CUET Mathematics Test

Chapter: Unit VIII: Linear Programming

SOLUTIONS

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Solutions

1. **Solution:** By definition, the objective function in an LPP must be a linear function of the decision variables. **Correct Option: (B)**

2. **Solution:** A feasible region can be bounded or unbounded. It does not "must" be bounded. **Correct Option: (C)**

3. **Solution:** $x + y \leq 4$ and $3x + 3y \geq 18$ (which is $x + y \geq 6$) cannot both be true simultaneously. Thus, there is no common region. **Correct Option: (C)**

4. **Solution:** Check Z at corner points: $Z(0,0) = 0, Z(5,0) = 20, Z(3,4) = 12 + 12 = 24, Z(0,5) = 15$. Max is 24. **Correct Option: (B)**

5. **Solution:** If the Z line is parallel to a boundary constraint line, every point on that line segment between the two corner points provides the same optimal value. **Correct Option: (C)**

6. **Solution:** These ensure that decision variables cannot be negative, which is a physical reality in most business/production problems. **Correct Option: (B)**

7. **Solution:** Put $(1,1)$ in $2x + 3y$: $2(1) + 3(1) = 5$. $5 \leq 12$ is true. Point $(4,2)$ gives $8 + 6 = 14 > 12$. **Correct Option: (C)**

8. **Solution:** If the region is unbounded, Z can often increase infinitely, but a minimum might still exist. Thus, it depends on the direction of optimization. **Correct Option: (C)**

9. **Solution:** According to the Corner Point Theorem, the optimal value (if it exists) must occur at a vertex of the feasible region. **Correct Option: (C)**

10. **Solution:** Wood: $1x + 1y \leq 6$. Time: $2x + 1y \leq 8$. **Correct Option: (A)**

11. **Solution:** $Z(0,2) = 0 - 4 = -4; Z(1,1) = 1 - 2 = -1; Z(3,3) = 3 - 6 = -3$. Minimum is -4. **Correct Option: (A)**

12. **Solution:** This is the standard definition of a convex set in geometry and optimization. **Correct Option: (B)**

13. **Solution:** "At least" implies a greater than or equal to condition: $2x + 3y \geq 12$. **Correct Option: (B)**

14. **Solution:** Linear constraints must have variables only to the power of 1 and no products of variables. **Correct Option: (C)**

15. **Solution:** Z is constant along the line segment joining $(2,3)$ and $(4,0)$. The midpoint is $(\frac{2+4}{2}, \frac{3+0}{2}) = (3, 1.5)$. **Correct Option: (A)**

16. **Solution:** Cost is price times quantity: $4x + 6y$. **Correct Option: (B)**

17. **Solution:** Subtracting $x + y = 6$ from $x + 2y = 10$ gives $y = 4$. Then $x = 2$. **Correct Option: (A)**

18. **Solution:** $(1,1)$ satisfies $x \geq 0, y \geq 0$ and is within the boundaries of the polygon, but it is not a vertex. **Correct Option: (C)**

19. **Solution:** This is the definition of Linear Programming (LP). **Correct Option: (B)**

20. **Solution:** Corners are $(0,0), (1,0), (0,1)$. $Z(0,0) = 0, Z(1,0) = 2, Z(0,1) = 1$. Max is 2. **Correct Option: (B)**