

QP Code

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| 1 | 6 | 0 | 0 | 7 | 6 |
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Register Number

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VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Semester Examinations – April / May 2017

Regulations-2016

Programme: MBA

Semester: 2

Max. Marks: 100

Duration 3 Hrs

Course Code & Title: **16MST26**

OPERATIONS RESEARCH

Knowledge
Levels (KL)

K1 - Remembering
K2 - Understanding

K3 - Applying
K4 – Analyzing

K5 – Evaluating
K6 – Creating

Part A - Answer ALL Questions.

10 x 2 = 20 Marks

| No. | Question | KL |
|-----|---|----|
| 1. | Define 'Operations Research'. | K1 |
| 2. | List two application of Big-M method. | K1 |
| 3. | Write Vogel's Approximation Algorithm to solve Transportation Problem. | K3 |
| 4. | Explain 'Degeneracy in LPP'. | K2 |
| 5. | Describe any two uses of Project Management concepts in practical scenario. | K1 |
| 6. | Write about 'Dominance Property'. | K3 |
| 7. | Explain 'Ordering Cost'. | K2 |
| 8. | Write about the Decision Trees in Inventory Management. | K3 |
| 9. | Discuss about the Random Numbers. | K2 |
| 10. | Write about Jockeying in Queuing Theory. | K3 |

Part B - Answer ALL Questions.

5 x 13 = 65 Marks

| No | Question | Marks | KL |
|-----|---|-------|----|
| 11. | a Solve the following LPP by graphical method. Maximize $Z = 2x_1 + x_2$ Subject to $3x_1 + 2x_2 \leq 12$ $x_1 + 2x_2 \leq 7$ $x_1 + x_2 \leq 5$ and $x_1, x_2 \geq 0$ | 13 | K3 |

OR

b Solve the LPP using simplex method.

13 K3

$$\text{Maximize } Z = 4x_1 + 10x_2$$

$$\text{Subject to } 2x_1 + x_2 \leq 10,$$

$$2x_1 + 5x_2 \leq 20$$

$$2x_1 + 3x_2 \leq 18$$

$$\text{and } x_1, x_2 \geq 0$$

12. a A company has factories at F_1, F_2 and F_3 which supply to warehouses at W_1, W_2 and W_3 . Weekly factory capacities are 200, 160 and 90 units respectively. Weekly warehouses requirements are 180, 120 and 150 units respectively. Unit shipping costs (in rupees) are as follows.

13 K3

| | | Warehouse | | | Supply |
|---------|-------|-----------|-------|-------|--------|
| | | W_1 | W_2 | W_3 | |
| Factory | F_1 | 16 | 20 | 12 | 200 |
| | F_2 | 14 | 8 | 18 | 160 |
| | F_3 | 26 | 24 | 16 | 90 |
| Demand | | 180 | 120 | 150 | 450 |

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

OR

- b Solve the following assignment problems.

13 K3

| | M1 | M2 | M3 | M4 |
|----|----|----|----|----|
| J1 | 18 | 24 | 28 | 32 |
| J2 | 8 | 13 | 17 | 18 |
| J3 | 10 | 15 | 19 | 22 |

13. a The utility data for a network are given below.

13 K3

| Activity | 0-1 | 1-2 | 1-3 | 2-4 | 2-5 | 3-4 | 3-6 | 4-7 | 5-7 | 6-7 |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Duration | 2 | 8 | 10 | 6 | 3 | 3 | 7 | 5 | 2 | 8 |

Determine the total, free, independent and interfering floats and identify the critical path.

OR

- b A project consists of seven activities and the time estimates of the activities are furnished as under

13 K3

| Activity | Optimistic (Days) | Most likely (Days) | Pessimistic (Days) |
|----------|-------------------|--------------------|--------------------|
| 1-2 | 4 | 10 | 16 |
| 1-3 | 3 | 6 | 9 |
| 1-4 | 4 | 7 | 16 |
| 2-5 | 5 | 5 | 5 |
| 3-5 | 8 | 11 | 32 |
| 4-6 | 4 | 10 | 16 |
| 5-6 | 2 | 5 | 8 |

- (i) Draw the network diagram.
- (ii) Identify the critical path and its duration.
- (iii) Calculate the probability that project will be completed in 5 days earlier than the critical path duration?
- (iv) Calculate the project duration will provide 95% confidence level of completion ($Z_{0.95}=1.65$)?

14. a The demand for an item in a company is 18000 units per year, and the company can produce the items at a rate of 3000 per month. The cost of one set-up is Rs.500 and the holding cost of one unit per month is 15 paise. The shortage cost of one unit is Rs.20 per month. Determine
- (i) Optimum production batch quantity and the number of strategies
 - (ii) Optimum cycle time and production time
 - (iii) Maximum inventory level in the cycle
 - (iv) Total associated cost per year if the cost of the item is Rs.20 per unit

13 K3

OR

- b Find the optimal order quantity for which the price breaks are as follows:

13 K3

| Quantity | Unit cost |
|----------------------|-----------|
| $0 \leq Q_1 < 500$ | Rs.10 |
| $500 \leq Q_2 < 750$ | Rs.9.25 |
| $750 \leq Q_3$ | Rs.8.75 |

The monthly demand for the product is 200 units, shortage cost is 2% of the unit cost and the cost of ordering is Rs.100.

15. a A TV repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If he repairs the sets in the order in which they come in, and if arrival of sets is appropriate Poisson with an average rate of 10 per 8 hour day,
What is the repairman's expected idle time each day?
How many jobs are ahead of the average set just brought in? 13 K3

OR

- b A petrol pump station has 2 pumps. The service time follows the exponential distribution with a mean of 4 mins and cars arrive for service in a Poisson process at the rate of 10 cars per hour. Find 13 K3
- (i) The probability that a customer has to wait for service
 - (ii) The average waiting time, average time spends in the system and the average number of cars in the system.
 - (iii) For what proportion of time the pump remains idle?

Part – C

1 x 15 =15 Marks

16. a Solve the following LPP by using Big - M method 15 K3
- Minimum $Z = 2x_1 + 3x_2$
- Subject to $x_1 + x_2 \geq 6$,
- $7x_1 + x_2 \geq 14$,
- and $x_1, x_2 \geq 0$

OR

- b The annual demand for a component is 7200 units. The carrying cost is 500 per unit per year, the ordering cost is Rs.1500 per order and shortage cost is 2000 per unit per year. Find 15 K3
- (i) Optimal values of EOQ,
 - (ii) Maximum inventory,
 - (iii) Maximum shortage quantity,
 - (iv) Cycle time (t),
 - (v) Inventory period (t_1),
 - (vi) Shortage period (t_2).
