

UNIT TEST

Duration: 1 hour

Marks: 30

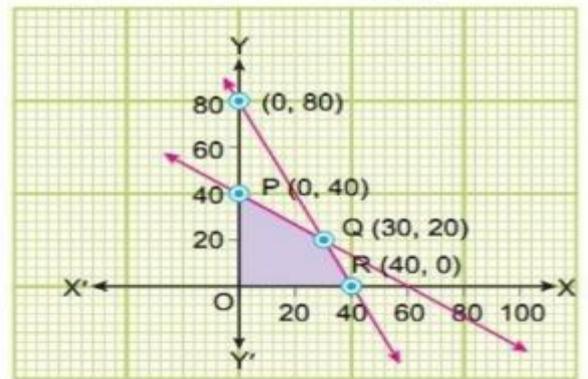
SECTION A

Each carry 1 mark

1. The corner points of the feasible region determined by the set of constraints are $P(0, 5)$, $Q(3, 5)$, $R(5, 0)$ and $S(4, 1)$ and the objective function $Z = ax + 2by$ where $a, b > 0$. The condition on a and b such that the maximum Z occurs at Q and S is

- (a) $a - 5b = 0$ (b) $a - 3b = 0$ (c) $a - 2b = 0$ (d) $a - 8b = 0$

2. For a LPP the objective function is $Z = 4x + 3y$ and the feasible region determined by a set of constraints is shown in the graph



Which of the following statement is true?

- (a) Maximum value of Z is at R (b) Maximum value of Z is at Q
(c) Value of Z at R is less than the value at P (d) Value of Z at Q is less than the value of R

3. The graph of the inequality $2x + 3y > 6$ is

- (a) Half plane that contains the origin
(b) Half plane that neither contains the origin nor the points of the line $2x + 3y = 6$
(c) Whole XOY plane excluding the points on the line $2x + 3y = 6$
(d) Entire XOY plane

4. Assertion: A LPP admits unique optimal solution.

Reason: The solution set of the inequation $2x+y > 5$ is open half plane not containing the origin.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

SECTION B

Each carry 3 marks

5. Solve the following linear programming problem graphically: Maximum $Z = 3x + 9y$ subject to the constraints $x + y \geq 10$, $x + 3y \leq 60$, $x \leq y$, $x \geq 0$, $y \geq 0$.

6. Solve the following linear programming problem graphically: Minimize $Z = 5x + 10y$ subject to constraints: $x + 2y \leq 120$, $x + y \geq 60$, $x - 2y \geq 0$, $x \geq 0$, $y \geq 0$.

7. Solve graphically the following linear programming problem: Maximize $Z = 6x + 3y$, subject to the constraints $4x + y \geq 80$, $3x + 2y \leq 150$, $x + 5y \geq 115$, $x \geq 0$, $y \geq 0$.

8. Minimize $Z = 10x + 4y$ subject to constraints $4x + y \geq 80$, $2x + y \geq 60$, $x \geq 0$, $y \geq 0$.

SECTION D

Each carry 5 marks

9. Solve the following LPP graphically: Minimize $Z = 5x + 7y$ subject to the constraints $2x + y \geq 8$, $x + 2y \geq 10$, $x \geq 0$, $y \geq 0$.

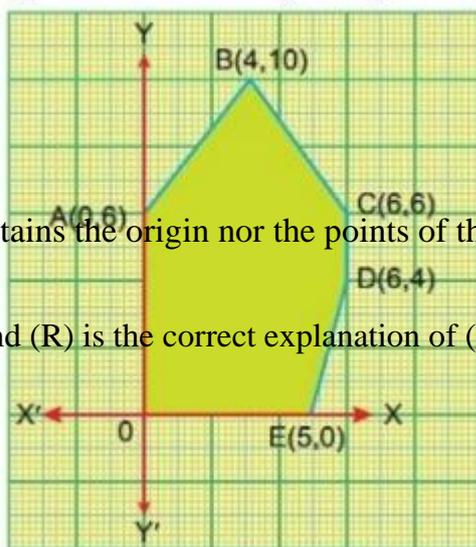
10. Minimize and Maximize $Z = 5x + 2y$ subject to the following constraints $x - 2y \leq 2$, $3x + 2y \leq 12$, $-3x + 2y \leq 12$, $x \geq 0$, $y \geq 0$.

SECTION E

11. Read the following passage and answer the following questions:

Linear programming problem is method of finding the optimal values (maximum or minimum) of quantities subject to the constraints when relationship is expressed as a linear equations or linear inequations.

The corner points of a feasible region determined by the system of linear constraints are as shown below.



3. (b) Half plane that neither contains the origin nor the points of the line $2x + 3y = 6$

4. (a) Both (A) and (R) are true and (R) is the correct explanation of (A).

5. Z

(i) Is this feasible region bounded?

(ii) Write the number of corner points in the feasible region.

(iii) If $Z = ax + by$ has maximum value at $C(6, 6)$ and $B(4, 10)$. Find the relationship between a and b .

UNIT TEST Answers

1. (d) $a - 8b = 0$ 2. (b) Maximum value of Z is at Q

3. (b) Half plane that neither contains the origin nor the points of the line $2x + 3y = 6$

4. (a) Both (A) and (R) are true and (R) is the correct explanation of (A).

5. $Z = 180$ at infinitely many points lying on the line joining points $(0,20)$ and $(15,15)$.

6. Min $Z = 300$ at $(60, 0)$ 7. Max $Z = 285$ at $(40, 15)$ 8. Min $Z = 260$ at $(10, 40)$

9. Min $Z = 38$ at $(2, 4)$

10. Min $Z = 0$ at $(0, 0)$ and Max $Z = 19$ at $\left(\frac{7}{2}, \frac{3}{4}\right)$

11. (i) Yes (ii) 6 (iii) $a = 2b$