Q) Explain linear Programming and their methods with example?

Sol) Linear programming is use to describe the relationship among two or more variables. A linear program is an optimization problem in which we are asked to find the value of x that minimizes or maximizes.

Linear Programming problem can be solved using graphical method. Here we explain a graphical method.

In graphical method, we plot the constraints on graph paper and decide the feasible region. To find the optimal solution we examine the points on the feasible solution. Means that we determine the coordinates of each extreme point of the feasible solution, compute, and compare the value of the objective function at each extreme point. And we get the extreme points which give maximum or minimize value of the objective function.

Example: - Suppose max is given $z=15x1+10x2$ and subject constraints are $4x1+6x2<=360$, $3x1+0x2<=180$,$0x1+5x2<=200$. Where x1 and x2 >=0.

Solution: Here Max is given $x=15x1+10x2$.

$4x1+6x2=360$ … (1)

$3x1+0x2=180$ … (2)

$0x1+5x2=200$ … (3)

Now put x1=0 in eq(1) we have ..

$4*0+6x2=360$

$X2=60$

Similarly x2=0, we get

$4x1+6*0=360$

$X1=90$

We have (0,60) and (90,0)

Similarly, we get the points from eq (2) and eq (3) –

$3x1=180$

$X1=60$

$5x2=200$

$X2=40$

We have (60,0) and (0,40)

The points are 0(0,0),A(0,60),B(90,0),D(0,40),F(30,40),E(60,20),C(60,0) are drawn on map and we get the extreme points. By putting the extreme points of the feasible region are 0(0,0),D(0,40),F(30,40),E(60,20),C(60,0).

If we put the coordinates into z=15x1+10x2;

We get the maximum value is 1100.

Q) What is transportation problem? Explain the algorithm of different transportation models?

Sol) A transportation problem is an important application of linear programming in which we deal with the minimizing the transportation cost from several origins centres to several demand centres.

There are three different methods for develop initial solution.

1) North- West Corner Method.

2) Least Cost Method

3) Vogel's Approximation Method.

North-West Corner Method:-

1) Find the north west corner cell of the transportation table.. Allocate as much as possible to the selected cell.

2) Adjust the associated amounts of supply and demand by subtracting the allocated amount.

3) If the capacity for the first row is exhausted then we move down to next row of first column. And we allocate minimum and go step 2.

4) If the requirement of first column is exhausted then we move horizontal to the next cell in the next column and go step 2.

5) Continue the procedure until the origin or destination satisfying. And Cross out the row or column with 0 supply or demand. If both a row and a column have a zero.

Least Cost Method:-

1. a) Select the lowest transportation cost among all the rows or columns of the transportation table.

1.b) If the minimum cost is not unique, then select arbitrary any cell with the lowest cost.

2) Allocate as many units as given in the requirements and eliminate that row or column if either requirement or available is exhausted.

3) Adjust the capacity and requirements for a next allocation.

4) Repeat steps 1,2and 3 for reduce the table, until the entire capacity is exhausted to fill the requirement at different destination.

Vogel’s Approximation Method:-

1) First we compute the penalty for each rows and columns in the transportation table. The penalty is to be find for given row and column is the difference between the smallest cost and the next smallest cost element.

2) Then identify the row or column with the largest penalty. Also, find the smallest cost cell and allocate the maximum requirement possible to this cell.

3) Delete the row or column in which capacity is exhausted.

4) Whenever the largest penalty is unique, make an arbitrary choice.

5) Repeats step 1 to 3 for the reduced table until entire capacities are used to fill the requirement.