OPTIMIZATION

The General Linear programming problem:

The general linear programming problem can be expressed as follows .

Find the value of variables X_1 X_2 , …… , X_n which (maximize or minimaize) on objective function , which is a linear function of variable , such as

$Z = C_1 X_1 + C_2 X_2 + \ldots\ldots\ldots\ldots + C_n X_n$

Subject to the constraints .

$a_{11} X_1 + a_{12} X_2 + \ldots\ldots\ldots\ldots + a_{1n} X_n \ (\leq , = , \geq)\ b_1$

$a_{21} X_1 + a_{22} X_2 + \ldots\ldots\ldots\ldots + a_{2n} X_n \ (\leq , = , \geq)\ b_2$

$a_{31} X_1 + a_{32} X_2 + \ldots\ldots\ldots\ldots + a_{3n} X_n \ (\leq , = , \geq)\ b_3$

,

,

,

$a_{m1} X_1 + a_{m2} X_2 + \ldots\ldots\ldots\ldots + a_{mn} X_n \ (\leq , = , \geq)\ b_n$

And meat the non-negative condition X_1 X_2 , …… , $X_n \geq 0$ for each constraints one only one of signs ($\leq , = , \geq$) holds bat the sign may Vary from one constraints to on ther .

Because of the variety of notation is common use one finds the general L.P.P stated in mary forms some of there are :

1) Compact form by using the sigen sign :

(Maximize or Minimize) Z = $\sum_{j=1}^{n} Cj\ X_j$

$\sum_{j=1}^{n} aij\ X_j\ (\leq , = , \geq)\ b_i$

And $X_j \geq 0$, (j = 1 , 2 , ... , n , i = 1 , 2 , ... , m)

2) Matrix _ Vector forms :

(Maximize or Minimize) CX

Subject to

Ax $(\leq , = , \geq)$ b and x ≥ 0

Where A is a (m x n) matrix , x is a(n x 1) column vector , b is a(m x 1) column vector and C is a(1 x m) row vector in other words

$$A(m \times n) = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$$

$$X(m \times 1) = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} \quad , \quad b(m \times 1) = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{bmatrix} \quad , \quad C(1 \times m) = \begin{bmatrix} c_1 & c_2 & \cdots & c_n \end{bmatrix}$$

Where A is coefficient matrix , x is the decision variables b is the requirement vector , c is the costor (price or profit) vector of L.P.P .