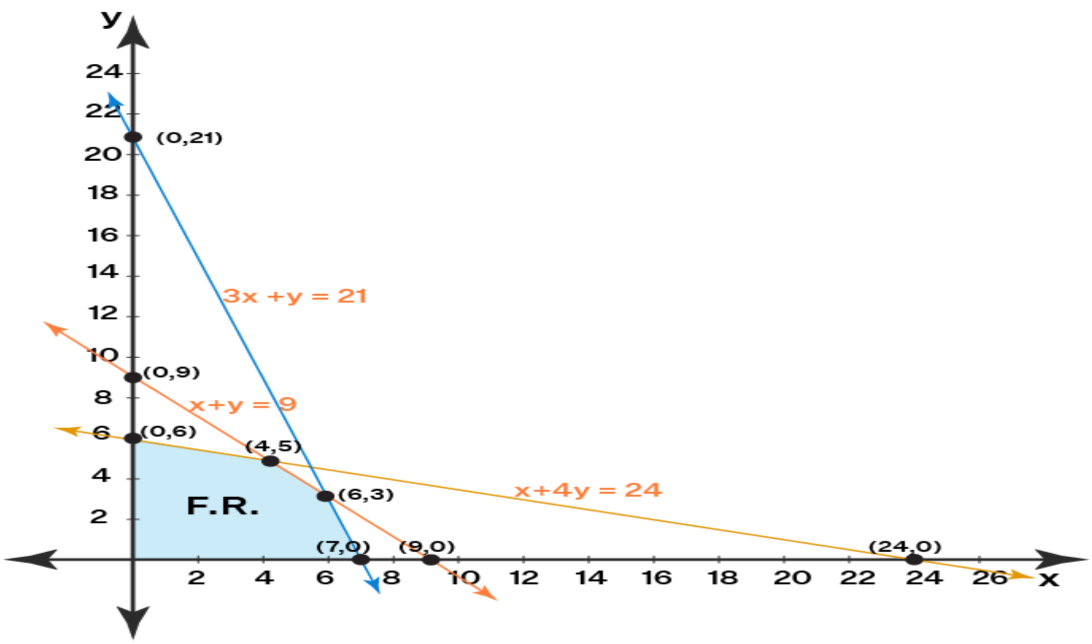
CHAPTER-12
LINEAR PROGRAMMING PROBLEMS
04 MARKS TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	Solve the following LPP using graphical method Maximize Z = 2x + 5y. Subject to constraints : x + 4y ≤ 24, 3x + y ≤ 21 and x + y ≤ 9 where, x ≥ 0 and y ≥ 0.	4
2.	Solve the linear programming problem using the graphical method. Maximize Z = 2x + 3y x + y ≤ 30, x ≤ 20, y ≤ 12 x, y ≥ 0	4
3.	Read the paragraph and answer the following questions If linear constraints of an LPP are $x - 2y \leq 2, 3x + 2y \leq 12, -3x + 2y \leq 3, x \geq 0, y \geq 0$. (a) Draw the graph of the feasible region made by the linear constraints. (b) If objective function $Z = 5x + 2y$ then find its maximum and minimum value of Z.	4
4.	Read the paragraph and answer the following questions If linear constraints of an LPP are $x + 2y \leq 120, x + y \geq 60, x - 2y \geq 0$, $x \geq 0, y \geq 0$ (a) Draw the graph of the feasible region made by the linear constraints. (b) Find the corner points of the feasible region. (c) If objective function $Z = 5x + 10y$ then find its minimum value of Z.	4
5.	A bullet train can carry a maximum of 200 people. A profit of Rs 600 is made on each of YELLOW ticket and a profit of Rs 1000 is made on each BLUE ticket The bullet train reservation executive reserves 20 BLUE ticket seats .However, at least four times as many people prefer to travel by YELLOW ticket, than by BLUE ticket. If the number of BLUE tickets is x and that of YELLOW ticket is y .Now ,answer the following questions (i)The maximum value of x + y is (A) 200 (B) 100 (C) 80 (D)20 (II) What is the relation between x and y? (A) y > 80 (B) x>4y (C) y≥4x (D) None	4
6.	A bakery shop prepares two types of cakes type one and type two: type one cake requires 200 g of flour and 25 g of fat, type two cake requires 100 g of flour and 50 g of fat. (I)What is the maximum number of cakes which can be made from 5 kg of flour and 1 kg of fat , assuming that there is no shortage of other ingredients. (A) 20 (B) 50 (C) 40 (D) 30 (ii) Choose the correct constraint (A) x+ 2y ≤40 (B) x+2y < 40 (C) x+2y > 40 (D) none	4

ANSWERS:

<table>
<tr><th>Q. NO</th><th>ANSWER</th><th>MARKS</th></tr>
<tr><td>1</td><td>

Step 1: Write all inequality constraints in the form of equations.
x + 4y = 24
3x + y = 21
x + y = 9
Step 2: Plot these lines on a graph by identifying test points.
x + 4y = 24 is a line passing through (0, 6) and (24, 0). [By substituting x = 0 the point (0, 6) is obtained. Similarly, when y = 0 the point (24, 0) is determined.]
3x + y = 21 passes through (0, 21) and (7, 0).
x + y = 9 passes through (9, 0) and (0, 9).
Step 3: Identify the feasible region. The feasible region can be defined as the area that is bounded by a set of coordinates that can satisfy some particular system of inequalities.
Any point that lies on or below the line x + 4y = 24 will satisfy the constraint x + 4y ≤ 24.
Similarly, a point that lies on or below 3x + y = 21 satisfies 3x + y ≤ 21.
Also, a point lying on or below the line x + y = 9 satisfies x + y ≤ 9.
The feasible region is represented by OABCD as it satisfies all the above-mentioned three restrictions.
Step 4: Determine the coordinates of the corner points. The corner points are the vertices of the feasible region.
O = (0, 0) ,A = (7, 0) , B = (6, 3).
B is the intersection of the two lines 3x + y = 21 and x + y = 9. Thus, by substituting y = 9 - x in 3x + y = 21 we can determine the point of intersection.
C = (4, 5) formed by the intersection of x + 4y = 24 and x + y = 9
D = (0, 6)



Step 5: Substitute each corner point in the objective function. The point that gives the greatest (maximizing) or smallest (minimizing) value of the objective function will be the optimal point.

</td><td>4</td></tr>
</table>

Corner Points	Z = 2x + 5y
O = (0, 0)	0
A = (7, 0)	14
B = (6, 3)	27
C = (4, 5)	33 (maximum)
D = (0, 6)	30

33 is the maximum value of Z and it occurs at C. Thus, the solution is x = 4 and y = 5.

2 | 4

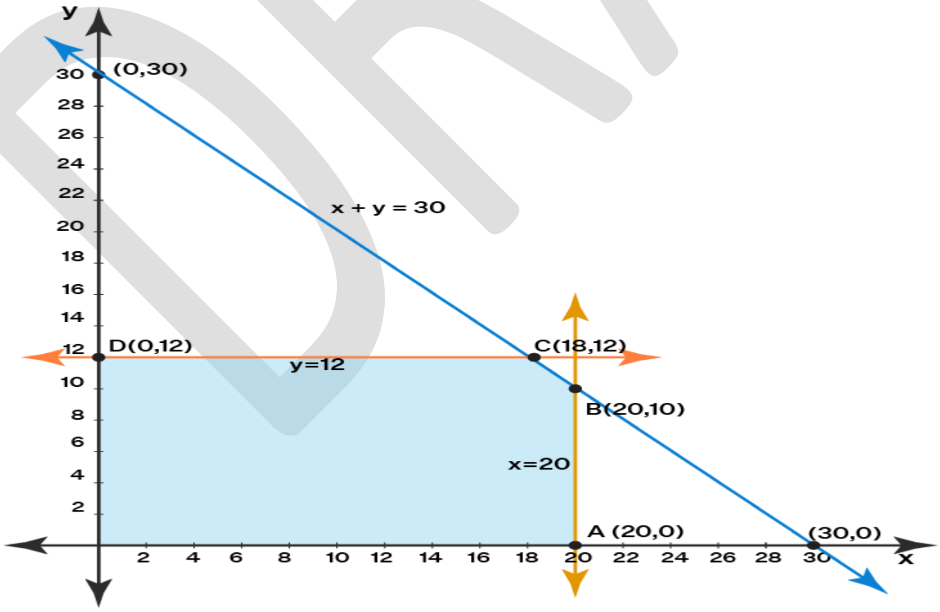
Corner points	Z = 2x + 3y
O = (0, 0)	0
A = (20, 0)	40
B = (20, 10)	70
C = (18, 12)	72
D = (0, 12)	36

Writing the inequalities as equations we get,

$x + y = 30$ passing through (0, 30) and (30, 0). Points on or below this line will satisfy $x + y \leq 30$

$x = 20$ is a line parallel to the y axis. Any point on or to the left of this line will satisfy $x \leq 20$.

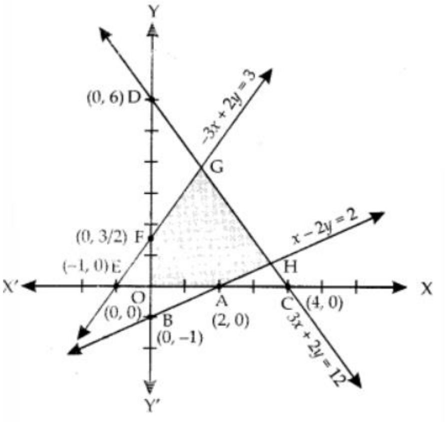
$y = 12$ is a line parallel to the x axis. Any point on or below this line will satisfy $y \leq 12$. The graph is given by



The maximum value of Z = 72 and it occurs at C (18, 12)

Therefore the maximum value of Z = 72 and the optimal solution is (18, 12)

3 (a) Feasible region of the linear constraints of the LPP is as shown in the figure

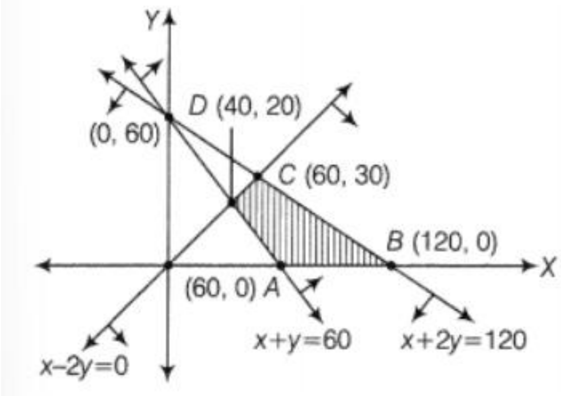


(b)

Corner Points	$Z = 5x + 2y$
(0,0)	0 (Minimum)
(2,0)	10
$\left(\frac{7}{2}, \frac{3}{4}\right)$	19 (Maximum)
$\left(\frac{3}{2}, \frac{15}{4}\right)$	15
$\left(0, \frac{3}{2}\right)$	3

Hence the maximum and minimum value of Z are 19 and 0 respectively at point $\left(\frac{7}{2}, \frac{3}{4}\right)$ and (0,0).

4 (a) Feasible region of the linear constraints of the LPP is as shown in the figure



(b) Corner points of the feasible region of the LPP are (60,0), (120,0), (60,30), (40,20).

(c)

Corner Points	$Z = 5x + 2y$
(60,0)	300 (Minimum)
(120,0)	600
(60,30)	600 (Maximum)
(40,20)	400

Hence the minimum value of Z is 300 at point (60,0).

5 (I) …….. A (II) ………. C — 4

6 (I) …….. (D) 30 cakes : 20 of type one and 10 cakes of typ[e two — 4
(II)……. (A)) x+ 2y ≤40