**OT Assignment-3**

* **23912**

(1) Formulate LP model for this problem?

A. **Obj:** **Maximize** 3x1 + 3x2 + 5x3

**Subject to**:

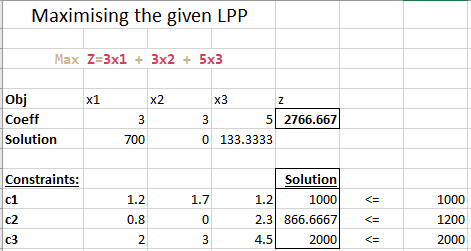
1.2(x1) + 1.7(x2) + 1.2(x3) <=1000

0.8(x1) + 0(x2) + 2.3(x3) <=1200

2(x1) + 3(x2) + 4.5(x3) <=2000

x1,x2,x3 >= 0

(2) Solve the problem by SOLVER?

A. 

(3) What is the optimal production mix? What contribution can the firm anticipate by producing this mix?

A. 700 units of Chairs, 0 Benches and 133.33 Tables, i.e.,

=> 700(x1) + 0(x2) + 133.33(x3) = 2766.667

**Max profit = $2766.667**

(4) What is the value of one unit more of tube-bending time? of welding time? of metal tubing?

A. The value of one unit more of resource is nothing but shadow price. So,

Value of one unit more of tube-bending time = $1.166

Value of one unit more of welding time = $0

Value of one unit more of metal tubing = $0.8

(5) A local distributor has offered to sell Outdoors, Inc. some additional metal tubing for $0.60/lb. Should Outdoors buy it? If yes, how much would the firm’s contribution increase if they bought 500 lbs. and used it in an optimal fashion?

A. We can buy 500 lbs metal from distributor because of 2 reasons:

i) As allowable increase is upto 555.55.

ii) Shadow Price is $0.8

Old price: 500\*0.8 =$400

Upon buying 500 lbs from distributor,

New price: 500\*0.6 =$300

Profit here is 400-300 = **$100**

(6) If Outdoors, Inc. feels that it must produce at least 100 benches to round out its product line, what effect will that have on its contribution?

A. Since reduced cost is -1.3833 for benches, buying 100 benches will contribute to loss of 100\*(-1.3833) = $138.33

(7) The R&D department has been redesigning the bench to make it more profitable. The new design will require 1.1 hours of tube-bending time, 2.0 hours of welding time, and 2.0 lbs. of metal tubing. If it can sell one unit of this bench with a unit contribution of $3, what effect will it have on overall contribution?

A. Cost of new product, Cost = $3

Shadow prices of the resources, SP = (1.166, 0, 0.8)

Coefficients of the new product, CN = (1.1, 2.0, 2.0)

Reduced Cost = Cost – (SP)(CN)

= 3 – 2.88

= $1.12

Since reduced cost is positive, we can produce the units.

(8) Marketing has suggested a new patio awning that would require 1.8 hours of tube-bending time, 0.5 hours of welding time, and 1.3 lbs. of metal tubing. What contribution must this new product have to make it attractive to produce this season?

A. Cost of new product, Cost = x

Shadow prices of the resources, SP = (1.166, 0, 0.8)

Coefficients of the new product, CN = (1.8, 0.5, 1.3)

Reduced Cost = Cost – (SP)(CN)

= x – 3.14

Reduced cost is positive if the cost of the item is at least $3.14.

(9) Outdoors, Inc. has a chance to sell some of its capacity in tube bending at cost + $1.50/hour. If it sells 200 hours at that price, how will this affect contribution?

A. We can sell it because of 2 reasons:

i) The shadow price of tube-bending constraint is $1.166/hr and this value won’t change if the rhs of the constraint is decreased by up to 466.6667.

ii) Loss incurred by decreasing by 200 hours = 1.166\*200 = $233.33

Profit earned by selling 200 hrs worth capacity = 1.5\*200 = $300

Total profit: 300 -233.33 = $66.66

(10) If the contribution on chairs were to decrease to $2.50, what would be the optimal production mix and what contribution would this production plan give?

A. Allowable decrease for contribution of chairs is until 3-0.777 = $2.223

So the optimal production mix won’t change even if we reduce it to $2.50.

Contribution = Total profit – Loss incurred

= 2766.66 – 0.5\*700

= $2416.66