IFoS 2014

Q obtain the initial basic feasible solution for the transportation problem by North-western Corner rule

	R_1	R_2	R_3	R_4	R_5	Supply
F_1	1	9	13	36	51	50
F_2	24	12	16	20	1	100
F_3	14	35	1	23	26	150
	100	70	50	40	40	

Sol

						Supply
	1	9	13	36	51	50
	24	12	16	20	1	100
	14	35	1	23	26	150
Demand	100	70	50	40	40	

Here Σ Demand $=$ Σ Supply $= 300$ (Balanced problem)

Consider cell (1,1) supply = 50, demand 100 allocate 50 to it & Strike row 1. (New demand for colum 1 = 50)

Now consider cell (2,1) supply = 100 demand = 50, allocate 50 to it & Strike column 1. (New supply for row 2 = 50)

Consider cell (2,2) supply = 50 demand 70, allocate 50 to it & Strike row 2 (New demand for colum 2 = 20)

Consider cell (3,2) supply = 150 demand = 20, allocate 20 to it & strike column 2 (New supply for row 3 = 130)

Consider cell (3,3) supply = 130, demand 50, allocate 50 to it & Strike column 3 (New supply for row 3 = 80) consider cell (3,4) supply = 80, demand = 40, allocate 40 to it & strike column 4 (New supply for row 3 = 40)

Consider cell (3,5) supply = 40, demand = 40, allocate 40 to it strike columns 5 & row 5.

So we have.

1 $\boxed{50}$	9	13	36	51	50/0
24 $\boxed{50}$	12 $\boxed{50}$	16	20	1	100/50/0
14	35 $\boxed{20}$	1 $\boxed{50}$	23 $\boxed{40}$	26 $\boxed{40}$	150/130/80/40/0
150/50/0	70/20/0	50/0	40/0	40/0	

so allocations are as follows (Basic feasible Solution, initial):

$F_1 \rightarrow R_1$ — 50

$F_2 \rightarrow R_1$ — 50

$F_2 \rightarrow R_2$ — 50

$F_3 \rightarrow R_2$ — 20

$F_3 \rightarrow R_3$ — 50

$F_3 \rightarrow R_4$ — 40

$F_4 \rightarrow R_5$ — 40

Total transportation cost

$= 1\times 50 + 24\times 50 + 12\times 50 + 35\times 20 + 1\times 50 + 23\times 40 + 26\times 40 = 4560$

Here total allocations = 7 is equal to $m+n-1 = 3+5-1 = 7$ so Solution is Non degenerate

[illegible] 2014

Q Solve the following LPP graphically:

Maximize $Z = 3x_1 + 4x_2$

Subject to

$x_1 + x_2 \le 6$

$x_1 - x_2 \le 2$

$x_2 \le 4$

$x_1, x_2 \ge 0$

Write dual problem of the above & obtain the optimal value of the objective function of the dual without actually

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Solving it.

Sol Maximize $Z = 3x_1 + 4x_2$

Subject to $x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2$

$x_2 \leq 4$

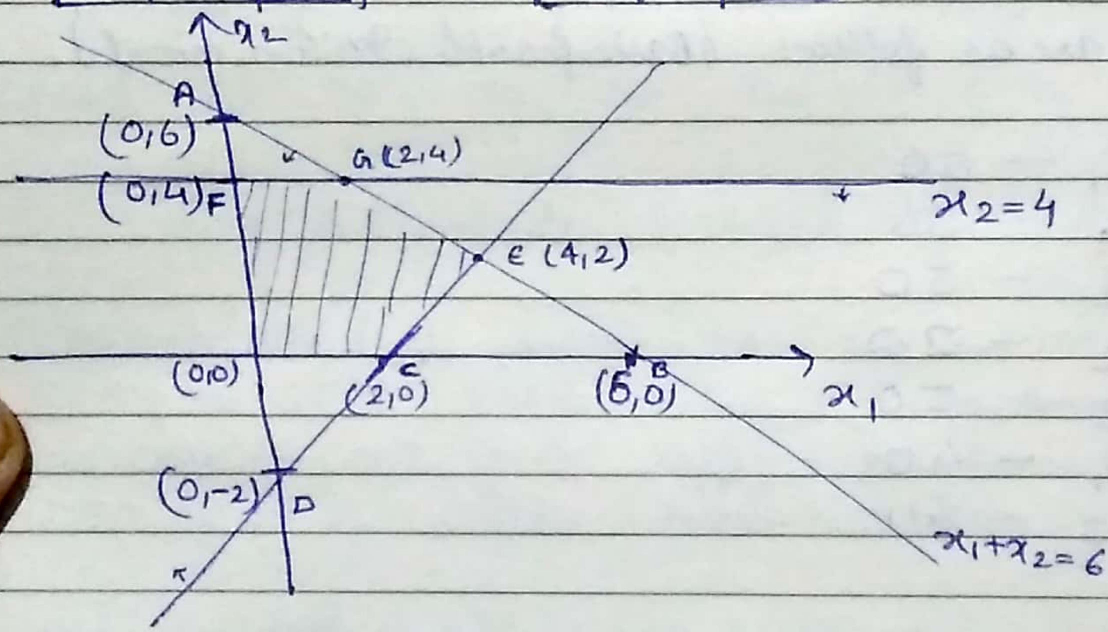
$x_1, x_2 \geq 0$.

$x_1 + x_2 = 6$

	x_1	x_2
A	0	6
B	6	0

$x_1 - x_2 = 2$

	x_1	x_2
C	2	0
D	0	-2



$x_1 + x_2 \leq 6$ → consists of area below $x_1 + x_2 = 6$ containing origin

$x_1 - x_2 \leq 2$ → consists of area above $x_1 - x_2 = 2$ containing origin

$x_2 \leq 4$ → consists of area below $x_2 = 4$ containing origin

$x_1 \geq 0, x_2 \geq 0$ → consists of 1st quadrant

point	value of z	
(0,0)	0	
(2,0)	6	
(4,2)	20	
(2,4)	22	(Max)
(0,4)	16	

so $\boxed{Z_{max} = 22 \text{ at } x_1 = 2 \ \& \ x_2 = 4.}$

Converting to dual

Minimize $Z' = 6y_1 + 2y_2 + 4y_3$
Subject to

$$y_1 + y_2 \geq 3$$
$$y_1 - y_2 + y_3 \geq 4$$
$$y_1, y_2, y_3 \geq 0.$$

Using fundamental duality Theorem which states that

" If either the primal or dual problem has a finite optimal solution, then the other problem also has a finite optimal solution & the values of the two objective functions are ~~for~~ equal".

we get $\boxed{Z'_{min} = 22}$