Linear Programming
Part - 2

ASSERTION AND REASON BASED MCQs (1 Mark each)

Directions: In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as

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

(B) Both A and R are true but R is NOT the correct explanation of A

(C) A is true but R is false

(D) A is false but R is True

Q. 1. Assertion (A): Feasible region is the set of points which satisfy all of the given constraints and objective function too.
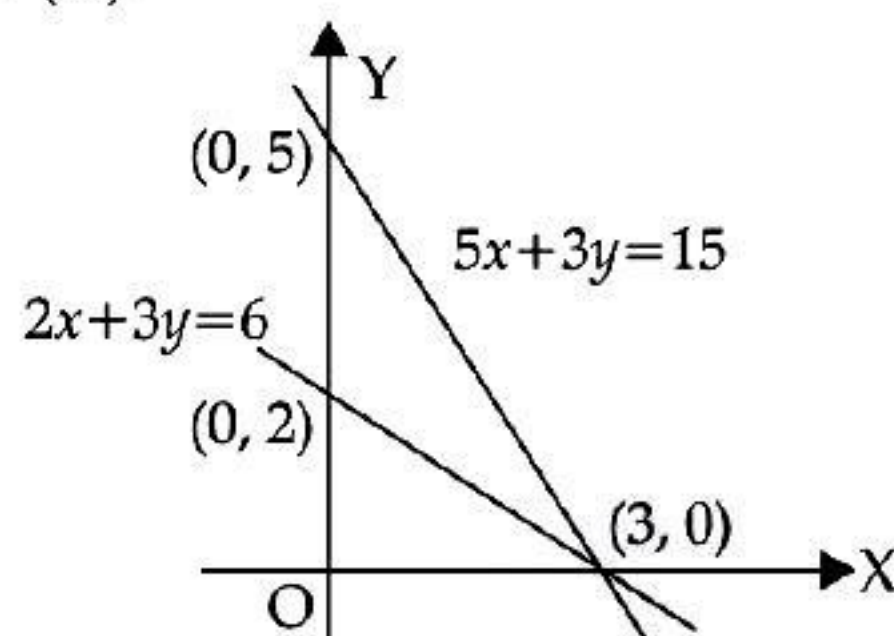
Reason (R): The optimal value of the objective function is attained at the points on X-axis only.

Ans. Option (C) is correct.

> *Explanation:* The optimal value of the objective function is attained at the corner points of feasible region.

Q. 2. Assertion (A): The intermediate solutions of constraints must be checked by substituting them back into objective function.

Reason (R):

Here $(0, 2)$; $(0, 0)$ and $(3, 0)$ all are vertices of feasible region.

Ans. Option (D) is correct.

> *Explanation:* The intermediate solutions of constraints must be checked by substituting them back into constraint equations.

Q. 3. Assertion (A): For the constraints of linear optimizing function $Z = x_1 + x_2$ given by $x_1 + x_2 \leq 1$, $3x_1 + x_2 \geq 1$, there is no feasible region.

Reason (R): $Z = 7x + y$, subject to $5x + y \leq 5$, $x + y \geq 3$, $x \geq 0$, $y \geq 0$. Out of the corner points of feasible region $(3, 0)$, $\left(\frac{1}{2}, \frac{5}{2}\right)$, $(7, 0)$ and $(0,5)$, the maximum value of Z occurs at $(7, 0)$.

Ans. Option (B) is correct.

> *Explanation:* Assertion (A) is correct.
> Clearly from the graph below that there is no feasible region.
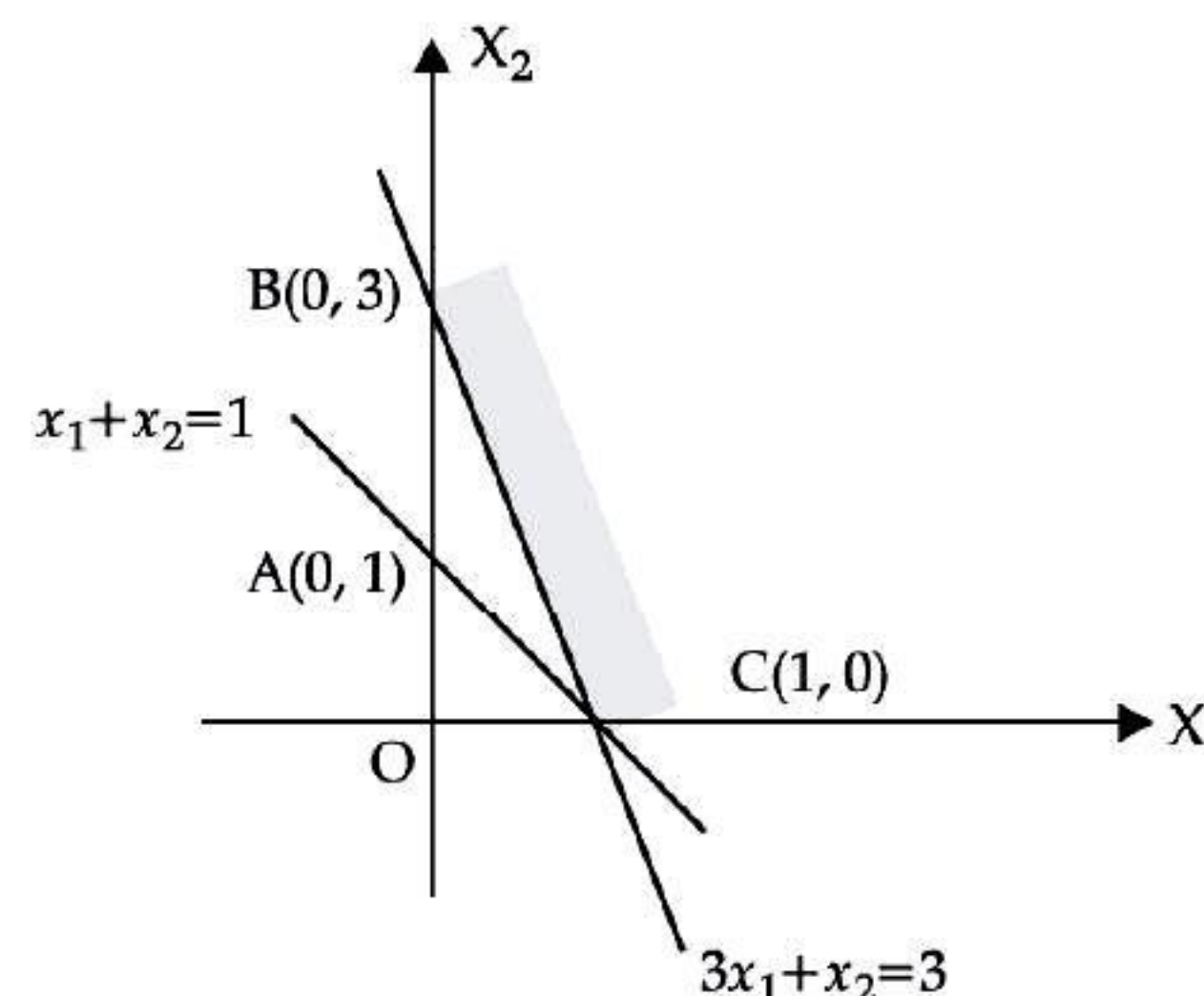
Reason (R) is also correct.

Corner Points	$Z = 7x + y$
$(3, 0)$	21
$\left(\frac{1}{2}, \frac{5}{2}\right)$	6
$(7, 0)$	49 maximum
$(0, 5)$	5

Q. 4. Assertion (A): $Z = 20x_1 + 20x_2$, subject to $x_1 \geq 0$, $x_2 \geq 2$, $x_1 + 2x_2 \geq 8$, $3x_1 + 2x_2 \geq 15$, $5x_1 + 2x_2 \geq 20$. Out of the corner points of feasible region $(8, 0)$, $\left(\frac{5}{2}, \frac{15}{2}\right)$, $\left(\frac{7}{2}, \frac{9}{4}\right)$ and $(0,10)$, the minimum value of Z occurs at $\left(\frac{7}{2}, \frac{9}{4}\right)$.

Reason (R):

Corner Points	$Z = 20x_1 + 20x_2$
$(8, 0)$	160
$\left(\frac{5}{2}, \frac{15}{4}\right)$	125
$\left(\frac{7}{2}, \frac{9}{4}\right)$	115 minimum
$(0, 10)$	200

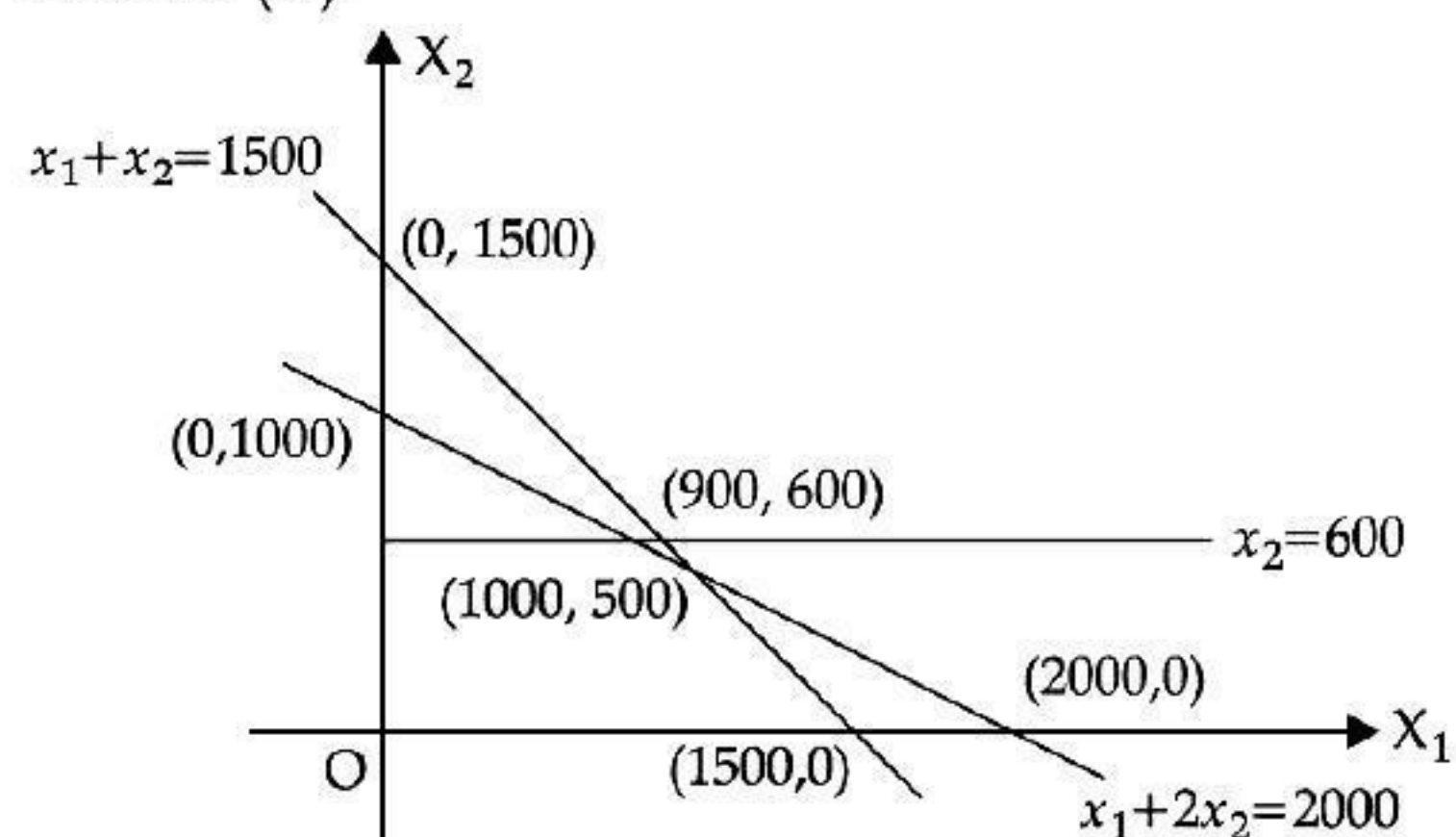**Ans.** Option (A) is correct.

> *Explanation:* Assertion (A) and Reason (R) both are correct and Reason (R) is the correct explanation of Assertion (A).

Q. 5. Assertion (A): For the constraints of a LPP problem given by $x_1 + 2x_2 \leq 2000$, $x_1 + x_2 \leq 1500$, $x_2 \leq 600$ and $x_1, x_2 \geq 0$, the points $(1000, 0)$, $(0, 500)$, $(2, 0)$ lie in the positive bounded region, but point $(2000, 0)$ does not lie in the positive bounded region.
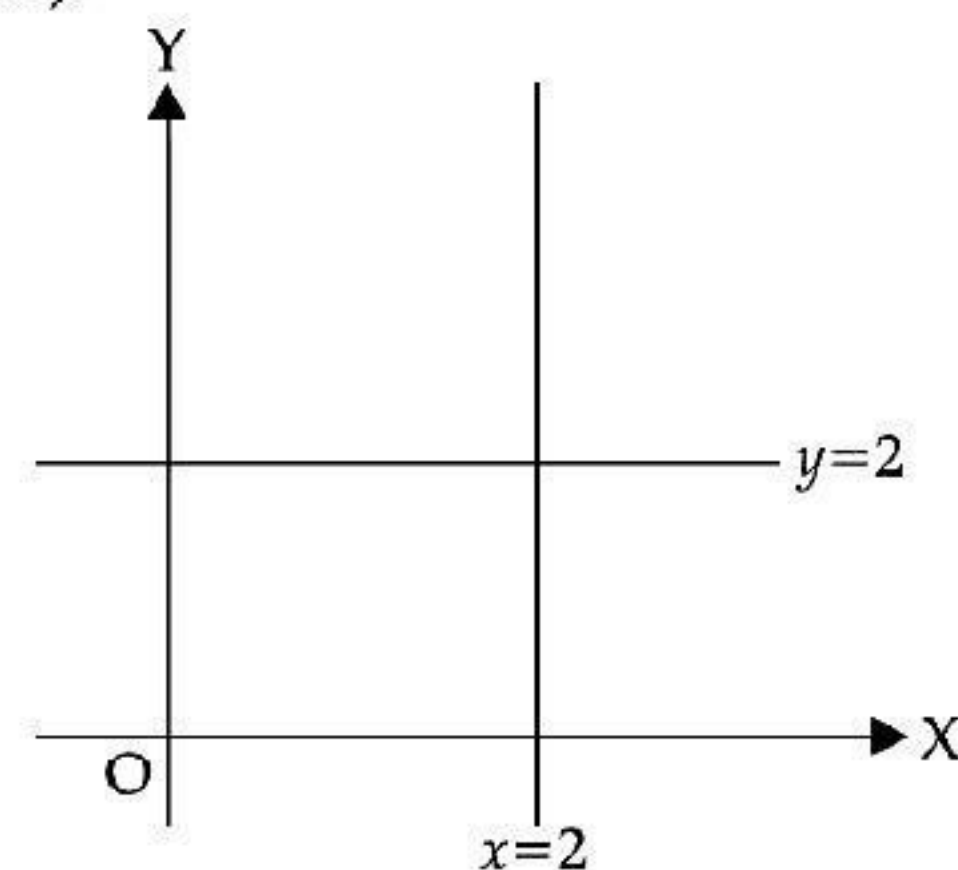
Reason (R):

From the graph, it is clear that the point (2000, 0) is outside.

Ans. Option (A) is correct.

> *Explanation:* Assertion (A) and Reason (R) both are correct, Reason (R) is the correct explanation of Assertion (A).

Q. 6. Assertion (A) : The graph of $x \leq 2$ and $y \geq 2$ will be situated in the first and second quadrants.

Reason (R):

Ans. Option (A) is correct.

> *Explanation:* It is clear from the graph given in the Reason (R) that Assertion (A) is true.