Ch - Linear programming

* Some important terms of Linear planning and programming :-

1) Decision variable:- The variables which are involved in LPP are called decision variables.

2) Objective function: A linear function of variables which is to be optimized i.e either maximized or minimized is called an objective function.

3) Constraints: Conditions under which the objective function is to be optimised are called constraints. It is also known as equations or inequations.

4) Non-negativity constraints: In some cases the value of the variables under consideration maybe positive or zero. due to ~~which~~ some imposed constraints are called non-negativity constraints. $(x \geq 0, y \geq 0)$

5) Feasible Solution: A solution which satisfies all the constraints is called feasible solution.

6) Feasible region: The common region or area determined by all the constraints of the L.P.P is called feasible region.

7) Optimal Solution: A solution which maximizes or minimizes the objective function as per the requirements is called an optimal solution.

$\geq$ = non-origin side

$\leq$ = origin side

Q. Minimize: $Z = 7x + y$ — objective function

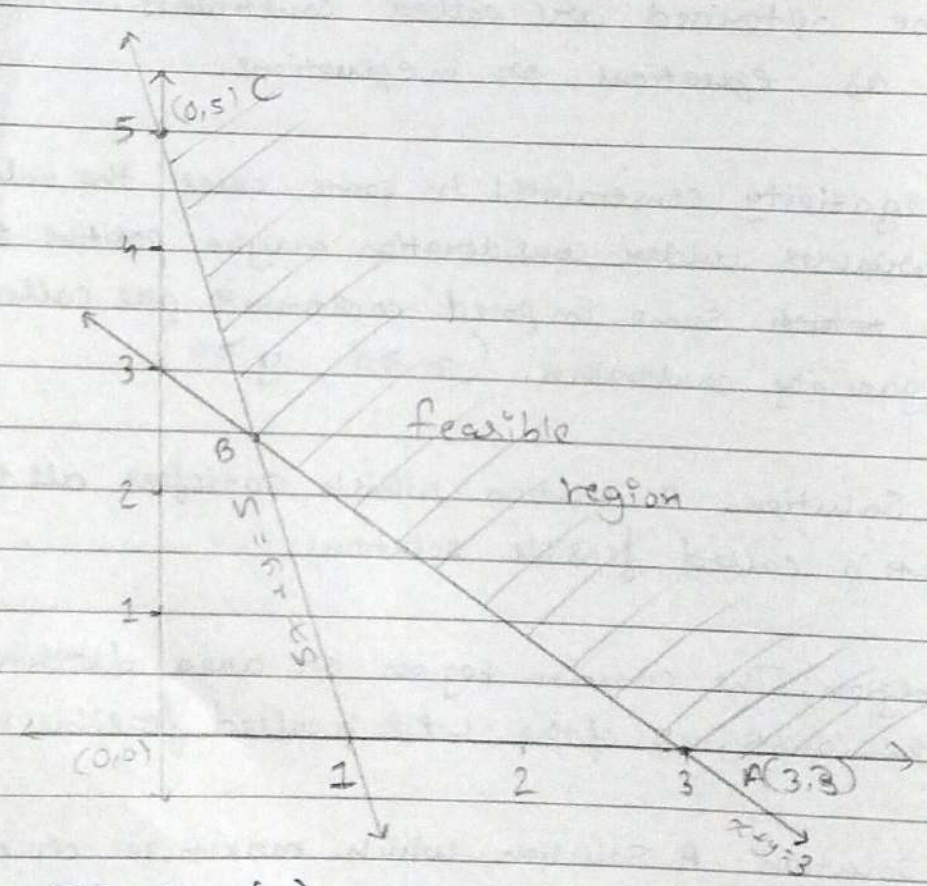
Sub to

$5x + y \geq 5$

$x + y \geq 3$ } Constraints

$x, y \geq 0$ — Non-negative constraints

To draw	x	y	Line passes through	Sign	Region lies on
$5x + y = 5$	0	5	(0,5) &	$\geq$	Non-origin side
	1	0	(1,0)		
$x + y = 3$	0	3	(0,3) &	$\geq$	Non-origin side
	3	0	(3,0)		



To Find 'B'

$5x + y = 5$

$-\ x + y = 3$

$4x = 2$

$x = \frac{1}{2}$, $y = \frac{5}{2}$ $\therefore B\left(\frac{1}{2}, \frac{5}{2}\right)$

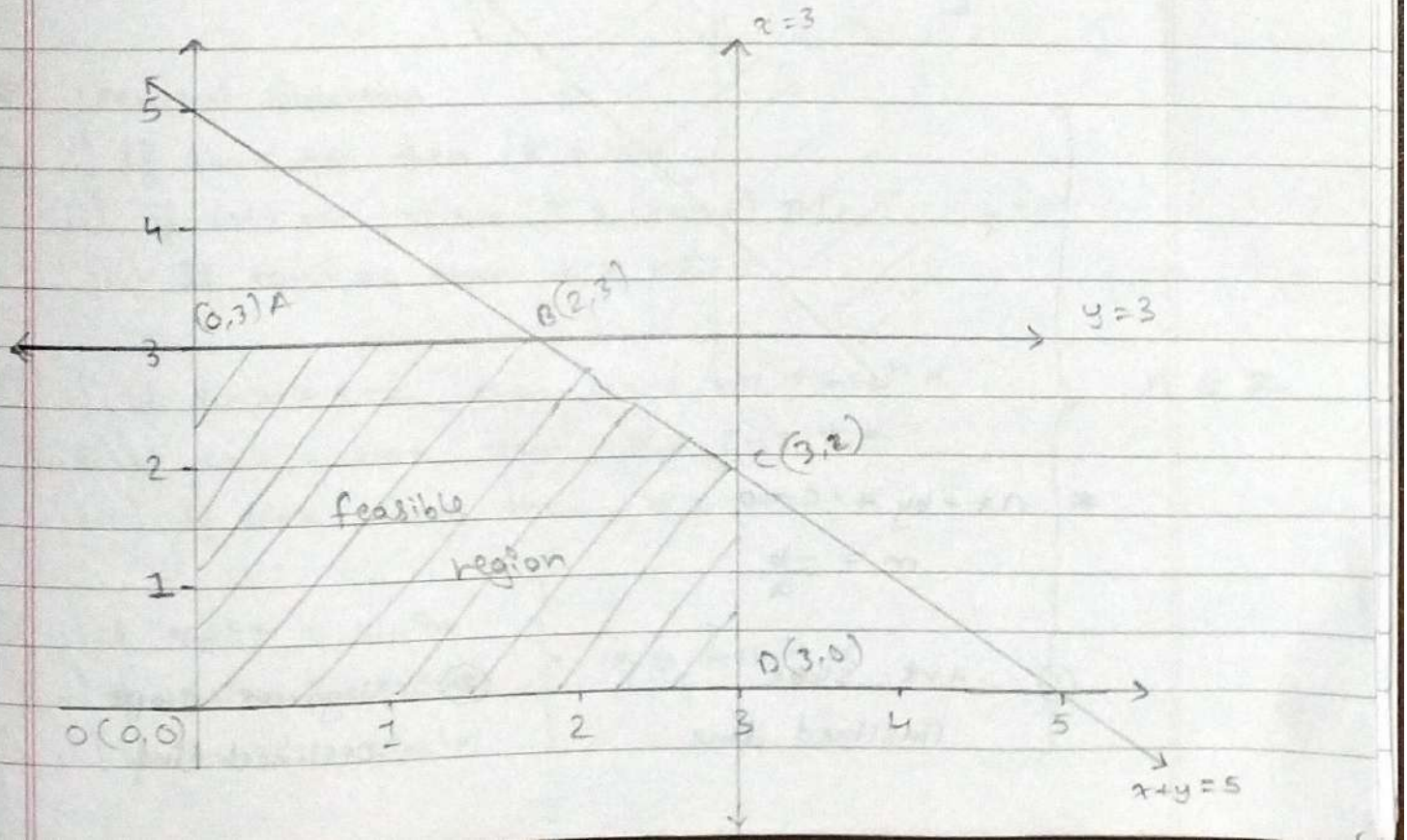
Points	objective function $z = 7x + y$	Answer
A (3,0)	$z = 7(3) + 0$	21
B $(1/2, 5/2)$	$z = 7(1/2) + 5/2$	6
C (0,5)	$z = 7(0) + 5$	5

∴ The minimum value of the objective function is 5 at $x = 0$ and $y = 5$.

Q. Maximize : $10x + 25y$

$0 \leq x \leq 3$, $0 \leq y \leq 3$, $x + y \leq 5$

To draw	x	y	Line passes through	Sign	Region lies on
$x = 3$	3	0	(3,0)	$\leq$	origin side
$y = 3$	0	3	(0,3)	$\leq$	origin side
$x + y = 5$	0	5	(0,5) and (5,0)	$\leq$	origin side
	5	0			

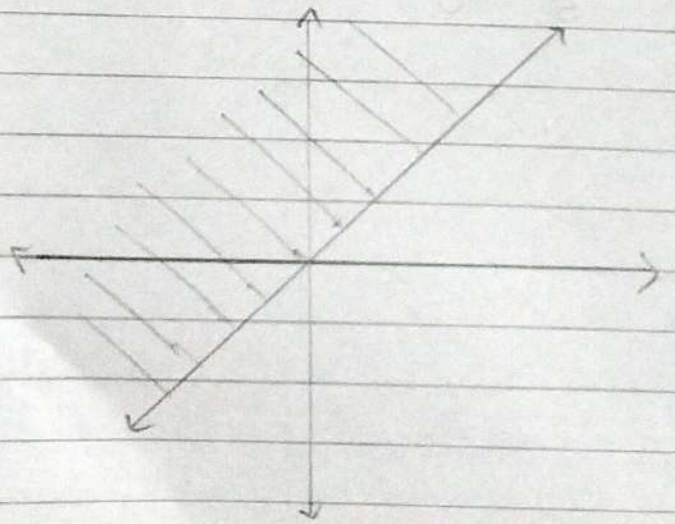


Points	objective function $Z = 10x + 25y$	Answer
A (0,3)	$Z = 10(3) + 25(0)$	30
B (2,3)	$Z = 10(2) + 25(3)$	80
C (3,2)	$Z = 10(3) + 25(2)$	95
D (0,3)	$Z = 10(0) + 25(3)$	75
O (0,0)	$Z = 10(0) + 25(0)$	0

∴ The maximum value of the objective function is 95 at $x = 2$ and $y = 3$.

Q. If $5x - 3y \geq 0$

then $5x - 3y = 0$, line passes through origin



* $ax + by + c = 0$

$$m = \frac{-b}{a}$$

① +ve slope
inclined line

② Negative slope
declined line