

**Post Graduate Program in Business Analytics and Business Intelligence**

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**Group Assignment on Optimization technique**

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**Solution# 1**

**Decision Variables**

Let’s consider

x1 be the $ amount invested in long-term bonds

x2 be the $amount invested in medium-term bonds

x3 be the $ amount invested in Government bonds

x4 be the $ amount invested in short-term bonds

X1,X2,X3,X4 is not equal to zero

**Objective Function**

Objective Function is to maximize the returns on investment made in different bonds

Z=0.15L+0.12M+0.9G+0.1S

**Constraints**

1. The Total amount invested under each bond should not exceed 1000000

X1+X2+X3+X4<=1000000

1. 45% of the total amount invested can be invested in any single bond

X1<=45\*Sum(X1+X2+X3+X4)

X2<=45\*Sum(X1+X2+X3+X4)

X3<=45\*Sum(X1+X2+X3+X4)

X4<=45\*Sum(X1+X2+X3+X4)

1. The average risk index of the portfolio should not exceed 6

0.03X1+0.04X2+0.07X3+0.09X4<=0.06\*Sum(X1+X2+X3+X4)

1. Expected return of the Government bond portfolio should be at least 1.2 times the return of the long-term and medium-term bond portfolio

0.09\*X3>=1.2\*0.15\*X1

0.09\*X3>=1.2\*0.12\*X2

Using LP solving method, U save company can invest the money as

Long-term bond : $225,000

Medium-term bond : $281250

Government bond : $450,000

Short-term bond : $43750

U Save company gets a return : $112375 of 1 Million investment made

**Solution# 2**

**Decision Variables**

Let’s consider

x1 be the number of bags of Mix 1

x2 be the number of bags of Mix 2

X1,X2 is not equal to zero

**Objective function**

Maximise Profit = Selling Price – Cost Price

Profit, x1 = 1.49 – ((0.50\*0.35) + (0.50\*0.50))

= $1.065

Profit, x2 = 1.69 – ((0.60\*0.35) + (0.25\*0.50) + (0.15\*0.60))

= $1.265

**Constraints**

X1+X4<= 30000 ( total amount of peanuts available)

X2+X5<= 12000 (total amount of cashews available)

X3+X6<= 9000 (total amount of almonds available)

By Solving the problem using LP Method

x1 = 0 bags of Mix 1

x2 = 48000 bags of Mix 2

Maximizing Profit = $60720.00

**Solution# 3**

**Decision Variables**

Let’s consider

x1 be the amount of sugar used in Slugger candy

x2 be the amounts of nuts used in Slugger candy

x3 be the amount of chocolate used in Slugger candy

x4 be the amount of sugar used in Easy out candy

x5 be the amounts of nuts used in Easy out candy

x6 be the amount of chocolate used in Easy out candy

P1 is the selling price of slugger candy in Cents

P2 is the selling price of easy out candy in cents

X1,x2,x3,x4,x5,x6,P1,P2 is not equal to zero

Mixture used to make Easy Out Candy must have at least 20% nuts

**Objective Function**

Objective function = 0.20\*X7 + 0.25\*X8

**Constraints**

X5 >= 0.20\*X8 (must contain at least 20% nuts)

X2 >= 0.10\*X7 (must contain at least 10% nuts )

X3 >= 0.10\*X7 (must contain at least 10% chocolate)

X7 = X1+X2+X3 (Total amount of Slugger candy)

X8 = X4+X5+X6 (Total amount of Easy out candy)

X1+X4 = 100 (Total amount of Sugar)

X2+X5 = 20 (Total amount of nuts)

X3+X6 = 30 (Total amount of chocolate)

with the help of LP model, Maximum Revenue from candy sale is $32.50 with 50 Oz of Easy Out Candy and 100 Oz of slugger Candy

**Solution# 4**

4 (a) What is the definition of the decision variables in the linear program used by the company?

4 (a) Decision variable defined as number of drivers works in shift

The following are the decision variables used by the company:

x1 = no. of employees who work from Monday - Friday

x2 = no. of employees who work from Tuesday – Saturday

x3 = no. of employees who work from Wednesday – Sunday

x4 = no. of employees who work from Thursday – Monday

x5 = no. of employees who work from Friday – Tuesday

x6 = no. of employees who work from Saturday – Wednesday

x7 = no. of employees who work from Sunday – Thursday

4 (b) Describe the objective function (in words) that the company uses in the linear program

4 (b) The objective function used is the total number of minimum workers the company needs to hire in accordance to their work policy which states that every employee works for 5 consecutive days and gets 2 days off in a week.

4 (c) Determine the optimal value of the objective function

4 (c) Based on the above calculations made via the solver, the optimal value of the objective function is 22 workers in total.

4 (d) Based on the optimal solution, how many drivers will be scheduled to work on Monday?

4 (d) The number of drivers scheduled to work on Monday are 19

4 (e) Based on the optimal solution, how many drivers will be scheduled to work on Tuesday?

4 (e) The number of drivers scheduled to work on Tuesday are 17

4 (f) Suppose the drivers were paid $50 per weekday and $80 for Saturday or Sunday, what is the total money paid to the drivers if the optimal plan determined above was implemented.

4 (f)



Total money paid to drivers will be $6250.00.