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Graphical Method of Solution for LPP in Two Variables

SUBJECT : (Mathematics)
CHAPTER NUMBER: 12
CHAPTER NAME : L. P. P.

Graphical Method of solution for LPP in two variables

There are two techniques of solving an LPP by graphical method

1. **Corner point method**

2. **Iso-profit or Iso-cost method**

CORNER-POINT METHOD

This method of solving an LPP graphically is based on the principle of the extreme point theorem.

The following algorithm can be used to solve an LPP in two variables graphically by using the corner–point method.

ALGORITHM

STEP-I

Formulate the given LPP in the mathematical form if it is not so.

STEP-II

Convert all inequations into equations and draw their graphs. To draw the graph of a linear equation, put $y = 0$ in it and obtain a point on $x - axis$. Similarly, by putting $x = 0$ obtain a point on $y - axis$. Join these two points to obtain the graph representing the equation.

CORNER-POINT METHOD

ALGORITHM

STEP-III

Determine the region represented by each inequation. To determine the region represented by an inequation replace x and y both by zero, if the inequation reduces to a valid statement, then the region containing the origin is the region represented by the given inequation.

STEP-IV

Obtain the region in $xy-$ plane containing all points that simultaneously satisfy all constraints including non-negativity restrictions. The polygonal region so obtained is the feasible region and is known as the convex polygon of the set of all feasible solutions of the LPP.

CORNER-POINT METHOD

ALGORITHM

STEP-IV

Determine the coordinates of the vertices (corner points) of the convex polygon obtained in Step II. These vertices are known as the extreme points of the set of all feasible solutions of the LPP.

STEP-V

Determine the coordinates of the vertices (corner points) of the convex polygon obtained in Step II. These vertices are known as the extreme points of the set of all feasible solutions of the LPP.

STEP-VI

Obtain the values of the objective function at each of the vertices of the convex polygon. The point where the objective function attains its optimum (maximum or minimum) value is the optimal solution of the given LPP.

CORNER-POINT METHOD

REMARK 1:

If the feasible region of an LPP is bounded $i.e.$, it is a convex polygon. Then, the objective function $Z = ax + by$ has both a maximum value M and a minimum value m and each of these values occurs at a corner point of the convex polygon.

CORNER-POINT METHOD

REMARK 2: Sometimes the feasible region of an LPP is not a bounded convex polygon. That is, it extends indefinitely in any direction. In such cases, we say that the feasible region is unbounded.

If the feasible region is unbounded, then we find the values of the objective function $Z = ax + by$ at each corner point of the feasible region. Let M and m respectively denote the largest and smallest values of Z at these points. To check whether Z has maximum and minimum values as M and m respectively, we proceed as follows:

i. Draw the line $ax + by = M$ and find the open half-plane $ax + by > M$. If the open half-plane represented by $ax + by > M$ has no point common with the unbounded feasible region, then M is the maximum value of Z. Otherwise, Z has no maximum value.

ii. Draw the line $ax + by = m$ and find the open half-plane $ax + by < m$. If the open half-plane represented by $ax + by < m$ has no point common with the unbounded feasible region, then m is the minimum value of Z. Otherwise, Z has no minimum value.

Example

Solve the following LPP graphically.

Maximize: $Z = 5x + 3y$

Subject to $3x + 5y \leq 15$

$5x + 2y \leq 10$

and $x \geq 0, \; y \geq 0$

Assignments

Choose the correct answer from the given options.

1. The optimal value of the objective function is attained at the points

(a) On X-axis (b) On Y-axis

(c) which are corner points of the feasible region (d) None of these

2. The inequation $2x + 3y \leq 6$ represents _______

(a)The open half-plane containing the origin (b)The closed half-plane containing the origin

(c) Open half-plane not containing the origin (d) Closed half-plane not containing the origin

3. Which of the following statement is correct?

(a) Every LPP admits an optimal solution (b) An LPP admits a unique optimal solution

(c) If an LPP admits two optimal solutions if it has an infinite number of optimal solutions

(d) The set of all feasible solutions of an LPP is not a convex set.

THANKING YOU

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