Optimization Techniques (MAT-2003)

Lecture-22

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Example:

Find the initial basic feasible solution to the following transportation problem. Given the cost matrix:

	D_1	D_2	D_3	D_4	Supply
S_1	20	25	28	31	200
S_2	32	28	32	41	180
S_3	18	35	24	32	110
Demand:	150	40	180	170	~~490~~ ~~540~~

Here, total supply $= 490$
And total demand $= 540$

Total supply $\neq$ Total demand $\Rightarrow$ The transportation problem is not balanced.
Moreover, Total supply $<$ Total demand $\Rightarrow$ we have to add a dummy row with a supply
50 ($= 540 - 490$).
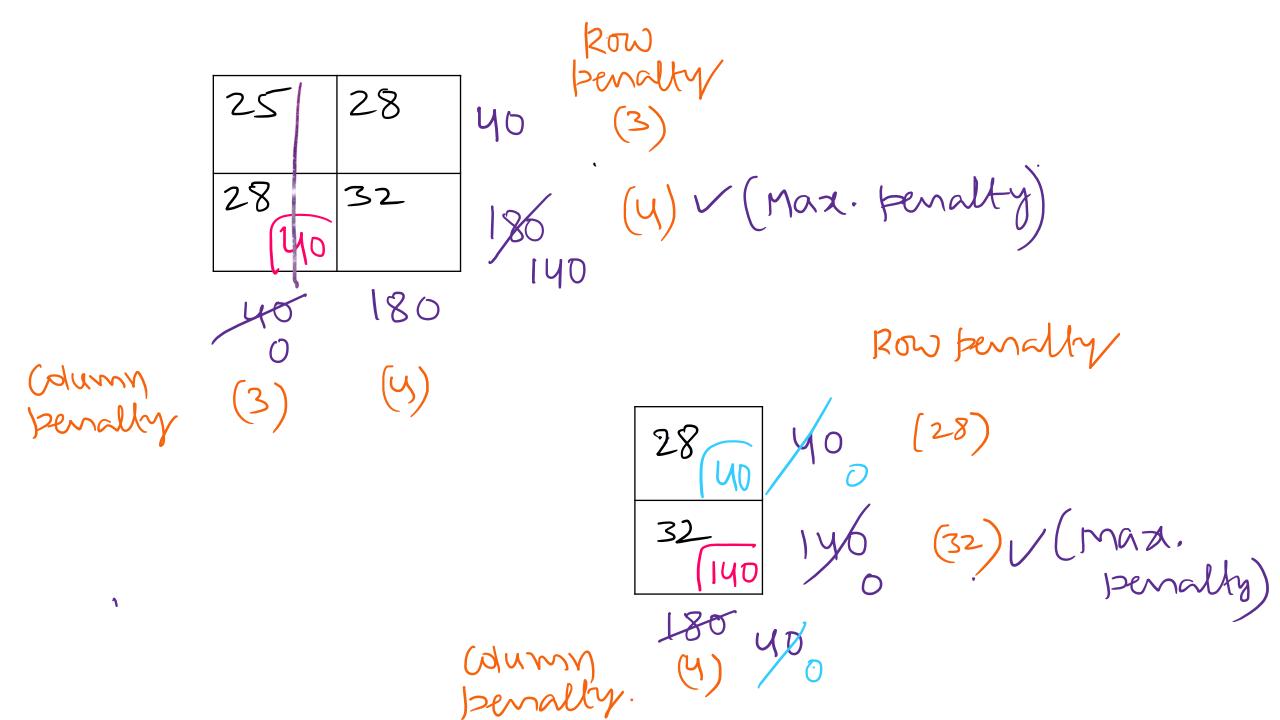
Vogel's Approximation Method

					Row Penalty
20	25	28	31	200	(5)
32	28	32	41	180	(4)
18	35	24	32	110	(6)
0	0	0	0	50 $\cancel{50}_0$	(0)
150	40	180	$\cancel{170}$ 120		
(18)	(25)	(24)	(31)		

Column Penalty

✓ (max. penalty)

					Row Penalty
20	25	28	31	200	(5)
32	28	32	41	180	(4)
18	35	24	32	~~110~~ 0	(6) ✓ (max. penalty)
110					
40 ~~150~~	40	180	120		
(2)	(3)	(4)	(1)		

20 $\boxed{40}$	25	28	31
32	28	32	41

~~200~~ 160 (5)

180 (4)

40 ~~0~~   40   180   120

Column Penalty   (12)   (3)   (4)   (10)

(Max. Penalty)

25	28	31 $\sqrt{120}$
28	32	41

Row penalty

1~~60~~ 40   (5)

180   (4)

Column penalty (3)   (4)   (10)

40   180   ~~120~~ 0

✓ (max. penalty)

25	28
28 [40]	32

40

180 140

40   180
0

Row penalty
(3)
(4) ✓ (Max. penalty)

Column penalty   (3)   (4)

Row penalty ✓

28 [40]	40 0 (28)
32 [140]	140 0 (32) ✓ (Max. penalty)

180 40 0
(4)

Column penalty.

Optimal Assignments are given by

20 [40]	25	28 [40]	31 [120]	200
32	28 [40]	32 [140]	41	180
18 [110]	35	24	32	110
0	0	0	0 [50]	50
150	40	180	170	

Optimal cost is given by $= 20 \times 40 + 28 \times 40 + 31 \times 120 + 28 \times 40 + 32 \times 140 + 18 \times 110 + 0 \times 50 = 13220.$

Example:

A company has three factories located in three cities viz. X, Y, Z. These factories supplies consignments to four dealers viz. A, B, C and D. The dealers are spread all over the country. The production capacity of these factories is 310, 100 and 290 units per month respectively. The net return per unit product is given in the following table:

Dealers / Factory	A	B	C	D	Capacity
X	6	6	6	4	310
Y	4	2	4	5	100
Z	5	6	7	8	290
Requirement	150	130	120	300	700

Determine a suitable allocation to maximize the total return.

Given the transportation problem is a maximization problem. First we have to convert it into minimization problem.

From the cost matrix the maximum cost is 8. Now, we have to subtract every entry of the cost matrix from the maximum cost.

2	2	2	4	310
4	6	4	3	150
3	2	1	0	290
150	130	120	300	750 / 750

Now this minimization problem and it is a balanced one. Next we have to find the initial basic feasible solution by using any one of the known method.