Point A is the intersection of lines $2x+y=2$ and $x+3y=2$

or, $2x+y-2=x+3y-2$

or, $x=2y$

$2(2y)+y=2$

or, $y=0.4$

$\therefore x=2-(3\times 0.4)$

$=0.8$

The feasible region is ABCA. The co-ordinates of extreme points of the feasible region are,

$A=(0.8,0.4)$, $B=(1,0)$, $C=(2,0)$

Objective function - $\max Z=3x-y$

$Z|_{(0.8,0.4)}=3\times 0.8-0.4=2.0$

$Z|_{(1,0)}=3.0$

$Z|_{(2,0)}=6.0$

Therefore, the maximum value of $Z=6$ which occurs at point $C(2,0)$, the solution to the given problem is, $x=2$, $y=0$ and $\max Z=6$.

2014

(2) Solve graphically the following LPP -

Minimize $Z = 3x_1 + 2x_2$

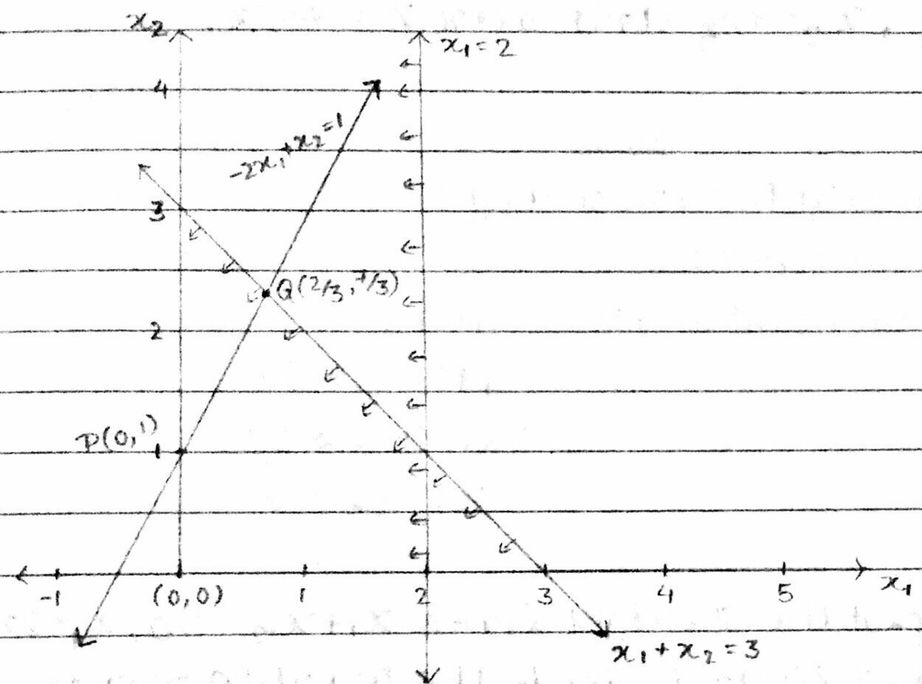
Subject to constraints $-2x_1 + x_2 = 1,$

$x_1 + x_2 \leq 3,$

$x_1 \leq 2,$

$x_1, x_2 \geq 0$

Firstly, we plot the straight lines $-2x_1 + x_2 = 1$, $x_1 + x_2 = 3$ and $x_1 = 2$ and shade the feasible region as shown in figure -



Point Q is the intersection of lines $-2x_1 + x_2 = 1$ —(1)

and $x_1 + x_2 = 3$ — (2)

From (2) $x_2 = 3 - x_1$ and putting in equation (1) we get,

$$-2x_1 + 3 - x_1 = 1$$

$$-3x_1 = -2$$

$$x_1 = 2/3$$

$\therefore x_2 = 3 - x_1$

$= 3 - 2/3$

$= 7/3$

So, $Q(2/3, 7/3)$

Point B – Intersection of $3x_1 + 8x_2 = 24$
and $x_1 + x_2 = 4$

$\therefore 3x_1 + 8(4 - x_1) = 24$

$3x_1 + 32 - 8x_1 = 24$

$-5x_1 = -8$

$x_1 = 8/5 = 1.6$

Therefore, $x_2 = 2.4$

$B(2.4, 1.6)$

Point C – Intersection of $10x_1 + 7x_2 = 35$
and $x_1 + x_2 = 4$

or, $10x_1 + 7(4 - x_1) = 35$

$3x_1 = 7$

$x_1 = 7/3$

$\therefore x_2 = 4 - 7/3 = 5/3$

$C(5/3, 7/3)$

The feasible region is OABCDO

The coordinates of extreme points of the feasible region are $O(0,0)$, $A(0,3)$, $B(8/5, 12/5)$, $C(5/3, 7/3)$, $D(7/2, 0)$.

Objective function $\rightarrow Z = 5x_1 + 7x_2$

$Z|_{0,0} = 0$, $Z|_{(0,3)} = 21$, $Z|_{(8/5, 12/5)} = 5.8/5 + 7.12/5 = 124/5$,

$Z|_{(5/3, 7/3)} = 5.5/3 + 7.7/3 = \frac{74}{3}$, $Z|_{(7/2, 0)} = 35/2$

Since, max value of Z occurs at $B(8/5, 12/5)$ which is $Z = 124/5$, the solution to the given problem is $x_1 = 8/5$, $x_2 = 12/5$ and max $Z = 124/5$.

Since min values of z occurs at y (15, 1.25) which is 205, the solution to the given problem is $a_1 = 15$, $a_2 = 1.25$ and min $Z = 205$.

2013

(2) Solve the LPP by graphical method-

Maximize $Z = 5x_1 + 7x_2$

Subject to $x_1 + x_2 \leq 4$

$3x_1 + 8x_2 \leq 24$

$10x_1 + 7x_2 \leq 35$

$x_1, x_2 \geq 0$

We plot the straight lines and shade the feasible region as shown in the figure

$x_1 + x_2 = 4 \rightarrow (0,4)$ and $(4,0)$

$3x_1 + 8x_2 = 24 \rightarrow (0,3)$ and $(8,0)$

$10x_1 + 7x_2 = 35 \rightarrow (0,5)$ and $(7/2, 0)$