Abhinav Thupili
811234108

Problem ①

Given,

-) Total shipment of material = 5000 sqft

-) material required by collegiate = 3 sqft

-) Material required by mini = 2 sqft

-) Total hours of work done/week

$$= 35 \text{ labors} \times 40$$
$$= 1400 \text{ hours}.$$

A) Decision variable :-

$P =$ Total profit as a function.

$C =$ no. of bags collegiate.

$M =$ no. of mini's

B) objective function

$$\text{Max } P = 32C + 24M \text{ ; where}$$

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

c) Constraints:

$$3c + 2M \le 5000$$

$$\frac{3}{4}c + \frac{2}{3}M \le 1400$$

D) Mathematical formulation:

Max $P = 32c + 24M$

Subject to $3c + 2M \le 5000$

$$\frac{3}{4}c + \frac{2}{3}M \le 1400$$

where $0 \le c \le 1000$

$$0 \le M \le 1200$$

Problem 2

A) Decision Variables:

Let P_1 = Plant 1; P_2 = Plant 2; P_3 = Plant 3

l = large; m = medium; s = small

Formulation for medium large sized

$L_1 P_1$ = no. of large product in P_1

$L_2 P_2$ = no. of lage product in P_2

$L_3 P_3$ = no. of large size product in P_3

Formulation for medium sized

$M_1 P_1$ = no. of medium product in P_1

$M_2 P_2$ = no. of medium product in P_2

$M_3 P_3$ = no of medium product in P_3

Formulation for small sized.

$S_1 P_1$ = no. of small product in P_1

$S_2 P_2$ = no. of small product in P_2

$S_3 P_3$ = no. of small product in P_3

B) Objective function

$$\text{Max } P = 420(L_1 P_1 + L_2 P_2 + L_3 P_3) + 360(M_1 P_1 + M_2 P_2$$
$$+ M_3 P_3) + 300(S_1 P_1 + S_2 P_2 + S_3 P_3)$$

c) Constraints:

→ capacity constraints

$$L_1 P_1 + M_1 P_1 + S_1 P_1 \leq 750$$
$$L_2 P_2 + M_2 P_2 + S_2 P_2 \leq 900$$
$$L_3 P_3 + M_3 P_3 + S_3 P_3 \leq 450$$

→ Space constraints

$$20 L P_1 + 15 m P_1 + 12 S P_1 \leq 13000$$
$$20 L P_2 + 15 m P_2 + 12 S P_2 \leq 12000$$
$$20 L P_3 + 15 m P_3 + 12 S P_3 \leq 5000$$

→ Sales per forecast

$$P_1 l + P_1 M + P_1 S \leq 900$$
$$P_2 l + P_2 M + P_2 S \leq 1200$$
$$P_3 l + P_3 m + P_3 S \leq 750$$

-) Percentage of Excess capacity

$$P_1 = \frac{P_1 l + P_1 m + P_1 S}{750} \times 100$$

$$P_2 = \frac{P_2 l + P_2 m + P_2 S}{900} \times 100$$

$$P_3 = \frac{P_3 l + P_3 m + P_3 S}{450} \times 100$$