Sol 1) The given details from the problem are :

Back Savers is a company where 2 types of bags are manufactured by nylon We get 5000sqft each week

1. Collegiate	2. Mini
3sqft	2sqft
1000	1200 sold per week
1 – 45mins	1 – 40mins to make a bag
$32	$24 profit incurred

No. Of laborer's= 35

No. Of hours they work per week= 40

Decision Variables :- (Z,C,M)

- Let us consider Z as the object function as it is defined, we should maximize the profit of the bags

  Z = 32C + 24M where C is Collegiate bags and M is Mini bags

  Both C and M are non-negative logically .

  Hence C ≥ 0 and M ≥ 0

- Amount of total nylon received per week= 5000sqft
- Amount of total number of labor's per week= 35
- Amount of total work hours per week= 40
- Total working hours of the labors= 1400

Object Function:- Is to maximize the profit by optimizing the production of the bag .

→ Z (C,M) = 32C + 24M ; as 32 and 24 Is the generated unit of profit

And C and M are non-negative .

→ Maximum no. Of Collegiate bags = 1000

$$0 \leq C \leq 1000$$

→ Maximum no. Of Mini bags = 1200

$$0 \leq M \leq 1200$$

Requirements : Collegiate Bag – 3sqft of nylon

Mini Bag – 2sqft of nylon

$\rightarrow$ 3C + 2M ≤ 5000

Each collegiate bag takes 45mins= $\frac{45}{60}$hrs = $\frac{3}{4}$hrs

Each Mini bag takes 40mins= $\frac{40}{60}$hrs= $\frac{2}{3}$hrs

$$\rightarrow \left[\frac{3}{4}\right] C + \left[\frac{2}{3}\right] M \leq 1400$$

Constraints:- The Non-negative terms and the variables are given as

$$3C + 2M < 5000$$

$$\left[\frac{3}{4}\right] C + \left[\frac{2}{3}\right] M \leq 144$$

Hence the mathematical formulation for this LP problem is in the limits of

$0 \leq C \leq 1000$ and $0 \leq M \leq 1200$

Sol2) Given are the following details:

A company has three branch plants – of 3 sizes Large(l), medium(m) & small(s).

$420, $360 & $300

750, 900 & 450

13000, 12000 & 5000

Giving a net profit of	$420	$360	$300
Excess capacity to produce	750	900	450
In-process storage space plants (sqft)	13000	12000	5000
In-process storage space units l,m,s (sqft)	20	15	12
Sales forecasted for l,m,s units	900	1200	750

Decision Variable:- Let P_{ij} be the size units

Where P denotes Units no.

i no. Of plants

j size of the product in each plant

l,m,s being the three sizes of the product of the plants

Z being the maximum profit drawn

Object function:- this is to maximize the profit of each plant by increasing the production of the items

Z= 420$[P_{1l} + P_{2l} + P_{3l}]$ + 360$[P_{1m} + P_{2m} + P_{3m}]$ + 300$[P_{1s} + P_{2s} + P_{3s}]$

As 420,360 & 300 are the units of producing the net profit

Constraints:-

$$P_{1l} + P_{2l} + P_{3l} \leq 750$$

$$P_{1m} + P_{2m} + P_{3m} \leq 900$$

$$P_{1s} + P_{2s} + P_{3s} \leq 450$$

Production of units per day regardless of the size and combination of the sizes Storage units mentioned is :

$$20P_{1l} + 15\,P_{1m} + 12P_{1s} \leq 13000$$

$$20P_{2l} + 15\,P_{2m} + 12P_{2s} \leq 12000$$

$$20P_{3l} + 15\,P_{3m} + 12P_{3s} \leq 5000$$

Sales forecasted for the production of items:-

$$P_{1l} + P_{2l} + P_{3l} \leq 900$$

$$P_{1m} + P_{2m} + P_{3m} \leq 1200$$

$$P_{1s} + P_{2s} + P_{3s} \leq 750$$

To avoid layoffs of possible, management has decided that the plants should use the same percentage of their excess capacity to produce the new product:

L= $\frac{P_{1l}+P_{1m}+P_{1s}}{750}$ - $\frac{P_{2l}+P_{2m}+P_{2s}}{900}$= 0

Linear programming model is given by the formula:-

Z= 420$[P_{1l} + P_{2l} + P_{3l}]$ + 360$[P_{1m} + P_{2m} + P_{3m}]$ + 300$[P_{1s} + P_{2s} + P_{3s}]$