

## ASSIGNMENT (Transportation & Assignment Problem)

### OPERATION RESEARCH

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**Q.1.** Define Transportation problem. Explain the process of solving a transportation problem.

**Q.2.** List out the differences and similarities between general linear programming model and Transportation model.

**Q.3.** Explain the differences and similarities between Assignment problem and Transportation problem.

**Q.4.** Explain briefly the procedure adopted in assignment algorithm. What do you mean by balancing an assignment problem?

**Q.5.** Four companies W, X, Y and Z supply the requirements of three warehouses A, B and C respectively. The companies' availability, warehouses requirements and the unit cost of transportation are given in the following table.

Companies	Cost in Rs. Warehouses			Supply
	A	B	C	
W	10	8	9	15
X	5	2	3	20
Y	6	7	4	30
Z	7	6	9	35
Requirement	25	26	49	

Find an initial basic feasible solution using:

**a.** North West Corner Method

**b.** Least Cost Method

**c.** Vogel Approximation Method (VAM)

**Q.6.** A transport company ships truckloads of food grains from three sources viz. X, Y, Z to four mills viz. A, B, C, D respectively. The supply and the demand together with the unit transportation cost per truckload on the different routes are described in the following transportation table. Assume that the unit transportation costs are in hundreds of Rs. Determine the optimum minimum shipment cost of transportation using MODI method.

Sources	Cost in Rs. (*100)				Supply
	Mills				
	A	B	C	D	
X	10	2	20	11	15
Y	12	7	9	20	25
Z	4	14	16	18	10
Demand	5	15	15	15	

**Q.7.** Four factories, A, B, C and D produce sugar and the capacity of each factory is given as: Factory A produces 10 tons of sugar and B produces 8 tons of sugar, C produces 5 tons of sugar and that of D is 6 tons of sugar. The sugar has demand in three markets X, Y and Z. The demand of market X is 7 tons, that of market Y is 12 tons and the demand of market Z is 4 tons. The following matrix gives the transportation cost of 1 ton of sugar from each factory to the destinations. Find the optimal solution for least transportation cost.

Factories	Cost in Rs. Per ton		
	Market		
	X	Y	Z
<b>A</b>	400	300	200
<b>B</b>	500	600	100
<b>C</b>	600	400	300
<b>D</b>	300	500	400

**Q.8.** A company has three plants A, B and C and three warehouses X, Y and Z. Number of units available at the plants is 60, 70 and 80, respectively. Demands at X, Y and Z are 50, 80 and 80, respectively. Unit Costs of transportation are as follows:

Plants	Cost in Rs.			Supply
	Warehouses			
	X	Y	Z	
A	8	7	3	60
B	3	8	9	70
C	11	3	5	80
Demand	50	80	80	

Using the “Lowest Cost Method” obtain the initial solution. Also find the optimal solution for least transportation cost using MODI Method.

**Q.9.** A work shop contains four persons available for work on the four jobs. Only one person can work on any one job. The following table shows the cost of assigning each person to each job. The objective is to assign person to jobs such that the total assignment cost is a minimum. Find the minimum cost of assignment.

Persons	Jobs			
	1	2	3	4
<b>A</b>	20	25	22	28
<b>B</b>	15	18	23	17
<b>C</b>	19	17	21	24
<b>D</b>	25	23	24	24

**Q.10.** A marketing company wants to assign three employees viz. A, B, and C to four offices located at W, X, Y and Z respectively. The assignment cost for this purpose is given in following table. How should be the employees assigned to the different offices so as to minimize the total cost of assignment? Find the total cost of assignment.

Employees	Offices			
	W	X	Y	Z
<b>A</b>	160	220	240	200
<b>B</b>	100	320	260	160
<b>C</b>	100	200	460	250

**Q.11.** Carefree Corporation has four plants each of which can manufacture anyone of the four products. Product costs differ from one plant to another as given in the following table. You are required to obtain which product each plant should produce to minimise the total cost of assignment? Also find the total cost of assignment.

Plant	Product			
	1	2	3	4
<b>A</b>	33	40	43	32
<b>B</b>	45	28	31	23
<b>C</b>	42	29	36	29
<b>D</b>	27	42	44	38

**Q.12.** A company has 5 jobs to be done. The following matrix shows the return in rupees on assigning  $i^{\text{th}}$  ( $i = 1, 2, 3, 4, 5$ ) machine to the  $j^{\text{th}}$  job ( $j = A, B, C, D, E$ ). Assign the five jobs to the five machines so as to maximize the total expected profit and find the total maximum profit.

Plant	Product				
	A	B	C	D	E
1	5	11	10	12	4
2	2	4	6	3	5
3	3	12	5	14	6
4	6	14	4	11	7
5	7	9	8	12	5