

17-S2-Q1

Solution (i)

① supply: $50 + 70 + 60 = 180$

demand: $75 + 65 + 40 = 180$

So this is a balance transportation problem

② Table

Supermarket					supply	Row dif
Factory		1	2	3		
	1	26	25	20	(40)	5
	2	20	23	18	70	2
	3	24	24	20	60	4
Demand		75	65	40		
		col dif 4	1	2		

③

Supermarket					supply	Row dif
Factory		1	2	3		
	1	26	25	20	(40)	1
	2	20	(70)	18	70	3
	3	24	24	20	60	0
Demand		75	65	0		
		col dif	(4) max	1		

④

Supermarket					
		1	2	3	supply
Factory	1	26	25	20	10
	2	20	23	18	0
	3	20	24	20	60
Demand		5	65	0	

row dif

1

0

col dif (2) 1
max

⑤

Supermarket					
		1	2	3	supply
Factory	1	26	25	20	10
	2	20	23	18	0
	3	20	24	20	55
Demand		0	65	0	

⑥ So the result is

		Supermarket			supply
		1	2	3	
Factory	1	26	25 (10)	20 (40)	50
	2	20 (70)	23	18	70
	3	24 (5)	24 (55)	20	60
Demand		75	65	40	

⑦ Test the optimum

		Supermarket			supply	u_i
		1	2	3		
Factory	1	26 1	25 (10)	20 (40)	50	0
	2	20 (70)	23 3	18 3	70	-5
	3	24 (5)	24 (55)	20 1	60	-1
Demand		75	65	40		

V_i 25 25 20

Since all blocks are nonnegative,
the result is optimum.

(ii) Sensitivity analysis \rightarrow not within exam

(b) Solution

	J_1	J_2	J_3	J_4	J_5
P_1	20	15	16	17	M
P_2	M	M	16	20	17
P_3	12	15	11	M	17
P_4	13	M	14	20	12

M denote a very large number

Extra Solution

①

	J_1	J_2	J_3	J_4	J_5
P_1	20 ⁸	15 ⁰	16 ⁵	17 ⁰	M
P_2	M	M	16 ⁵ ²	20 ³ ⁰	17 ⁵ ²
P_3	12 ⁰	15 ⁰	11 ⁰	M	17 ⁵
P_4	13 ⁰	M	14 ³ ²	20 ³ ²	12 ⁰

②

	J_1	J_2	J_3	J_4	J_5
P_1	8	0	5	0	M
P_2	M	M	2	0	2
P_3	0	0	0	M	5
P_4	0	M	2	2	0

③ cover all zero use minimum lines, adjust

	J_1	J_2	J_3	J_4	J_5
P_1	8	0	5	2 ²	M
P_2	M	M	2 ⁰	0	2 ⁰
P_3	0	0	0	M	5
P_4	0	M	2	2 ⁴	0

④ assignment

	J_1	J_2	J_3	J_4	J_5	min cost
P_1	8	0*	5	2	M	$= 15 + 16 + 12 + 12$ $= 55$
P_2	M	M	0*	0	0	
P_3	0*	0	0	M	5	
P_4	0	M	2	4	0*	

PS we can have a lot of solution can be accepted

	J_1	J_2	J_3	J_4	J_5
P_1	8	0*	5	2	M
P_2	M	M	0	0*	0
P_3	0*	0	0	M	5
P_4	0	M	2	4	0*

	J_1	J_2	J_3	J_4	J_5
P_1	8	0*	5	2	11
P_2	11	11	0	0*	0
P_3	0	0	0*	11	5
P_4	0	11	2	4	0*

	J_1	J_2	J_3	J_4	J_5
P_1	8	0*	5	2	11
P_2	11	11	0	0	0*
P_3	0	0	0*	11	5
P_4	0*	11	2	4	0