Transportation Problem (T.P.)

- Minimization Model
- Allocation model

IBFS – check for optimality – improving the solution if needed – SBFs ....

Prob 1

Find the Initial Basic Feasible Solution (IBFS) for the transportation problem below.

Warehouses

Factories	W1	W2	W3	W4	Capacity
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Requirement	5	8	7	14	

Capacity = Availability = Supply

Requirement = Demand

In order to solve TP, it requires to be balanced T.P.

When Σ Demand = Σ Supply – Balanced T.P.

Σ Demand $\neq$ Σ Supply – Unbalanced T.P.

Solution

Total Demand/requirement = 5+8+7+14 = 34 units

Total Capacity = 7+9+18 = 34 units

As Total requirement = Total Capacity

Given T.P. is a balanced T.P.

(1) North-West Corner Rule (Stepping stone method)

	W_1	W_2	W_3	W_4	Capacity
F_1	19 (5)	30 (2)	50	10	~~7~~ ~~2~~
F_2	70	30 (6)	40 (3)	60	~~9~~ ~~3~~
F_3	40	8	70 (4)	20 (14)	~~18~~ ~~14~~
Requirement	~~5~~	~~8~~ ~~6~~	~~7~~ ~~4~~	~~14~~	

Total transportation cost (TTC) = $[(19\times5)+(30\times2)+(30\times6)+(40\times3)+(70\times4)+(20\times14)]$ =

$= (95+60+180+120+280+280) = \underline{\text{Rs } 1{,}015}$

(2) Row minima method

	W_1	W_2	W_3	W_4	Capacity
F_1	19	30	50	10 (7)	~~7~~
F_2	70	30 (8)	40 (1)	60	~~9~~ ~~1~~
F_3	40 (5)	8	70 (6)	20 (7)	~~18~~ ~~11~~ ~~6~~
Requirement	~~5~~	~~8~~	~~7~~ ~~6~~	~~14~~ ~~7~~	

Total Transportation cost (TTC) = $[(10\times7)+(30\times8)+(40\times1)+(40\times5)+(70\times6)+(20\times7)]$

$= 70+240+40+200+420+140 = \underline{\text{Rs } 1110}$/-

(3) Coloumn minima method

	W1	W2	W3	W4	Capacity
F1	19 (5)	30	50	10 (2)	~~7~~ ~~2~~
F2	70	30	40 (7)	60 (2)	~~9~~ ~~2~~
F3	40	8 (8)	70	20 (10)	~~18~~ ~~10~~
Requirement	~~5~~	~~8~~	~~7~~	~~14~~ ~~12~~ ~~2~~	

$$TTC = Rs\left[(19\times5)+(8\times8)+(40\times7)+(10\times2)+(60\times2)+(20\times10)\right]$$

$$= Rs\,(95+64+280+20+120+200) = \underline{Rs\ 779}$$

(4) Matrix minima method (Least cost Entry Method)

	W1	W2	W3	W4	Capacity
F1	19	30	50	10 (7)	~~7~~
F2	70 (2)	30	40 (7)	60	~~9~~ ~~2~~
F3	40 (3)	8 (8)	70	20 (7)	~~18~~ ~~10~~ ~~3~~
Requirement	~~5~~ ~~2~~	~~8~~	~~7~~	~~14~~ ~~7~~	

Max Demand
or
Min Supply

$$TTC = Rs\left[(10\times7)+(70\times2)+(40\times7)+(40\times3)+(8\times8)+(20\times7)\right]$$

$$= Rs\,(70+140+280+120+64+140)$$

$$= \underline{Rs\ 814}$$

(5) Vogel's Approximation method (VAM)

	W1	W2	W3	W4	Capacity	
f1	19 (5)	30	50	10 (2)	~~7~~ ~~2~~	[9] [9] [40] [40]
f2	70	30	40 (7)	60 (2)	~~9~~ ~~2~~	[10] [20] [20] [20]
f3	40	8 (8)	70	20 (10)	~~18~~ ~~10~~	[12] [20] [50] ←
Requirement	~~5~~	~~8~~	~~7~~	~~14~~ ~~4~~ ~~2~~		
	[21]	[22] ↑	[10]	[10]		
	[21] ↑		[10]	[10]		
			[10]	[10]		
			[10]	[50] ↑		

$$TTC = Rs[(19\times5) + (10\times2) + (40\times7) + (60\times2) + (8\times8) + (20\times10)]$$

$$= Rs\,(95 + 20 + 280 + 120 + 64 + 200) = Rs\ \underline{779}$$

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1) N-W Corner Rule — Rs 1015

2) Row minima method — Rs 1110

3) Coloumn minima method — Rs 779 —

4) Matrix Minima method — Rs 814

5) Vogel's Approximation method — 779 —