

## Assignment - LP Model

- Que. 1 a) clearly define the decision variables  
 let the collegiate be  $x_1$   
 the mini be  $x_2$
- b) Objective functions for profit maximization  
 $\nabla \text{Max } Z = 32x_1 + 24x_2 - \text{labour cost (1550)}$

$$\text{labour cost} = 0.75(1000) + 0.67(1200)$$

$$= 750 + 800 = 1550 \text{ hours}$$

let wage per hour be  $y = 1550y$

- c) Constraints:  $x_1 \leq 1000, x_2 \leq 1200$

nylon 5000 sq ft / week

$$\text{labour} = 3.5 - 40 \text{ hrs/week} + (30 \times 45) = 1350 \text{ hours}$$

- d) Subject to,  $3x_1 + 2x_2 \leq 5000$

$$0.75x_1 + 0.67x_2 \leq 1350$$

$$x_1, x_2 \geq 0$$

Mathematical formulation

Non negativity -  $x_1 \geq 0, x_2 \geq 0$

$$y \geq 0$$



Que. 2 (a) decision variables  $\rightarrow$  different plants are  $X_1, X_2, X_3$   
different sizes are  $L_1, M_1, S_1$   
 $L_2, M_2, S_2$   
 $L_3, M_3, S_3$

$$\text{Max } Z = 420(L_1 + L_2 + L_3) + 360(m_1 + m_2 + m_3) + 300(S_1 + S_2 + S_3) \quad [\text{our daily profit}]$$

$$= 420L_1 + 420L_2 + 420L_3 + 360m_1 + 360m_2 + 360m_3 + 300S_1 + 300S_2 + 300S_3$$

$$\text{constraints} - L_1 + M_1 + S_1 \leq 750 \quad [\text{Plant 1 space capacity}]$$

$$L_2 + M_2 + S_2 \leq 900 \quad [\text{Plant 2 space capacity}]$$

$$L_3 + M_3 + S_3 \leq 450 \quad [\text{Plant 3 space capacity}]$$

$$L_1 + L_2 + L_3 \leq 900 \quad (\text{large sales forecast})$$

$$M_1 + M_2 + M_3 \leq 1200 \quad (\text{medium sales forecast})$$

$$S_1 + S_2 + S_3 \leq 750 \quad (\text{small sales forecast})$$

$$20L_1 + 15M_1 + 12S_1 \leq 13000 \quad (\text{Plant 1 storage space})$$

$$20L_2 + 15M_2 + 12S_2 \leq 12000 \quad (\text{Plant 2 storage})$$

$$20L_3 + 15M_3 + 12S_3 \leq 5000 \quad (\text{Plant 3 storage})$$

$$L_1X_1, L_2X_2, L_3X_3, M_1X_1, M_2X_2, M_3X_3, S_1X_1, S_2X_2, S_3X_3 \geq 0$$