Code No:**R164205C** **R16** **Set No. 1**

IV B.Tech II Semester Advanced Supplementary Examinations, October - 2021

OPERATION RESEARCH

(Computer Science and Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) What are the different types of operational research models [2]
   b) Explain least cost method. [3]
   c) What do you mean by n Jobs through m Machines in sequencing? [2]
   d) Describe the characteristics of two –person zero-sum games? [2]
   e) What is replacement? Give any two examples? [3]
   f) Mention at least four reasons for keeping an inventory. [2]

PART–B *(4x14 = 56 Marks)*

2. a) Maximize $Z=1000X_1+4000X_2+5000X_3$ [10]
   Subject To
   $3X_1+3X_3 \leq 22$
   $X_1+2X_2+3X_3 \leq 14$
   $3X_1+2X_2 \leq 14$
   $X_1, X_2, X_3 \geq 0$
   i. Develop a simplex table
   ii. Analyse and find the values of X_1, X_2 and X_3?
   b) Write the limitations of operations research. [4]

3. a) Write & Explain stepping stone method with suitable example? [6]
   b) Obtain an optimal solution for the following transportation problem using MODI method? [8]

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	

4. a) Explain the procedure for processing 2 Jobs through 'm' machines. [6]
   b) A salesman stationed at city A has to decide his tour plan to visit cities B, C, D, E and back to city A in the order of his choice so that total distance traveled is minimum. No sub touring is permitted. He cannot travel from city A to city A itself. The distance between cities in Kilometers is given below [8]

Cities	A	B	C	D	E
A	M	16	18	13	20
B	21	M	16	27	14
C	12	14	M	15	21
D	11	18	19	M	21
E	16	14	17	12	M

Instead of M we can use infinity also, which is larger than all the elements in the matrix.

5. Use the idea of dominated strategies to determine optimal strategies for the reward matrix in Table shown below [14]

	Player B					
Player A	-5	-10	-1	-10	2	-1
	-1	2	-10	7	-5	20
	2	7	-5	-10	-10	7
	7	20	-1	-1	-1	2
	20	7	-10	7	-1	-10

Formulate this as a two-person zero-sum game. Then graphically determine the value of the game and each player's optimal strategy.

6. The following failure rates have been observed for a certain type of transistors in digital computer: [14]

End of week:	1	2	3	4	5	6	7	8
Prob. Of failure:	0.07	0.11	0.25	0.41	0.70	0.88	0.96	1.00

The cost of replacement of transistors individually on failure is Rs. 15 per unit. A decision is made to replace all transistors simultaneously and to replace the individual transistor as they fail in service. If the cost of group replacement is Rs.8/unit,

i) What is the best interval between group replacements?

ii) Which policy of replacement is economical?

iii) If group replacement is economical at current cost, at what cost of individual replacement, group replacement would be uneconomical?

iv) How high can the cost per unit in group replacement be to make a preference for individual replacement policy?

7. A specialty coffeehouse sells Colombian coffee at a fairly steady rate of 140Kg annually. The coffee beans are purchased from a local supplier with the price of Rs.100 per Kg. No shortage allowed. The coffeehouse estimates that it costs Rs.10,000 in paperwork and labor to place an order for the coffee beans. The holding cost of the coffee beans is based on a 20 percent annual interest rate. i)Determine the optimal order quantity for Colombian coffee. ii)What is the time between placement of two consecutive orders? iii)What is the average annual cost of holding and setup due to this item? iv)If replenishment lead time is three weeks, determine the reorder point. [14]