California State University, East Bay

College of Business and Economics

BAN 630: Optimization for Analytics

**Homework 1**

**Due: 11:59 pm Sunday, June 14, 2020**

Instructions:

* **Build Spreadsheet/Optimization Models to solve this homework.**
* Explain your answer and reasoning clearly.
* You may work in groups, but write/type your own homework report.
* **Upload your finished Excel file unto Blackboard.**

1. Julie James is opening a lemonade stand. She believes the fixed cost per week of running the stand is $50.00. Her best guess is that she can sell 300 cups per week at $0.50 per cup. The variable cost of producing a cup of lemonade is $0.20.

a. Given her other assumptions, what level of sales volume will enable Julie to break even?

b. Given her other assumptions, discuss how a change in sales volume affects profit.

c. Given her other assumptions, discuss how a change in sales volume and variable cost jointly affect profit.

2. A chemical company manufactures three chemicals: A, B, and C. These chemicals are produced via two production processes: 1 and 2. Running process 1 for an hour costs $400 and yields 300 units of A, 100 units of B, and 100 units of C. Running process 2 for an hour costs $100 and yields 100 units of A and 100 units of B. To meet customer demands, at least 1000 units of A, 500 units of B, and 300 units of C must be produced daily.

a. Use Solver to determine a daily production plan that minimizes the cost of meeting the company’s daily demands.

b. Based on the sensitivity analysis report, what happens to the total cost when the requirement for chemical C increases by 100 unit? (hint: check the shadow price of Chemical C in sensitivity analysis report and you may need to input constraints one by one instead input by range to get the report.)

3. A chemical company produces three products, A, B, and C, and can sell these products in unlimited quantities at the following unit prices: A, $10; B, $55; and C, $100. Producing a unit of A requires one hour of labor; a unit of B, two hours of labor plus two units of A; and a unit of C, three hours of labor plus one unit of B. Any A that is used to produce B cannot be sold. Similarly, any B that is used to produce C cannot be sold. A total of 4000 hours of labor is available. Only as many as 500 units of product C can be sold. Determine how to maximize the company’s revenue.