Payoff matrix

		Player B's strategies		
Player A's strategies		b_1	b_1	b_1
	a_1	7	4	4
	a_2	3	5	8

4. The maintenance cost and resale value per year of a machine whose purchase price is Rs. 7,000 is given in the Table. When should the machine be replaced ? **15**

Yearly maintenance costs and resale value data

Year	**Maintenance Cost (Rs.)**
1	100
2	250
3	400
4	600
5	900
6	1200
7	1600
8	2000

CC-85

M. Tech. EXAMINATION, Dec. 2018

(Third Semester)

(B. Scheme) (Main & Re-appear)

(ME)

MEI601B

ADVANCE OPERATION RESEARCH

Time : 3 *Hours*] [*Maximum Marks* : 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section. All questions carry equal marks. Use of statistical tables is permitted. Assume the missing data, if any, suitably.

Section I

1. A travelling salesman has to cover five cities in his tour. He has to visit the cities one by one and then return to the starting city. The travelling cost (in thousands of rupees) to each city from different cities is as given in Table. Which sequence of cities minimizes his total cost ? **15**

Travelling costs between cities

To → From ↓	A	B	C	D	E
A	—	3	6	8	2
B	7	—	4	9	3
C	9	8	—	5	8
D	13	5	7	—	6
E	2	4	3	9	—

2. A company has three plants and four warehouses. The supply and demand of the units and the corresponding transportation costs are given in the Table.

Data of Transportation Costs

Warehouse → Plant ↓	1	2	3	4	Supply
A	6	11	5	6	100
B	7	9	8	3	250
C	5	3	6	8	200
Demand	250	100	150	50	

Answer the following questions :

(a) Is the solution degenerate ?

(b) Is the optimal solution unique ? If it is not, then show the alternate optimal solution.

(c) If the cost of the route C4 is reduced from 8 to 7 per unit, will it affect the optimal solution ? **15**

Section II

3. Solve the game with the payoff matrix shown in the Table given ahead , using the algebraic method : **15**

(b) What is the probability that up to three customers will reach the telephone booth in a 30-minute period ?

(c) What is the probability that above three customers will reach the telephone booth in a 30-minute period ?

Section IV

7. Explain the forward and backward methodology of solving a Dynamic Programming (DP) problem, using the example of a network. **15**

8. For the following function, determine whether the function is convex, concave, or neither.

$f(x) = 3x_1x_2 - x_1^2 - x_2^2$. **15**

Section III

5. Draw the network diagram for the list of activities shown in the Table. **15**

Activities with predecessor relationships

Activity	Predecessor	Activity	Predecessor
A	—	E	D
B	A	F	E
C	B	G	E
D	C	H	C
I	C, F	P	O
J	G, H, I	Q	B
K	J	R	N
L	K	S	L, M
M	K	T	S
N	K	U	P, Q
O	D	V	U

6. On average, five customers reach a telephone booth every hour to make a call : **15**

(a) Determine the probability that exactly customers will reach the telephone booth in a 30-minute period, assuming that the arrivals follow that Poisson distribution.