Operation Research

Q. A company has a current shipping schedule, which is being questioned by the management as to whether or not it is optimal. The firm has 3 factories and 4 warehouses. The necessary data in terms of transportation cost in ₹ per unit from a factory to a destination and factory capacities and warehouse requirements are as follows.

Warehouses	W_1	W_2	W_3	W_4	Requirement
factory					
F_1	19	30	50	10	720
F_2	40	30	40	60	900
F_3	40	8	70	20	1800
capacity	500	800	700	1400	

Solve for a basic feasible shipping schedule in terms of lowest possible shipping cost

Soln:- As Σ capacity = Σ Requirements, the above problem is balanced.

We will use Vogel's Approximation Method to solve the above problem.

Requirements = 700 + 900 + 1800 = 3400

Capacity = 500 + 800 + 700 + 1400 = 3400

Iteration 1 :-

warehouse / factory	W_1	W_2	W_3	W_4	requirements	penalties
F_1	19	30	50	10	700	9
F_2	40	30	40	60	900	10
F_3	40	8 (800)	70	20	1800 1000	12
capacity	500	800	700	1400	3400	-
penalties	21	22 ↑	10	10	-	-

Iteration 2

warehouse / factory	W_1	W_3	W_4	requirement	penalties
F_1	19 (500)	50	10	700 200	9
F_2	40	40	60	900	20
F_3	40	70	20	1000	20
capacity	500	700	1400	2600	-
penalties	21 ↑	10	10	-	-

Iteration 3.

warehouse / factory	W_3	W_4	requirement	penalties
f_1	50	10	200	40
F_2	40	60	900	20
F_3	70	20 (1000)	1000	50 ←
capacity	700	1400 400	2100	-
penalties	10	10	-	-

Iteration 4.

Warehouse / factory	W_3	W_4	requirement	penalties
F_1	50	10 (200)	200	40
F_2	40	60 (~~400~~)	900 ~~800~~	20
capacity	700	400 ~~200~~	1100	
penalties	10	50 ↑		

Iteration 5.

warehouse / factory.	W_3	W_4	requirement.	-
F_2	40 (700)	60 (200)	900	-
capacity	700	200	900	-
penalties	-	-		

Warehouse / factory	W_1	W_2	W_3	W_4	requirements
f_1	19 (500)	30	50	10 (200)	700
f_2	40	30	40 (700)	60 (200)	900
f_3	40	8 (800)	70	20 (1000)	1800
capacity	500	800	700	1400	

Total cost = $19\times500 + 10\times200 + 40\times700 + 60\times200 + 8\times800 + 20\times1000$

$= 9500 + 2000 + 2800 + 12000 + 6400 + 20000$

$= 52700$