Code No.: **20328**

**MR12**

# MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
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## IV B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, APRIL-2018

Branch: **ME**

Subject: **Operations Research**

**Time: 3 hours** **Max. Marks: 75**

Answer any **FIVE** Questions of the following **5x15M=75M**

1. a) How and why OR methods have been valuable in aiding executive decisions? **[5M+10M]**
   b) Use simplex method to solve Max $z = 3x_1 + 2x_2$, subject to $x_1 + x_2 \leq 4$, $x_1 - x_2 \leq 2$ & $x_1, x_2 \geq 0$.
2. A salesman wants to visit A, B, C, D and E. He does not want to visit any city twice before completing his work. Find the least cost route.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| A | - | 2 | 5 | 7 | 1 |
| B | 6 | - | 3 | 8 | 2 |
| C | 8 | 7 | - | 4 | 7 |
| D | 12 | 4 | 6 | - | 5 |
| E | 1 | 3 | 2 | 8 | - |

3. An electric company which generates and distributes electricity conducted a study on the life of pole. The appropriate data is given in the table

| Years after installation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Percentage poles falling | 1 | 2 | 3 | 7 | 12 | 20 | 30 | 16 | 5 | 4 |

   a) If company now installs 5000 poles and follows a policy of replacing poles only when they fail, how many poles are expected to be replaced each year during the next 10 years? To simplify the computation, assume that failures occur and replacements are made only at the end of year **(7M)**
   b) The cost of replacing individual poles is '160. If we have a common group replacement policy, it costs '80 per pole. Find the optimal period for group replacement **(8M)**

4. a) Explain i) Two-person zero sum game ii) Principal of dominance **[5 M]**
   b) Solve the game whose playoff matrix to the player A is given in the table. **[10 M]**

| | I | II | III |
|---|---|---|---|
| I | 1 | 7 | 2 |
| II | 6 | 2 | 7 |
| III | 5 | 2 | 6 |

5. On an average 96 patients per day requires the service of an emergency clinic which can handle only one patient at a time. It takes on the average 10 minutes to give treatment to a patient. The cost of the treatment is Rs100/- per patient for 10 minutes. The cost increases at Rs10/- per minute of time reduced. How much amount should be budgeted by the clinic to reduce the queue size to 0.5?

6. A manufacturer requires rivets at an approximately constant rate of 2500 kgs/ year .The cost of the rivets is Rs 40 per kg. The company purchase manager estimates that the carrying cost of inventory is 10 % per year. Procurement cost is Rs 200/order. Find optimal lot size and total inventory cost.

7. a) Discuss in brief about Bellman's principle of optimality **[5M]**
   b) Use dynamic programming to **[10M]**

   Maximize $z= 2x_1+3x_2$

   Subjected to constraints

   $x_1+ x_2 \leq 1$

   $x_1+ x_2 \leq 3$

   $x_1+ x_2 \geq 0$

   $x_1, x_2, x_3 \geq 0$

8. A tourist car company finds that during the past 200 days the demand for the car has the following frequency distribution

| Trips per week | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Frequency | 16 | 24 | 30 | 60 | 40 | 30 |

Using random numbers simulate the demand for a period of 10 weeks.