12 | 15 | 1 | 8 | 7 |
| Most Likely Time | 6 | 1 | 4 | 6 | 1 | 2 | 4 |
| Optimistic Time | 5 | 1 | 2 | 3 | 1 | 2 | 1 |

Draw network diagram. Find out Critical path & Project duration. Estimate expected Standard deviation of critical path.

- 4c) The activities of a project an estimated times in days for each activity are given below: (8) CO4

| Activity | 1-2 | 1-3 | 1-4 | 2-3 | 2-6 | 3-5 | 4-5 | 4-6 | 5-6 |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Duration (in days) | 8 | 10 | 8 | 10 | 16 | 17 | 18 | 14 | 9 |

- i) Draw network diagram ii) Find critical path iii) Calculate total float and free float

OR

- 4d) A Company manufacturing plant and equipment for chemical processing is in the process of quoting a tender called by a public sector undertaking. Th delivery data, once promised is crucial and a penalty clause is applicable. The project manager has listed down the activities in the project as under: (8) CO4

| Activity | Immediate Predecessor | Activity Time (In Weeks) | | |
|----------|-----------------------|--------------------------|------------------|------------------|
| | | Optimistic Time | Most Likely Time | Pessimistic Time |
| A | - | 1 | 3 | 5 |
| B | - | 2 | 4 | 6 |

| | | | | |
|----------|--------------|---|---|----|
| C | A | 3 | 5 | 7 |
| D | A | 5 | 6 | 7 |
| E | C | 5 | 7 | 9 |
| F | D | 6 | 8 | 10 |
| G | B | 7 | 9 | 11 |
| H | E,F,G | 2 | 3 | 4 |

- a) Find out the delivery week from the date of commencement of the project.
b) Find the total float and free float for each of Non- Critical Activities.

Question No. 5

5a) Solve the following game:

(8) CO5

| Player A | Player B | | |
|-----------------|-----------------|-----------|-----------|
| | B1 | B2 | B3 |
| A1 | 1 | 7 | 2 |
| A2 | 6 | 2 | 7 |
| A3 | 5 | 1 | 6 |

OR

5b) Dr. Kelkar has been thinking about starting his own independent nursing home. The problem is to decide how large the nursing home should be. The annual returns will be depending on both size of nursing home and number of marketing factors. after a careful analysis, Dr. Kelkar developed following table:

(8) CO5

| Size of Nursing Home | Good Market (Rs.) | Fair Market (Rs.) | Poor Market (Rs.) |
|-----------------------------|--------------------------|--------------------------|--------------------------|
| 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 |

Find optimal strategy using i) Laplace ii) Hurwicz (a=0.8) iii) Maximax iv) Regret

5c) A company decides on production allocation of 1000 units across three plants (A:400, B:350, C:250 max capacity) to two markets (X:500, Y:600 demand) under uncertain demand scenarios. Strategies:

(8) CO5

S1 (prioritize X), S2 (balance), S3 (prioritize Y). Profits per scenario: Strong X demand (prob 0.4), Balanced (0.3), Strong Y (0.3).

Payoff Table (Profits \$000s)

| Strategy /Scenario | Strong X (0.4) | Balanced (0.3) | Strong Y (0.3) |
|--------------------|-------------------|-------------------|-------------------|
| S1 (Prioritize X) | 240 | 180 | 120 |
| S2 (Balance) | 220 | 200 | 180 |
| S3 (Prioritize Y) | 160 | 170 | 240 |

Calculate **EMV, EOL and EVPI**.

OR

5d) Determine the optimal strategies for A & B in the following game. Obtain value of game.

(8) CO5

| | | PLAYER B | | |
|----------|----|----------|----|----|
| | | B1 | B2 | B3 |
| PLAYER A | A1 | 9 | 8 | -7 |
| | A2 | 3 | -6 | 4 |
| | A3 | 6 | 7 | 7 |

..... End of question paper.....