

Lukhdhirji Engineering College, Morbi

Department of Mechanical Engineering

Assignment 2. Transportation and Assignment (CO3)

Subject: Operation Research (3151910)

Semester: 5th

Year: 2022-23

1. A company has factories at F1, F2 and F3 which supply to warehouses at W1, W2, and W3. Weekly factory capacities are 200,160 and 90 units, respectively. Weekly warehouses requirement are 180,120 and 150 units, respectively. Unit shipping costs (in Rs.) are as follows. Determine the optimal distribution to minimize total transportation cost.

Factory	Warehouse			Supply
	W1	W2	W3	
F1	16	20	12	200
F2	14	8	18	160
F3	26	24	16	90
Demand	180	120	150	450

2. A transport company has 5, 10, 7 and 3 trucks available at four different sites A, B, C and D. Its customers have requirement of 5, 8 and 10 trucks at three different destinations X, Y and Z respectively. The distance (in kms.) from an origin to destination is summarized in following table.

Sites	Customers		
	X	Y	Z
A	70	30	60
B	40	60	80
C	50	80	40
D	80	40	30

Formulate above problem as a transportation problem and determine strategy for a company using VAM. Test the optimality of VAM solution and determine optimum strategy for the transport company.

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3. Find the optimal solution of the following Transportation problem using MODI method. Use VAM to find IBFS.

	M1	M2	M3	M4	Supply
F1	3	2	4	1	20
F2	2	4	5	3	15
F3	3	5	2	6	25
F4	4	3	1	4	40
Demand	30	20	25	25	

4. Consider the transportation problem shown in table below. Find the initial basic feasible solution using Northwest corner method and Least cost cell method.

		1	2	3	4	5	Supply
Plant	1	20	4	32	28	20	3000
	2	12	36	24	26	32	5000
	3	16	8	28	24	20	8250
	4	28	44	40	16	36	3750
Demand		3500	4000	2500	1500	4000	

5. A Manufacturer wants to ship 8 loads of his product as shown in following matrix. The matrix gives the mileage from origins, O to the destinations, D. The shipping cost is Rs. 10 per load per mile. What will be the optimal schedule and optimal cost? Use Vogel's approximation method to find initial basis feasible solution and MODI method to obtain optimal solution.

	D1	D2	D3	Supply
O1	50	30	220	1
O2	90	45	170	3
O3	250	200	50	4
Demand	4	2	2	

6. Obtain an I.B.F.S. to the following transportation problem using N-W Corner method & Optimum solution by STEPPING STONE method.

	Q1	Q2	Q3	Q4	Supply
P1	1	3	2	4	8
P2	5	4	2	0	10
P3	0	3	3	1	12
Demand	4	5	8	5	

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7. Solve the following transportation problem for maximum profit. Use Vogel's approximation method to find out initial feasible solution.

		Market (Per unit profit in Rs.)			
		A	B	C	D
Warehouse	X	12	18	6	25
	Y	8	7	10	18
	Z	14	3	11	20

Availability in	Demand in the
X = 200 units	A = 180 units
Y = 500 units	B = 320 units
Z = 300 units	C = 100 units
	D = 400 units

8. The following is the cost matrix of assigning the 4 operators to 4 jobs. Each operator is assigned only one job so as to minimize the total cost of jobs. What will be the total minimum job cost?.

Operators	Job			
	J₁	J₂	J₃	J₄
O1	2	10	9	7
O2	15	4	14	8
O3	13	14	16	11
O4	4	15	13	9

9. The captain of a cricket team has to allot five middle order batting positions to six batsmen available for selection. The average runs scored by each batsmen at these positions are summarized in a table below.

Using Assignment model, determine the assignment of batsmen top positions which would give maximum runs in favor of team. Which batsmen will not qualify for selection based on the solution obtained?

Batsman	Batting Position
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	III	IV	V	VI	VII
A	40	40	35	25	50
B	42	30	16	25	27
C	50	48	40	60	50
D	20	19	20	18	25
E	58	60	59	55	53
F	45	62	38	50	49

10. A solicitors' firm employs typists on hourly piece-rate basis for daily work. There are five typists available with hourly charges and speed mentioned in table below.

Typist	A	B	C	D	E
Rate per hour (Rs.)	5	6	3	4	4
No. pages typed/hour	12	14	8	10	11

There are five jobs available to the firm and it wishes to allocate one job to one typist only. The typist is paid for full hour even if he works for fraction of an hour. The details of job are given in table below.

Job	P	Q	R	S	T
No. of pages	199	175	145	298	178

Find least cost allocation for the firm using Assignment model.

11. The captain of cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:

Batsman	Batting Position				
	I	II	III	IV	V
P	40	40	35	25	50
Q	42	30	16	25	27
R	50	48	40	60	50
S	20	19	20	18	25
T	58	60	59	55	53

Find the assignments of batsmen to positions which would give the maximum number of runs.

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12. Consider the assignment problem shown in table below. In the problem 5 different jobs are to be assigned to 5 different operators such that the total processing time is minimized. The matrix entries represent processing times in hours. Develop a zero-one programming model and also solve with Hungarian method.

	1	2	3	4	5
1	20	24	30	24	16
2	14	32	28	28	22
3	26	28	14	18	18
4	24	20	22	26	20
5	16	26	30	22	30

13. Solve the following assignment problem by minimization method.

	I	II	III	IV	V
M ₁	12	5	9	18	11
M ₂	13	7	6	12	14
M ₃	3	2	3	4	5
M ₄	18	9	12	16	15
M ₅	12	6	14	19	10

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