



10916

**II Semester M.B.A. Degree Examination, December 2022
(CBCS 2018-19 Scheme)**

MANAGEMENT

Paper – 2.6 : Quantitative Techniques and Operations Research

Time : 3 Hours

Max. Marks : 70

SECTION – A

Answer **any five** questions from the following. **Each** question carries **5** marks.

(5×5=25)

1. Explain the role and importance of operation research in managerial decisions.
2. What is sequencing problem ? Give its essential characteristics.
3. Solve the following LPP by graphic method.

$$\text{Maximise } Z = 375x + 425y$$

$$\text{Subject to } 5x + 4y \leq 200$$

$$3x + 5y \leq 150$$

$$5x + 4y \geq 100$$

$$8x + 4y \geq 80$$

$$\text{and } x, y \geq 0$$

4. Solve the problem of assignment for the given table to maximise the sales.

| | | Machines | | | | |
|-------------|---|-----------------|----------|----------|----------|----------|
| | | A | B | C | D | E |
| Jobs | 1 | 32 | 38 | 40 | 28 | 40 |
| | 2 | 40 | 24 | 28 | 21 | 36 |
| | 3 | 41 | 27 | 33 | 30 | 37 |
| | 4 | 22 | 38 | 41 | 36 | 36 |
| | 5 | 29 | 33 | 40 | 35 | 39 |

P.T.O.



5. A truck owner estimates that maintenance cost per year of a truck whose purchase price is Rs. 1,50,000 and the resale value of the truck will be

| Year | 1 | 2 | 3 | 4 | 5 | 6 |
|---------------------------|----------|----------|----------|----------|--------|--------|
| Maintenance cost : | 10,000 | 50,000 | 20,000 | 25,000 | 30,000 | 40,000 |
| Resale value : | 1,30,000 | 1,20,000 | 1,15,000 | 1,05,000 | 90,000 | 75,000 |

Determine at which time it is profitable to replace the truck.

6. A dealer sells a particular model of washing machine for which the probability distribution of daily demand as given below :

| | | | | | | |
|----------------------|------|------|------|------|------|------|
| Demand/day : | 0 | 1 | 2 | 3 | 4 | 5 |
| Probability : | 0.05 | 0.25 | 0.20 | 0.25 | 0.10 | 0.15 |

Find the average demand of washing machine per day using the following random numbers

67, 84, 02, 77, 90, 14, 25, 65, 45, 82.

7. Determine the optimal sequence of jobs that minimizes total elapsed time. Jobs are processed in the order $M_1 M_2 M_3$.

| Job | A | B | C | D | E | F | G |
|-------|---|---|---|----|---|---|----|
| M_1 | 3 | 8 | 7 | 4 | 9 | 8 | 7 |
| M_2 | 4 | 3 | 2 | 5 | 1 | 4 | 3 |
| M_3 | 6 | 7 | 5 | 11 | 5 | 6 | 12 |

SECTION – B

Answer **any three** questions from the following. **Each** question carries **10** marks. **(3×10=30)**

8. Solve the given LPP by Simplex method.

$$\begin{aligned} \text{Maximise } & Z = 3x_1 + 5x_2 + 4x_3 \\ \text{Subject to } & 2x_1 + 3x_2 \leq 8 \\ & 2x_2 + 5x_3 \leq 10 \\ & 3x_1 + 2x_2 + 4x_3 \leq 15 \\ & \text{and } x_1, x_2, x_3 \geq 0 \end{aligned}$$

9. What is a game in game theory ? What are the properties of a game ? Explain the 'best strategy' on the basis of minimax criterion of optimality.



10. Solve the following transportation problem for maximum profit.

| Warehouse | Per Unit Profit (Rs.) | | | | D |
|--------------------------------------|-----------------------|-----|-----|-----|----|
| | X | A | B | C | |
| Y | 12 | 8 | 18 | 6 | 25 |
| Z | 14 | 7 | 3 | 10 | 18 |
| Availability at warehouse (in Units) | X | Y | Z | | 20 |
| Demand in the market (Units) | 200 | 500 | 300 | | |
| | A | B | C | D | |
| | 180 | 320 | 100 | 400 | |

11. Solve the following game using dominance principle.

| Company A | Company B | | | |
|----------------|----------------|----------------|----------------|----------------|
| | A ₁ | B ₁ | B ₂ | B ₃ |
| A ₁ | 35 | 65 | 25 | 05 |
| A ₂ | 30 | 20 | 15 | 00 |
| A ₃ | 40 | 50 | 00 | 10 |
| A ₄ | 55 | 60 | 10 | 15 |

SECTION - C

12. Compulsory - Case study.

A Publisher has signed a contract for the publication of a book. What is the earliest time that the book can be ready for distribution? Estimates are given in weeks. (1×15=15)

| Activity : | A | B | C | D | E | F | G | H | I | J |
|---------------|----|---|------|----|------|---|---|------|------|------|
| Precedence : | - | - | A, B | A | C, D | E | E | C, D | F, G | I, H |
| Most likely : | 8 | 2 | 2 | 6 | 4 | 3 | 4 | 6 | 8 | 1 |
| Optimistic : | 4 | 2 | 1 | 4 | 3 | 3 | 3 | 4 | 6 | 1 |
| Pessimistic : | 10 | 2 | 3 | 12 | 5 | 3 | 5 | 9 | 16 | 1 |

- 1) Draw a network and find the critical path, what is the expected length of the critical path and its variance?
- 2) What is the probability that length of the critical path does not exceed
 - a) 32 weeks
 - b) 36 weeks