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**II Semester M.B.A. (Day and Eve.) Examination, November/December 2023
(CBCS) (2021 – 22 Onwards)**

MANAGEMENT

2.6 : Quantitative Techniques and Operations Research

Time : 3 Hours

Max. Marks : 70

- Instructions :** 1) Graph sheets will be **provided**.
2) Normal distribution tables may be **used**.

SECTION – A

Answer **any five** questions. **Each** question carries **five** marks.

(5×5=25)

1. Discuss the historical background of Operations Research.
2. A certain machine was bought for Rs. 32,400. Installation charges were Rs. 4,000. Based on the maintenance costs of each year given below, advise when the machine must be replaced if the salvage value is Rs. 3,000.

| Year | 1 | 2 | 3 | 4 | 5 |
|--------------------|--------|--------|--------|--------|--------|
| Maintenance in Rs. | 12,000 | 14,000 | 15,000 | 17,000 | 18,000 |

3. A tea shop has only one person serving at the counter. Every 5 minutes, six customers arrive. The person can serve seven customers in five minutes. Assuming that the arrival rate of customers follows the Poisson distribution and the service time follows the exponential distribution, determine :
 - a) The average number of customers in the system.
 - b) The average time a customer spends in the system.
4. Solve the following game. Find the value of the game.

| | | Player A | |
|----------|-------|----------|-------|
| | | B_1 | B_2 |
| Player B | A_1 | 6 | 11 |
| | A_2 | 10 | 8 |

5. Two machines need to process six jobs. Based on the processing time in minutes given below, determine the optimal sequencing and the total elapsed time.

| Jobs | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|----|---|---|----|----|
| Machine A | 10 | 7 | 5 | 8 | 12 | 11 |
| Machine B | 6 | 11 | 9 | 9 | 7 | 4 |





6. Explain how the different models of OR help assess and solve business issues.
7. Discuss the practical applications of transportation and assignment.

SECTION – B

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

8. Use the Vogel's approximation method to solve the following transportation problem. Find an economical solution and conduct the test of optimality. The cost is given in Rs.

| Destination | | | | |
|-------------|----------|----------|----------|----------|
| Sources | Seller 1 | Seller 2 | Seller 3 | Seller 4 |
| Depot 1 | 7 | 5 | 11 | 130 |
| Depot 2 | 10 | 9 | 5 | 70 |
| Depot 3 | 8 | 10 | 7 | 60 |
| Requirement | 110 | 100 | 50 | 260/260 |

9. Solve the following assignment problem and find the total time taken. Time taken is given in minutes.

| Jobs | | | | | |
|---------|----------|----------|----------|----------|----------|
| Drivers | Travel 1 | Travel 2 | Travel 3 | Travel 4 | Travel 5 |
| A | 10 | 11 | 12 | 9 | 8 |
| B | 16 | 15 | 14 | 13 | 12 |
| C | 9 | 10 | 11 | 12 | 13 |
| D | 40 | 6 | 7 | 8 | 9 |
| E | 8 | 10 | 12 | 14 | 15 |

10. Draw the network diagram, find the total time for the completion of the project and the critical path.

| | | | | | |
|--------------------------|-------|-------|-------|-------|-------|
| Activity | 1 – 2 | 1 – 3 | 1 – 5 | 2 – 3 | 3 – 4 |
| Duration in weeks | 5 | 7 | 3 | 8 | 9 |
| 3 – 5 | 4 – 5 | 5 – 6 | 5 – 7 | 6 – 7 | 6 – 8 |
| 4 | 6 | 8 | 5 | 7 | 9 |
| 7 – 8 | 7 – 9 | 8 – 9 | | | |
| 6 | 3 | 9 | | | |



11. Solve the following LPP graphically :

$$\text{Minimise } Z = 4x_1 + 3x_2$$

Subject to the constraints :

$$9x_1 + 6x_2 \geq 36$$

$$20x_1 + 5x_2 \geq 60$$

$$x_1, x_2 \geq 0.$$

SECTION – C

Case study. This is a **compulsory** question.

(1×15=15)

12. A canteen makes idlis every morning for customers. The casserole can hold only fifty idlis. Any extra idlis are wasted. The idlis produced everyday vary from 47 to 55. Simulate the demand based on the given data. How many times is the casserole not full ? How many idlis are wasted because the casserole is already full ? If one idli costs Rs.15, how much money is lost due to wastage ? Should the canteen owner buy another casserole to hold the idlis ?

| | | | | | | | | |
|------|------|------|------|------|------|------|------|------|
| 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 0.10 | 0.05 | 0.20 | 0.05 | 0.10 | 0.15 | 0.05 | 0.15 | 0.15 |

The random numbers given are as follows: 24, 32, 55, 90, 86, 74, 43, 56, 61, 82, 45, 78, 25, 87, 23. Simulate the demand for 15 days.