Degenerate LPP- Numerical Examples

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Degenerate LPP:

While solving LPP the situation may arise in which there is a tie between two or more basic variables for leaving the basis i.e. minimum ratio to identify the basic variable to leave the basis is not unique or values of one or more basic variables in the solution values column (XB) become equal to zero. This causes the problem of degeneracy. However, if minimum ratio is zero, then the iterations of simplex method are repeated (cycle) indefinitely without arriving at the optimal solution. In most of the cases when there is a tie in the minimum ratios, the selection is made using certain rules. The number of iterations required to arrive at the optimal solution can be minimized by applying certain rules.

Degenerate LPP: Condensed Tableau

Numerical Example (D1):
Try to solve these LPPs.

$$\max : Z = x_1 + 3x_2$$

Subject to

$$x_1 + x_2 \leq 10$$

$$x_1 + 6x_2 \leq 24$$

$$x_1 + 5x_2 \leq 20$$

$$x_1 + 4x_2 \leq 16$$

$$x_1, x_2 \geq 0$$

Degenerate LPP: Condensed Tableau

Numerical Example (D2):

$$\max : Z = x_1 + 3x_2$$

Subject to

$$x_1 + x_2 \leq 12$$

$$-2x_1 + 4x_2 \leq 40$$

$$-2x_1 + 5x_2 \leq 50$$

$$-2x_1 + 6x_2 \leq 60$$

$$x_1, x_2 \geq 0$$

Numerical Example (D3):

$$\max : Z = x_1 + 3x_2$$

Subject to

$$x_1 + x_2 \leq 10$$

$$-x_1 + 3x_2 \leq 12$$

$$-x_1 + 4x_2 \leq 16$$

$$-x_1 + 5x_2 \leq 20$$

$$x_1, x_2 \geq 0$$

Degenerate LPP: Condensed Tableau

Numerical Example (D4):

$$\max : Z = 2x_1 + 5x_2$$

Subject to

$$x_1 + x_2 \leq 9$$

$$x_1 + 6x_2 \leq 18$$

$$x_1 + 5x_2 \leq 15$$

$$x_1 + 4x_2 \leq 12$$

$$x_1, x_2 \geq 0$$