Chapter: Linear Programming (Optimization and Feasibility)

General Instructions

1. Total Questions: **20**
2. Duration: **60 Minutes**
3. All questions are compulsory.
4. Read each question carefully before answering.
5. Choose the most appropriate answer from the given options.
6. Use of calculator or electronic devices is strictly prohibited.

1. Determine the maximum value of $Z = 3x + 4y$ subject to the constraints $x + y \leq 4$, $x \geq 0$, and $y \geq 0$.

2. For the constraints $x + 2y \leq 10$, $3x + y \leq 15$, $x, y \geq 0$, find all the corner points of the feasible region.

3. If the objective function $Z = ax + by$ has the same maximum value at $(0, 4)$ and $(2, 3)$, find the ratio $a : b$.

4. Find the minimum value of $Z = 2x + 5y$ subject to $2x + y \geq 8$, $x + 2y \geq 10$, $x, y \geq 0$.

5. Show that the feasible region for the constraints $x + y \leq 1$, $x + y \geq 2$, $x, y \geq 0$ is empty.

6. A objective function $Z = 3x + 2y$ is to be maximized subject to $x + 2y \leq 10$, $3x + y \leq 15$, $x \geq 0, y \geq 0$. At which corner point is the maximum attained?

7. Find the maximum value of $Z = x + y$ subject to $x - y \leq -1$, $-x + y \leq 0$, $x, y \geq 0$.

8. Given the constraints $x + y \leq 5$, $x \leq 3$, $y \leq 3$, $x, y \geq 0$, find the area of the feasible region.

9. If the objective function $Z = 10x + 6y$ is to be maximized subject to $x + y \leq 12$, $2x + y \leq 20$, $x, y \geq 0$, identify the redundant constraint.

10. Find the range of values of k such that the maximum of $Z = x + ky$ occurs only at the point $(4, 3)$ for the region bounded by $(0, 0), (4, 0), (4, 3), (0, 5)$.

11. Minimize $Z = 3x + 2y$ subject to $x + y \geq 8, 3x + 5y \geq 30, x \geq 0, y \geq 0$.

12. If the feasible region is a triangle with vertices $(0, 0), (6, 0)$, and $(0, 4)$, find the maximum value of $Z = 2x + 3y$.

13. Determine if the point $(2, 2)$ lies inside the feasible region defined by $3x + 2y \leq 12, x + y \geq 5, x, y \geq 0$.

14. Solve graphically to find the maximum value of $Z = 5x + 3y$ subject to $3x + 5y \leq 15, 5x + 2y \leq 10, x, y \geq 0$.

15. Find the number of optimal solutions for $Z = x + y$ subject to $x + y \leq 10, x, y \geq 0$.

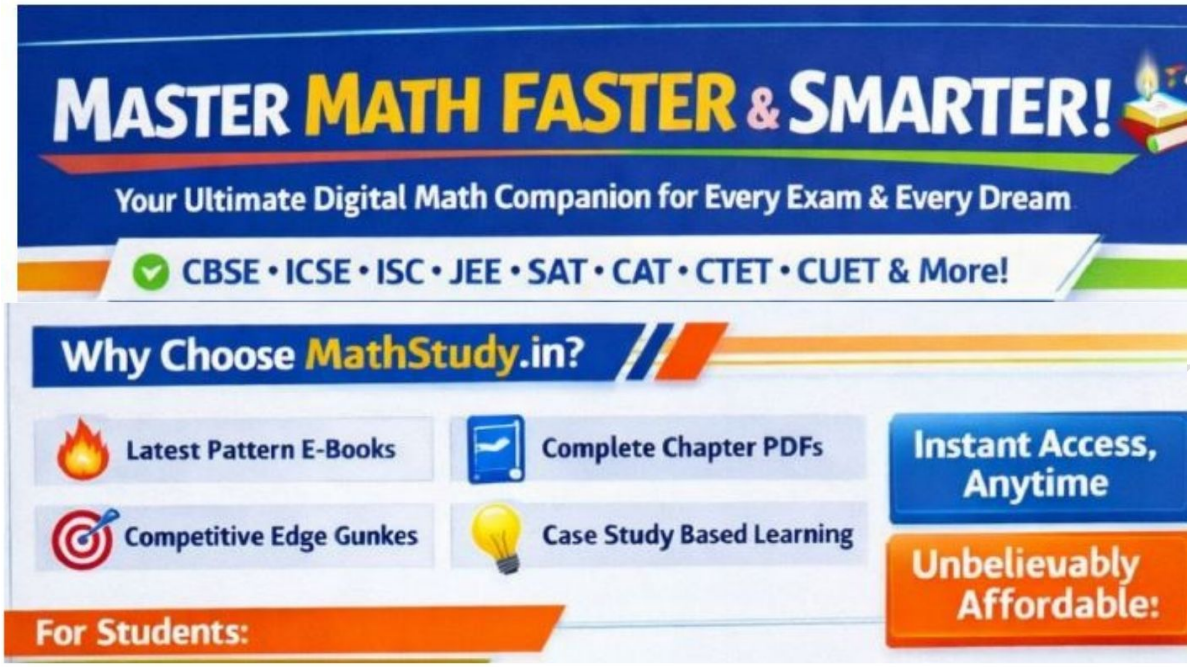
16. A linear programming problem has the constraints $x \geq 3, y \geq 2, x + y \leq 5$. Describe the nature of the feasible region.

17. Find the maximum value of $Z = 4x + y$ subject to $x + y \leq 50, 3x + y \leq 90, x \geq 0, y \geq 0$.

18. Find the coordinates of the point where $Z = 2x - y$ is minimized subject to $x + y \leq 5, x + 2y \leq 8, x, y \geq 0$.

19. If $Z = 3x + 5y$ and the feasible region is bounded by $x + y = 10, x = 0, y = 0$, find the average value of Z at the corner points.

20. For the objective function $Z = ax + by$, if the maximum occurs at every point on the line segment joining $(10, 0)$ and $(5, 5)$, find the value of b if $a = 1$.



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