

III B.Tech II Semester Supplementary Examinations, April/May - 2019
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**

PART - A

- 1
 - a) What are the advantages and limitations of LP problem? [4M]
 - b) Give the mathematical formulation of an assignment problem [3M]
 - c) What are the situations which make the replacement of items necessary? [4M]
 - d) What is a rectangular game? Define pure strategy and mixed strategy in a game. [3M]
 - e) Derive the mathematical equation for EOQ. What are the assumptions involved? [4M]
 - f) What are the prerequisites for dynamic programming? [4M]

PART - B

- 2 Using Two-phase method to solve the LPP: [16M]
 Maximize $Z = 2X_1 + X_2 + X_3$

 Subjected to $4X_1 + 6X_2 + 3X_3 \leq 8$
 $3X_1 - 6X_2 - 4X_3 \leq 1$
 $2X_1 + 3X_2 - 5X_3 \leq 4, X_1, X_2, X_3 \geq 0$

- 3
 - a) When do you say a solution to a transportation problem is degenerate? [8M]
 - b) Find the sequence that minimises the total elapsed time (in hours) required to complete the following tasks on two machines. [8M]

Task	A	B	C	D	E	F	G	H	I
Machine I	2	5	4	9	6	8	7	5	4
Machine II	6	8	7	4	3	9	3	8	11

- 4 An automatic machine uses 250 moving parts as parts of its assembly. The average cost of a failed moving part is Rs.200. Removing the failed part and replacing it is time consuming and disrupts manufacture. Due to this problem, the management is considering group replacement policy i.e. replacing all the moving parts at a specific interval. What replacement policy should the manufacturer adopt? The information regarding the machine break down and the cost is given below. [16M]

Use time in months	1	2	3	4	5	6
Probability failure	0.05	0.05	0.10	0.15	0.25	0.40

Replacement	Replacement Cost		
	Purchase	Installation	Total
Individual Replacement	200	500	700
Group replacement	150	200	350

Code No: RT32031

R13
SET - 1

- 5 a) At what average rate must a clerk at a super market work in order to ensure a probability of 0.90 that the customers will not have to wait longer than 12 minutes? It is assumed that there is only one counter to which customers arrive in a Poisson fashion at an average rate of 15 per hour. The length of service by the clerk has an exponential distribution. [8M]
- b) Write the assumptions made in game theory. Solve the following game graphically. [8M]

	Player B	
Player A	1	2
	5	4
	-7	9
	-4	-3
	2	1

- 6 The consumption of an item is known to be fixed at 4,800 units per year. The cost of processing an order of this item is Rs.400 and the inventory carrying charges work out to 24% per annum of the cost of the item. The cost of the item depends on the purchase lot size as per schedule given below. Determine the optimum ordering policy. [16M]

Quantity	Unit cost (Rs)
Up to 999	20.00
1000-1499	18.50
1500 and above	17.00

- 7 a) Solve the following problem by using dynamic programming: [8M]
 Maximize $Z = 2x_1 + 9x_2$
 subjected to $2x_1 + x_2 \leq 25$
 $x_2 \leq 11, x_1, x_2 \geq 0$.
- b) Write the principal features of simulation languages and also discuss the types of simulation models. [8M]
