IE375 Spring 2020 (On-Line Course)
Assignment: Case 1
Due: April 20, Monday, Strict due-time: 23:00

Information on the Assigned Cases:

1) Each Case is 12%.
2) Each Case will be worked with groups of 2 students. If you cannot form a group, please send an e-mail to IE375 course TA Emin. Also let us learn if you have a preference to solve it by yourself. There is at most one student who will solve the case by herself/himself.
3) You need to be efficient in computations. Sometimes, a similar computation is required to be utilized for different parts – use a spreadsheet or a computer program for that purpose. Please report the program code and all the formulas you have used. DO not simply submit the output.
4) Most of the questions are problem types. However, there may be 1-2 questions which are more open-ended and asks for your thought/suggestion as well as solution on a certain situation. In those cases please be more specific. The only part close to this description is Part D of the current case.

This environment for the case is taken from the textbook, 7th ed., Page 245, Question 45. Note that the numbers are not the same.

Green's Buttons of Rolla, Missouri, supplies all the New Jersey Fabrics stores with eight different styles of buttons for men's dress shirts. The plastic injection molding machine can produce only one button style at a time and substantial time is required to reconfigure the machine for different button styles. As Green's has contracted to supply fixed quantities of buttons for the next six years, its demand can be treated as fixed and known. You are not allowed to have any shortages, and hence the total variable cost you will incur is a constant regardless of the production policy you follow. The relevant data for this problem appear in the following table.

Button Type	Annual Sales	Production Rate (units/day)	Setup Time (hours)	Variable Cost
A	25,900	4,000	6	$0.003
B	42,000	2,750	4	$0.002
C	14,400	1,650	8	$0.008
D	46,000	1,600	4	$0.002
E	12,500	900	5	$0.010
F	100,000	1,950	2	$0.005
G	100,000	1,450	1	$0.004
H	18,900	600	5	$0.007

Assume 250 working days per year and 8 working hours per day. Green's accounting department has established an 18 percent annual interest rate for the cost of capital and a 3 percent annual interest rate to account for storage space. Setup costs are $20 per hour required to reconfigure the equipment for a new style.

A) (30%) Although Green has contractual obligations with New Jersey Fabrics that may prevent them from implementing the policy the firm decides to try a rotation cycle policy for production of the buttons. Answer the following:
   a) What is the optimal rotation cycle time?
   b) How large should the lots be for each button?
   c) What is the average total cost of holding and setups for all buttons at the optimal solution? What are those costs for each individual button?

B) (30%) Contractual obligation mentioned above requires Green not to exceed a certain maximum inventory level for each button, i.e. maximum inventory level reached by the rotation cycle policy has a limit for each button. To put these restrictions in a simpler way let us say that they correspond to setting the maximum rotation cycle level to one year. Hence production policy obtained above is not implementable (if you have performed the numbers correctly, this should be what you get). You still want to implement a rotation cycle policy, but this time with the constraint stated. Specifically, if Green has agreed to make at least one shipment per year for each button style, answer the following?
   a) What is the optimal rotation cycle time?
   b) How large should the lots be for each button?
   c) What is the average total cost of holding and setups for all buttons at the optimal solution? What are those costs for each individual product?

C) (10%) Now compare the following and report %average cost increase as defined in the following formula:

   % increase in the average cost =
   100*(Average Cost in Part B – Average Cost in Part A)/(Average Cost in Part A)

   Report all differences (for all buttons, as well as individual buttons). Comment on what you see. What do you think is creating the difference in % increase results under the given circumstances?

D) (30%) Now, forget about the contractual obligation. Assume that you can divide all the buttons into two groups and implement two different rotation cycle policies. To be more specific, consider the following grouping (comes naturally when you run the numbers): One group will have only two buttons, and the other will have the remaining.
   a) Utilizing what you learned in Part C), recommend such a grouping. State your reason(s). Now you are ready to solve two different rotation cycle problems.
   b) What is the optimal rotation cycle time for each group?
   c) How large should the lots be for each button?
   d) What is the average total cost of holding and setups for all buttons at the optimal solution? What are those costs for each individual product?
   e) Is the result you have obtained implementable with the single resource you have?