NAME: GEETHIKA VULLI
ID: 811290653

QUESTION 1:

Total nylon sheet = 5000sqft

Total working time = 35*40* 60 = 84000minutes = 1400 hours

a) Decision Variables:

Y1= produced collegiate backpacks per week
Y2= produced Mini Backpacks per week

b) Objective Function:

Z = 32Y1 + 24Y2(maximize profit)

c) Constraints:

Constrain 1: 3Y1+2Y2 ≤ 5000 (square feet of material nylon to be shipped per week)
Constrain 2: Y1 ≤ 1000
Constrain 3: Y2 ≤ 1200
Constrain 4: 45Y1+40Y2 ≤ 84000 = (45/60) Y1+(40/60) Y2 ≤ 1400 (converting minutes into hours that is converting 45 minutes into hours by dividing them with 60 (as 1 hour = 60 minutes) and the same case with the 40 minutes and 84000 hours)

d) **Mathematical formulation**:

Max Z = 32Y1 + 24Y2
Subject to the restrictions
3Y1+2Y2 ≤ 5000 (Material)
Y1 ≤ 1000
Y2 ≤ 1200
(3/4) Y1+(2/3) Y2 ≤ 1400 (Time)
45mins =3/4 hour
40 mins = 2/3 hour
where Y1, Y2 ≥ 0

QUESTION 2:

a) Decision variables

Let A1, B1, and C1 be the quantities of products with large, medium, and small sizes of Plant 1.
Let A2, B2, and C2 be the quantities of products with large, medium, and small sizes of Plant 2.
Let A3, B3, and C3 be the quantities of products with large, medium, and small sizes of Plant 3.

b) Linear programming model:

i) Decision variables → Ax, Bx, Cx

ii) Objective function :

Z = 420A1+420A2+420A3+360B1+360B2+360B3+300C1+300C2+300C3 (Maximize profit)

Subject to Constraints:

A1+B1+C1 ≤ 750 (plant 1 spare capacity)

A2+B2+C2 ≤ 900 (plant 2 spare capacity)

A3+B3+C3 ≤ 450 (plant 3 spare capacity)

A1+A2+A3 ≤ 900 (sales forecast of Large)

B1+B2+B3 ≤ 1200 (sales forecast of Medium)

C1+C2+C3 ≤ 750 (sales forecast of Small)

20A1+15B1+12C1 ≤ 13000 (storage space in plant 1)

20A2+15B2+12C2 ≤ 12000 (storage space in plant 2)

20A3+15B3+12C3 ≤ 5000 (storage space in plant 3)

Ax, Bx, Cx ≥ 0

Given that each plant should use equal percentage of its production units

900*(A1+B1+C1) = 750*(A2+B2+C3)
450*(A2+B2+C2) = 900*(A3+B3+C3)
450*(A1+ B1 + C1) = 750 *(A3 + B3+C3)

Non-Negativity

Where A1, A2, A3, B1, B2, B3, C1, C2, C3 ≥ 0