CHAPTER-12

LINEAR PROGRAMMING PROBLEMS

03 MARKS TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	If The corner points of the feasible region of an LPP are (0, 0) (0, 8) , (2, 7), (5,4) and (6,0). Then at what point the maximum profit $P = 3x + 2y$ $P = 3x + 2y$ occurs .	3
2.	A health enthusiast wishes to mix two types of foods in his diet, in such a way that vitamin content of the mixture contains at least 10 units of vitamin B and 13 units of vitamin C. Food (F1) contains 1 unit/kg of vitamin B and 2 units/kg of vitamin C. Food (F2) contains 2 unit/kg of vitamin B and contains 1 unit/kg of vitamin C. F1 costs Rs 60/kg and F2 costs Rs 80/kg. Frame his diet plan making a linear programming problem in order to minimize the cost of the mixture.	3
3.	A small firm manufacturers gold rings and chains. The total number of rings and chains manufactured per day is atmost 24. it takes 1 hour to make ring and 30 minutes to make a chain. The maximum number of hours available per day is 16 . If the profit on a ring is Rs.300 and that on a chain is Rs.190. Firm is concerned about earning maximum profit on the number of rings$(x)(x)$ and chains$(y)(y)$ that have to be manufactured per day. Using the above information formulate the LPP.	3
4.	Maximize $Z = 3x + 2y$ subject to $x + 2y \leq 10, 3x + y \leq 15, x, y \geq 0$.	3
5.	Minimize $Z = x + 2y$ Subject to $2x + y \geq 3, x + 2y \geq 6, x, y \geq 0$. Show that the minimum of Z occurs at more than two points.	3
6.	Minimize and maximize $Z = x + 2y$ subject to $x + 2y \geq 100, 2x - y \leq 0, 2x + y \leq 200, x, y \geq 0$	3
7.	Minimize Z=150x +200y subject to constraints $3x + 5y \geq 30$ $x + y \geq 8$ and for positive x and y	3
8.	If Z=24x+18y with the constraints The maximum value of the objective function Z =x+2y subject to constraints $x + 2y \geq 100$, $2x + 3y \leq 10$, $3x + 2y \leq 10$ $x, y \geq 0$. Can we get (0,2) as a corner point?	3
9.	Given that Z=7x +4y Constraints $3x + 2y \leq 12$, $3x + y \leq 9$, $x, y \geq 0$ Find the corner points .	3

ANSWERS:

<table>
<tr><th>Q. NO</th><th>ANSWER</th><th>MARKS</th></tr>
<tr><td>1.</td><td>(5,4)</td><td>3</td></tr>
<tr><td>2.</td><td>

Solution: Let x and y represent the number of units of vitamin B and C, respectively.
Subject to constraints:
$x, y \geq 0$ (Non−negative constraints)
$x + 2y \geq 10$ (Vitamin B constraint)
$2x + y \geq 13$ (Vitamin C constraint)

<table>
<tr><th>Resources</th><th>Food (F1)</th><th>Food (F2)</th></tr>
<tr><td>Vitamin (B)</td><td>1</td><td>2</td></tr>
<tr><td>Vitamin (C)</td><td>2</td><td>1</td></tr>
<tr><td>Total Cost</td><td>Rs 60/kg</td><td>Rs 80/kg</td></tr>
</table>

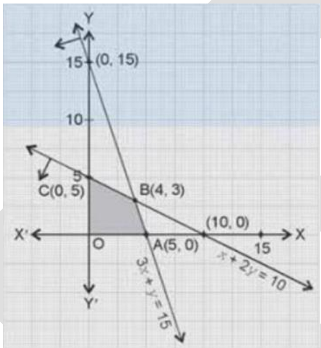
Objective function: Z = 60x + 80y (objective is to minimize cost)

</td><td>3</td></tr>
<tr><td>3.</td><td>

(i) Objective function ,maximize Z=$300x + 190y300x + 190y$
s.t $2x + y \leq 322x + y \leq 32$

</td><td>3</td></tr>
<tr><td>4.</td><td>

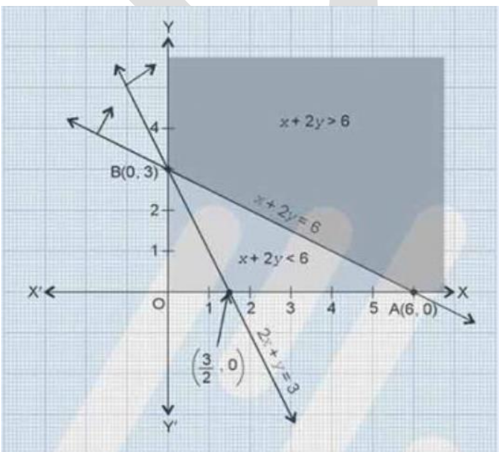
The feasible region the given LPP is as shown in the figure



<table>
<tr><th>Corner Point</th><th>$z = 3x + 2y$</th></tr>
<tr><td>(0,0)</td><td>0</td></tr>
<tr><td>(5,0)</td><td>15</td></tr>
<tr><td>(4,3)</td><td>18= M</td></tr>
<tr><td>(0,5)</td><td>10</td></tr>
</table>

Hence maximum value of $Z = 18$ at point(4,3).

</td><td></td></tr>
<tr><td>5.</td><td>



Feasible region of the following LPP is as shown in the figure

Now note that the feasible region is unbounded and has two corner points.

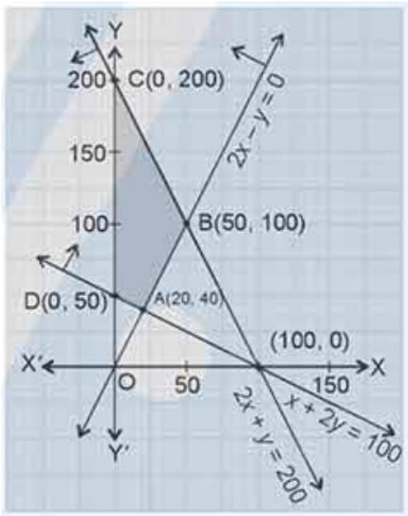
<table>
<tr><th>Corner Points</th><th>$Z = x + 2y$</th></tr>
<tr><td>(6,0)</td><td>6</td></tr>
<tr><td>(0,3)</td><td>6</td></tr>
</table>

Since feasible region is unbounded. To decide whether 6 is the minimum or not we draw $Z < m$ i.e., $x + 2y < 6$.

The line $x + 2y = 6$ for this constraint $Z < m$ is the same as the line AB for constraint. Put (0,0) in $Z < m \Rightarrow 0 < 6$ hence there in no point common to the

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

<table>
<tr><td></td><td>feasible line and $Z < m$.
Hence 6 is the minimum value of Z occur at least two different points.
Hence minimum of Z Occur at two corner points $(6,0)$ and $(0,3)$.</td><td></td></tr>
<tr><td>6.</td><td>



The feasible region of the following LPP is as shown in the following figure

<table>
<tr><th>Corner Point</th><th>$Z = x + 2y$</th></tr>
<tr><td>$(20,40)$</td><td>$100 = m$</td></tr>
<tr><td>$(50,100)$</td><td>250</td></tr>
<tr><td>$(0,200)$</td><td>$400 = M$</td></tr>
<tr><td>$(0,50)$</td><td>$100 = m$</td></tr>
</table>

Hence the maximum value of Z is 400 and minimum value of Z is 100 at each and every point of the line segment joining the points $(20,40)$ and $(0,50)$.</td><td></td></tr>
<tr><td>7.</td><td>Z =1350 at x=5 and y =3</td><td>3</td></tr>
<tr><td>8.</td><td>Yes</td><td>3</td></tr>
<tr><td>9.</td><td>(0,0) (3,0) (2,3) and (0,6)</td><td>3</td></tr>
</table>