DHANAMANJURI UNIVERSITY

Examination- 2025 (June)

Four-year course B.A/B.Sc. 2nd Semester (NEP)

Name of Programme	:	B.A. / B.Sc. Mathematics (Honours)
Paper Type	:	SEC (Theory)
Paper Code	:	SMA-003
Paper Title	:	Transportation and Game Theory
Full Marks	:	40
Pass Marks	:	16 Duration: 2 Hours

The figures in the margin indicate full marks for the questions.

1. Choose and rewrite the correct answer for the following questions: 1×4=4

   a) Which method is used to find the optimal solution in the Transportation Problem?

      i) Vogel's Approximation Method

      ii) Simplex Method

      iii) MODI Method

      iv) Graphical Method

   b) What is Hungarian method used for?

      i) solving transportation problems

      ii) solving assignment problems

      iii) solving Linear Programming Problems

      iv) solving games

   c) What is the primary focus of Game Theory?

      i) Study human behavior

      ii) analyzing strategic interactions

      iii) Finding minimum transportation cost

      iv) Assigning tasks to agents

d) If a game does not have a saddle point then the solution offers

    i) a mixed strategy

    ii) a pure strategy

    iii) a pure game

    iv) a mixed game

2. **Answer the following questions.**   1×6=6

a) What is an unbalanced transportation problem?

b) What do you mean by a saddle point of a game?

c) What do you mean by a fair game?

d) When is a player said to have a mixed strategy in a game?

e) Define a two person zero sum game.

f) When is the basic feasible solution said to be non degenerate?

3. **Answer the following questions.**   3×4=12

a) Write the steps of Vogel's Approximation Method for finding the initial basic feasible solution of a transportation problem.

b) Obtain an initial basic feasible solution to the following transportation problem using North West Corner Rule.

	D_1	D_2	D_3	D_4	Supply
O_1	10	2	20	11	15
O_2	12	7	9	20	25
O_3	4	14	16	18	10
Demand	5	15	15	15	

c) Solve the following game using dominance property.

		Company Y			
		E	F	G	H
	A	3	2	4	5
Company X	B	2	1	3	4
	C	1	0	2	3
	D	0	-1	1	2

d) The pay off matrix of a game is given below. find the solution. Is it a fair game?

Player A		Player B				
		B_1	B_2	B_3	B_4	B_5
	A_1	-2	0	0	5	3
	A_2	4	2	1	3	2
	A_3	-4	-3	0	-2	6
	A_4	5	3	-4	2	-6
	A_5	-2	-1	0	1	2

4. **Answer the following questions. (Choose any two)**

$9 \times 2 = 18$

a) The Head of Department has five jobs A,B,C,D and E and 5 subordinates V,W,X,Y and Z. The number of hours each subordinate would take to perform each job is as follows:

	V	W	X	Y	Z
A	3	5	10	15	8
B	4	7	15	18	8
C	8	12	20	20	12
D	5	5	8	10	6
E	10	10	15	25	10

How would the jobs be allocated to minimize the total time?

b) Find the solution of the game whose payoff matrix is as follows:

Player A		Player B	
		B_1	B_2
	A_1	2	4
	A_2	3	1
	A_3	1	3
	A_4	4	0
	A_5	0	5
	A_6	5	-1

c) Derive the formula for solving any 2x2 two person zero sum game without any saddle point where the pay off matrix of player A is

Player A		Player B	
		B_1	B_2
	A_1	a_{11}	a_{12}
	A_2	a_{21}	a_{22}

d) Determine an initial basic feasible solution of the following transportation problem by Vogel's approximation method. Test the optimality of the solution by using UV method and find the optimal solution.

	Destination				
	D1	D2	D3	D4	Supply
Source A	19	30	50	10	7
Source B	70	30	40	60	9
Source C	40	8	70	20	18
Demand	5	8	7	14	

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