Problem Sheet 5
(Transportation Problem)

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1. Use the north-west corner rule to determine an initial basic feasible solution to the following transportation problems:

	D_1	D_2	D_3	D_4	Supply
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Demand	6	10	15	4	

	I	II	III	IV	V	Supply
A	2	11	10	3	7	4
B	1	4	7	2	1	8
C	3	9	4	8	12	9
Demand	3	3	4	5	6	

2. Using the lowest-cost entry method, find the initial B.F.S. of the following transportation problems:

	A	B	C	D	Supply
I	1	5	3	3	34
II	3	3	1	2	15
III	0	2	2	3	12
IV	2	7	2	4	19
Demand	21	25	17	17	

	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	2	2	1	10
Demand	4	6	8	6	

3. Obtain an initial B.F.S. to the following transportation problems using the Vogel approximation method:

	I	II	III	IV	Available
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	1	4	2	19
Demand	21	25	17	17	

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	2	5	9	20
Demand	20	40	30	10	100

4. Find the initial basic feasible solution of the following transportation problem using (i) north-west corner rule (i) least-cost entry method (iii) Vogel's approximation method:

	W_1	W_2	W_3	W_4	Capacity
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement	5	8	7	14	

Is the solution obtained by each method an optimal solution? If not, obtain the optimal solution.

5. Determine the optimum basic feasible solution to the following transportation problem:

	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	2	2	1	10
Requirement	4	6	8	6	

6. The cost-requirement table for the transportation problem is given below:

	W_1	W_2	W_3	W_4	W_5	Available
F_1	4	3	1	2	6	40
F_2	5	2	3	4	5	30
F_3	3	5	6	3	2	20
F_4	2	4	4	5	3	10
Required	30	30	15	20	5	

Obtain the optimal solution to the problem.

7. Is $x_{13} = 50$, $x_{14} = 20$, $x_{21} = 55$, $x_{31} = 30$, $x_{32} = 35$, $x_{34} = 25$ an optimum solution of the following transportation problem?

					Available units
	6	1	9	3	70
	11	5	2	8	55
	10	12	4	7	90
Required units	85	35	50	45	

8. The following table gives the cost for transporting material from supply points A, B, C and D to demand points E, F, G, H and J.

	E	F	G	H	J
A	8	10	12	17	15
B	15	13	18	11	9
C	14	20	6	10	13
D	13	19	7	5	12

The present allocation is as follows:

$$A \to E : 90; A \to F : 10; B \to F : 150; C \to F : 10; C \to G : 50; C \to J : 120; D \to H : 210; D \to J : 70.$$

Check if this allocation is optimum. If not, find an optimum schedule.

9. Consider the following unbalanced transportation problem:

	D_1	D_2	D_3	Supply
O_1	5	1	7	10
O_2	6	4	6	80
O_3	3	2	5	15
Demand	75	20	50	

   (a) Solve it for cost minimization.

   (b) Suppose there are penalty costs for every unsatisfied demand unit which are given by 5, 3 and 2 for destinations D_1, D_2 and D_3 respectively. Find the optimal solution.