Code No: RT32031          $\boxed{R13}$          $\boxed{SET - 1}$

### III B. Tech II Semester Supplementary Examinations, November -2018
## OPERATIONS RESEARCH
### (Mechanical Engineering)

Time: 3 hours                                    Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**
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### PART – A

| | | | |
|---|---|---|---|
| 1 | a) | State the general linear programming problem (LPP) and put it in the standard form. | [4M] |
| | b) | Give the mathematical formulation of transportation problem. How does it differ from an assignment problem? | [4M] |
| | c) | Write a note on Group replacement Policy? | [3M] |
| | d) | A game refers to a situation of business conflict. Discuss. | [3M] |
| | e) | Explain significance of inventory. | [4M] |
| | f) | Distinguish between mathematical models and simulation models. | [4M] |

### PART – B

2  a)  What do you mean by duality? Explain.                                    [6M]

   b)  Using Simplex method solve the LPP.                                       [10M]

$$\text{Maximize } Z = X_1+X_2+3X_3$$
$$\text{Subjected to} \quad 3X_1+2X_2+X_3 \leq 3$$
$$2X_1+X_2+2X_3 \leq 2$$
$$X_1,X_2,X_3 \geq 0$$

3    Solve the following transportation problem.                                [16M]

| | | Destinations | | | | | Availability |
|---|---|---|---|---|---|---|---|
| | | $D_1$ | $D_2$ | $D_3$ | $D_4$ | $D_5$ | |
| Origins | $O_1$ | 9 | 12 | 9 | 6 | 9 | 5 |
| | $O_2$ | 7 | 3 | 7 | 7 | 5 | 4 |
| | $O_3$ | 6 | 5 | 9 | 11 | 3 | 2 |
| | $O_4$ | 6 | 8 | 11 | 2 | 2 | 9 |
| Requirements | | 4 | 4 | 6 | 2 | 4 | 20 |

4  a)  A machine costs Rs. 10,000. Its operating cost and resale values are given below    [8M]

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Operating cost | 1000 | 1200 | 1400 | 1700 | 2000 | 2500 | 3000 | 3500 |
| Resale value | 6000 | 4000 | 3200 | 2600 | 2500 | 2400 | 2000 | 1600 |

Determine at what time it could be replaced?

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   b) Briefly explain what you mean by "individual and group replacement policy" in Replacement Analysis. [8M]

5  a) In a railway marshalling yard, goods train arrive at a rate of 30 trains per day. Assuming that inter arrival time and the service time distribution follows an exponential distribution with an average of 30 minutes. Calculate the following i) the mean queue size (ii) the probability that queue size exceeds 10 (iii) if the input of the train increases to an average of 33 per day, what will be the changes in (i) and (ii) [8M]

   b) Obtain the optimal strategies for both players and the value of the game for two-person zero-sum game whose payoff matrix is given below: [8M]

| Player A | Player B | |
|---|---|---|
| | $B_1$ | $B_2$ |
| $A_1$ | -6 | 7 |
| $A_2$ | 4 | -5 |
| $A_3$ | -1 | -2 |
| $A_4$ | -2 | 5 |
| $A_5$ | 7 | -6 |

6  Determine a decision rule using the basic purchasing EOQ model for annual demand of 20,000 units, ordering cost of Rs.200 per order and carrying cost of 10% per year. The basic price is Rs.8.00 per unit. This price is in effect of all orders of less than 5000 units. Orders for 5000 or more but less than 10000 units may be purchased for Rs.7.50 per unit. Orders for 10000 or more units may be purchased for Rs.7.25 per unit. [16M]

7  a) State and explain Bellman's principle of optimality in dynamic programming. [8M]
   b) What are the major limitations of simulation? Explain. [8M]

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