12 LINEAR PROGRAMMING

1 OMQ + 1 SAQ [1M + 4M = 5 M]

CONCEPTS & FORMULAS

1. What do we do in Linear Programming?

We have to find the optimum solution (Maximum or Minimum) for the given

LPP - Linear Programming Problem.

LPP consists of a linear function in the form Z=ax+by and a set of linear inequalities (constraints) like $a_1x + b_1y \geq c_1$; $a_2x + b_2y \geq c_2$ with non-negative restrictions on the variables $x \geq 0, y \geq 0$

2. How to Solve an LPP?

i) Convert the linear inequalities into linear equations.

ii) Draw the lines on the graph (spot two points on the line (s) one on the x-axis and the other on the y-axis by putting y=0 and x=0); Also find the coordinates of point of intersection incase of intersecting lines.

iii) Shade the feasible region (where all possible solutions are available)

iv) Identify the corner points. (vertices of the polygon)

v) Substitute all the corner points in the given objective function.

vi) Choose the Maxima or Minima **See Hint Box Page 311 SAQ(1)**

3. 4 Components of LPP:

i) Decision variables (x,y): The unknown quantities that are to be find.

ii) Objective function(Z=ax+by): The linear function to be optimised (Maximum or Minimum)

iii) Constraints: $a_1x + b_1y \geq c_1$; $a_2x + b_2y \geq c_2$; $x \geq 0, y \geq 0$

iv) Non-negative variables: Variables cannot be negative i.e., $x \geq 0, y \geq 0$ (first quadrant)

4. If the **feasible region R is bounded** then the objective function Z has both a **maximum and a minimum value** on R and each of these occurs at a **corner point (vertex) of R.**

5. If the **feasible region R is unbounded,** then a **maximum or a minimum value** of the objective function **may not exist**. However, if it exists, it must occur at a **corner point of R.**

6. Important terms:

i. **Objective function :** The linear function $Z = ax + by$, where a, b are constants, which has to be maximized or minimized is called a linear **objective function.**

ii. **Constraints (≥0):** The linear inequalities on the variables of a L.P.P are called **constraints**.

iii. **Optimal (feasible) solution :** Any point in the feasible region that gives the optimal value (maximum or minimum) of the objective function is called an **optimal solution.**

iv. **Optimal value:** Optimal value is a maximum or minimum value of a objective function to be find in L.P.P.

v. **Decision variables** are x and y which denote the required number of items/products.