CUET (UG) – MATHEMATICS

Chapter Test -Unit V: Linear Programming

General Instructions

1. Total Questions: **20**
2. Duration: **60 Minutes**
3. All questions are compulsory.
4. Each question carries **5 marks**.
5. For each correct answer: **+5 marks**.
6. For each incorrect answer: **-1 mark**.
7. No negative marking for unanswered questions.
8. Use of calculator or electronic devices is strictly prohibited.
9. Choose the most appropriate answer from the given options.

1. In a Linear Programming Problem, the function to be maximized or minimized is called:
   (A) Constraint function
   (B) Feasible function
   (C) Objective function
   (D) Optimal function

2. The region determined by all the constraints including non-negative constraints $x, y \geq 0$ is called:
   (A) Unbounded region
   (B) Feasible region
   (C) Infeasible region
   (D) Optimal region

3. If the feasible region for a LPP is unbounded, then the maximum or minimum value of the objective function:
   (A) Does not exist
   (B) Always exists
   (C) May or may not exist
   (D) Is always zero

4. Corner points of the feasible region for an LPP are $(0, 2), (3, 0), (6, 0), (6, 8)$ and $(0, 5)$. Let $Z = 4x + 6y$ be the objective function. The minimum value of Z occurs at:
   (A) $(0, 2)$ only
   (B) $(3, 0)$ only
   (C) The midpoint of the line segment joining $(0, 2)$ and $(3, 0)$
   (D) Any point on the line segment joining $(0, 2)$ and $(3, 0)$

5. In an LPP, if the objective function $Z = ax + by$ has the same maximum value on two corner points of the feasible region, then the number of points at which Z_{max} occurs is:
   (A) 2
   (B) 1
   (C) Finite
   (D) Infinite

6. A feasible region is bounded by the y-axis, the line $x = 2$, and the line $x + y = 6$. Which of the following systems of inequalities defines this region in the first quadrant?
   (A) $x + y \geq 6, x \geq 2$
   (B) $x + y \leq 6, x \geq 2$
   (C) $x + y \leq 6, x \leq 2$
   (D) $x + y \geq 6, x \leq 2$

7. The maximum value of $Z = 3x + 4y$ subjected to constraints $x + y \leq 4, x \geq 0, y \geq 0$ is:
   (A) 12
   (B) 16
   (C) 14
   (D) 0

8. Which of the following sets is not a convex set?
   (A) $\{(x, y) : x^2 + y^2 \leq 1\}$
   (B) $\{(x, y) : y^2 \leq x\}$
   (C) $\{(x, y) : 3x + 4y \geq 12\}$
   (D) $\{(x, y) : y^2 \geq x\}$

9. A linear programming problem is as follows: Maximize $Z = 5x + 10y$ subject to: $x + 2y \leq 120, x + y \geq 60, x - 2y \geq 0, x, y \geq 0$. The number of corner points of the feasible region is:

(A) 3
(B) 4
(C) 5
(D) 6

10. If a LPP admits optimal solution at two consecutive vertices of a feasible region, then:
(A) The required optimal solution is unique
(B) The optimal solution is only at the midpoint of the line joining them
(C) The LPP has infinitely many optimal solutions
(D) The LPP has no solution

11. The optimal value of the objective function is attained at:
(A) Intersection of constraints with axes only
(B) Corner points of the feasible region
(C) Any point in the interior of the feasible region
(D) The origin always

12. The feasible region for an LPP is bounded. The corner points are $(0, 10), (5, 5), (15, 15), (0, 20)$. Let $Z = px + qy$ where $p, q > 0$. The condition on p and q so that the maximum of Z occurs at both $(15, 15)$ and $(0, 20)$ is:
(A) $p = q$
(B) $p = 2q$
(C) $q = 3p$
(D) $3p = q$

13. For the constraints $x + y \leq 3, 2x + 5y \leq 12, x, y \geq 0$, which of the following is a feasible point?
(A) $(1, 2)$
(B) $(2, 2)$
(C) $(3, 1)$
(D) $(1, 1)$

14. In the context of LPP, the non-negativity constraints $x \geq 0, y \geq 0$ imply that the feasible region must lie in:
(A) First quadrant
(B) Second quadrant
(C) Third quadrant
(D) Fourth quadrant

15. If the objective function $Z = 3x + 2y$ is to be maximized subject to $x + 2y \leq 10, 3x + y \leq 15, x, y \geq 0$, the maximum value is:
(A) 10
(B) 15
(C) 18
(D) 20

16. An LPP has the objective function $Z = 11x + 7y$. The constraints are $x \leq 3, y \leq 2, x, y \geq 0$. The maximum value of Z is:
(A) 33
(B) 14
(C) 47
(D) 50

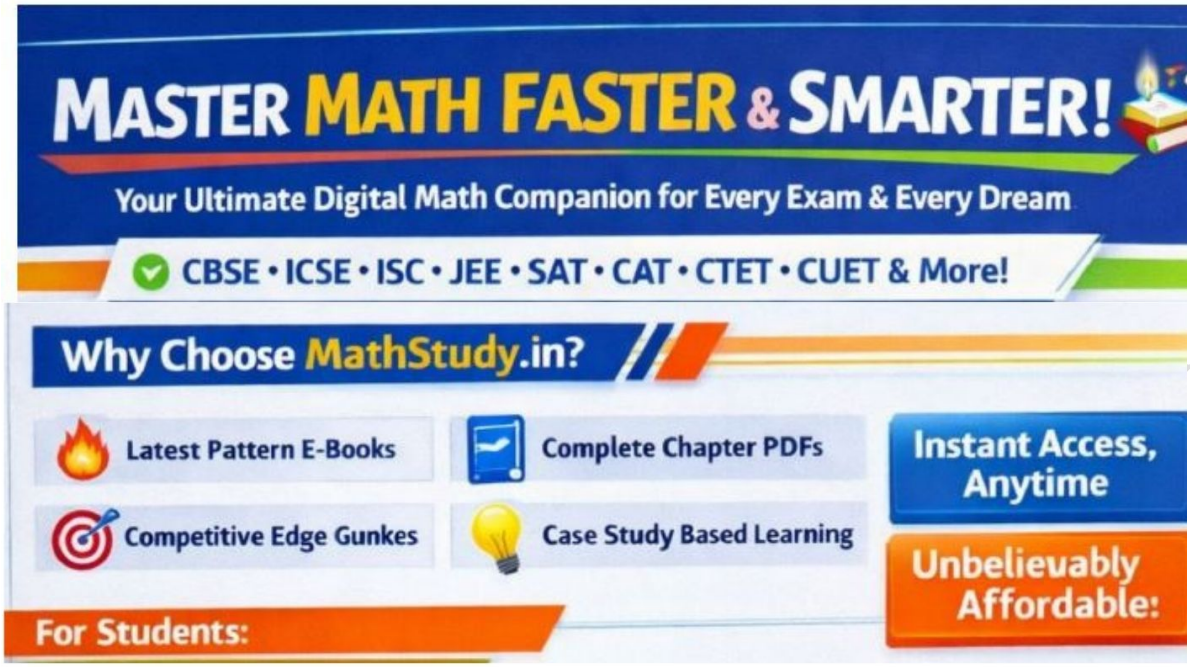
17. For an LPP, the objective function is $Z = 4x + y$ and the feasible region is determined by $x + y \leq 50, 3x + y \leq 90, x \geq 0, y \geq 0$. The corner points are:

(A) $(0,0), (30,0), (20,30), (0,50)$
(B) $(0,0), (50,0), (20,30), (0,90)$
(C) $(0,0), (30,0), (50,0), (0,50)$
(D) $(0,0), (30,0), (0,50)$

18. In a maximization problem, if the feasible region is a triangle with vertices $(0,0), (4,0), (0,6)$ and $Z = 2x + 3y$, the maximum value is:
(A) 8
(B) 18
(C) 12
(D) 24

19. The objective function of an LPP is $Z = 2x + y$. The constraints are $x + y \geq 1, x + y \leq 5, x \geq 0, y \geq 0$. The maximum and minimum values of Z are:
(A) 10, 1
(B) 5, 2
(C) 10, 2
(D) 5, 1

20. A feasible region has corner points $(0,0), (5,0), (4,3), (0,5)$. For the objective function $Z = 3x - 4y$, the maximum value of Z is:
(A) 0
(B) 15
(C) 12
(D) -20



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