DHANAMANJURI UNIVERSITY
Examination- 2023 (June)
Four-year course B.Sc./B.A. 2nd Semester

Name of Programme : **B.Sc./B.A. Mathematics**
Paper Type : **SEC(Theory)**
Paper Code : **SMA-003**
Paper Title : **Transportation and Game Theory**
Full Marks : 30
Pass Marks : 12 **Duration: 2 Hours**

The figures in the margin indicate full marks for the questions
Answer any three of the following questions:

1. a) Write a necessary and sufficient condition for the existence of a feasible solution to the transportation problem.

   b) Write the standard mathematical model for the transportation problem.

   c) Obtain an initial basic feasible solution to the following transportation problem using the Vogel's approximation method. 2+3+5=10

	D_1	D_2	D_3	D_4	Capacity
O_1	1	2	3	4	6
O_2	4	3	2	0	8
O_3	0	6	8	6	10
Demand	4	6	8	6	24

2. A company has three cement factories located in cities 1, 2, 3 which supply cement to four projects located in towns A, B, C and D. Each plant can supply daily 6, 1, 10 truckloads of cement respectively and the daily cement requirements of the projects are respectively 7, 5, 3, 2 truckloads. The following table depicts the transportation cost per truckloads of cement (in hundreds of rupees) from each plant to each project site. Determine the optimal distribution for the company by using U-V method so as to minimize the total transportation cost. 10

	A	B	C	D	Supply
Sources-1	2	3	11	7	6
Sources-2	1	0	6	1	1
Sources-3	5	8	15	9	10
Demand	7	5	3	2	

3. a) Write the standard mathematical model for the Assignment problem.

   b) Five different machines can do any of the required five jobs with different profits resulting from each assignment as given below.

Jobs/Machines	Machine A	Machine B	Machine C	Machine D	Machine E
Job1	40	47	50	38	50
Job2	50	34	37	31	46
Job3	50	42	43	40	45
Job4	35	48	50	46	46
Job5	39	72	51	44	49

   Find out the maximum profit possible through optimal assignment. 3+7=10

4. a) Write some characteristics of Competitive Game.

    b) Define Two-Person Zero-Sum Game.

    c) When a Game is said to have Saddle point?

    d) Solve the following game. What is the value of the game and is it fair game?

Player A		Player B			
		B_1	B_2	B_3	B_4
	A_1	20	15	12	35
	A_2	25	14	8	10
	A_3	-5	4	11	0

3+2+2+3=10

5. Find the initial basic solution for the following transportation problem by using Matrix Minima method and North West Corner rule.   5+5=10

	D_1	D_2	D_3	D_4	Total supply
A	5	3	6	2	19
B	4	7	9	1	37
C	3	4	7	5	34
Total demand	16	18	31	25	

6. Define Assignment problem. Solve the cost-minimizing assignment problem.   2+8=10

Person/Jobs	I	II	III	IV	V
A	11	10	18	5	9
B	14	13	12	19	6
C	5	3	4	2	4
D	15	18	17	9	12
E	10	11	19	6	14

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