# Quantitative Management Modelling
# Name & Id: Pallepati Pallavi (#811249048)
# Assignment 1 – LP Model

## Question 1:

1A. Decision Variables:

X1 = Number of collegiate Bags

X2 = Number of Mini Bags

1B. Objective functions:

Let the objective function be Z which represents the maximum profit = Z= 32 X1+ 24 X2

1C. Constraint:

Material constraint: Nylon fabric sheet in sq.ft = 5000

3 X1 +2 X2 <= 5000

Time constraint: Total working time in hours = 35 Employees works 40 hours per week

X1 needs 45 minutes of labour to generate profit of 32$ and X2 needs 40 minutes to earn profit of 25$

45 X1+ 40X2 <=35 *40 hrs * 60 minutes = 84000 = 1400 hrs

Non-negative constraints:

0=X1<=1000

0=X2<=1200

1D: Mathematical Formulation for this LP Problem:

Z= 32X1+ 24X2

Subject to restrictions

32X1+24X2<=5000 Sq.ft of material required per week

X1<=1000 collegiates sold per week

X2<=1200 Minis sold per week

45X1+40X2 <=84000 hrs per week (35 labours * 40 hrs * 60 minutes)(in minutes) (or)

3/4X1+2/3X2<= 1400 HRS (35 Labours*40 hrs)[hrs) (45 minutes = ¾ hrs. & 40 minutes= 2/3hrs)

X1, X2>=0

# Question 2:

Let X = Large, Y = Medium and Z= small

2A. Decision Variables:

Let X1, Y1, Z1 be the quantities produced in L, M & S for plant 1
Let X2, Y2, Z2 be the quantities produced in L, M & S for plant 2
Let X3, Y3, Z3 be the quantities produced in L, M & S for plant 3

2B. Formulating LP model:

Let the objective function be Z which represents the maximum profit =

Z= 420 (X1+X2+X3) + 360( Y1 +Y2+Y3) + 300 ( Z1+Z2+Z3)

Capacity Constraints:

X1+Y1+Z1<=750 (Excess production of 750 units of plant 1 every day)

X2+Y2+Z2<=900 (excess production of 900 units of plant 2 every day )

X3+Y3 +Z3<=450 (excess production of 450 units of plant 3every day)

Storage constraint:

20X1+15Y1+12Z1<=13000 (storage capacity of plant 1 13000 sq.ft )

20X2+ 15Y2+ 12Z2<= 12000 (storage capacity of plant 2 12000 sq.ft)

20X3+15Y3+12Z3<= 5000 (storage capacity of plant 3 5000 units sq.ft)

Sales constraints:

L = X1+X21+X3 <=900 (900 Units needs to be sold plant 1 every day)

M= Y1+Y2+Y3<= 1200 (1200 Units needs to be sold plant 2 every day)

S= Z1+Z2+Z3<= 750 (750 Units needs to be sold plant 3 every day)

Xx,Yx,Zx>=0

Percentage Constraints:

As said that plant always consumes same % of their excess capacity to produce the new product, below are the equations:

(X1+Y1+Z1)/750=(X2+Y2+Z2)/900=(X3+Y3+Z3)/S450

It can be written as:

900(X1+Y1+Z1) =750 (X2+Y2+Z2)

450 (X2+Y2+Z2) = 900 (X3+Y3+Z3)

450 (X1+Y1+Z1) =750(X3+Y3+Z3)

Non- Negative zero:

X1,Y1,Z1, X2,Y2,Z2,X3,Y3, Z3>=0