

## IE460 – Fall 2023

### Homework V- Due date – November 7, 2023 Tuesday – 17:00 pm

#### Information on Homework V

- **Homework V is 2%. Make sure that you review course material before you start. Cite sources used if any.**
- **Grading Policy:** The homework grades will not be only based on the correctness of the answers provided, but on the perceived degree of effort on the returned assignment. This means that even without obtaining the correct answers one can obtain full credit. The grade scale will be “2” (full effort, all questions); “1” (some effort or full effort, some questions); “0” (no effort or no submission). The submissions that exceed expectations may get a bonus – grade will be “3” (extra effort). Note that “2” corresponds to a grade out of 100% - 2% of the overall grade in this case. Late submissions will not be accepted.
- The grading scale for each question is 2 points (close to full effort), 1 point (some effort), and 0 (no effort or no submission). Total points that would lead to your overall HW grade are given below:

| Total Points | HW Grade |
|--------------|----------|
| 2+           | 3        |
| 1.5-2        | 2        |
| 0.5-1        | 1        |
| 0            | 0        |

- **Academic Dishonesty (taken from IE460 Course Information):** For assignments: Discussion of the course material and working in groups are effective ways of learning. However, this does not mean that you can copy the assignment from one of your friends. You can discuss with your friends, but you should be alone, without any written solution in front of you, when you actually prepare your assignment. It is extremely important to understand the value of this exercise in the process of learning. Any violation of the above understanding will result measures outlined in the student rules and regulations.
- **Submission Information:** An assignment submission box is to be placed in front of office EA307 about two days before submission date and is to be removed at the time of the deadline. You need to put your assignment in the designated box before the deadline. **Submission via e-mail is NOT accepted.**

#### **Suggestions: Before you start solving the problems:**

Please read Chapter 12 of the text carefully. For details – see the reading list posted on the course WEB site.

#### **Homework Problem:**

Assume a continuous review inventory policy is being implemented. Demand information (mean and standard deviation) for three regions is given **monthly**, and demand is distributed normally with the following parameters:

|                             | Region 1 | Region 2 | Region 3 |
|-----------------------------|----------|----------|----------|
| Mean, $\mu_i$               | 35       | 19       | 17       |
| Stan. Deviation, $\sigma_i$ | 7        | 6        | 5        |

Let the correlation coefficient of demand be 0.5 for each pair of regions. The expected lead time to any region is three months with a standard deviation of 1 month. The fixed cost of ordering one truck is \$100, and the truck capacity is 200 units.

Holding cost is calculated based on an annual interest rate of 25%. Purchasing cost per unit is 5\$. The cycle service level is 95% for regions 1 and 2 and 80% for region 3. Assume there are 12 months in a year.

- a) Decentralized system: Identify the inventory components. Find the total safety stock inventory for each region. What is the total safety stock for all regions? Total value of safety stock for all regions?
- b) Centralization for regions 1, 2, 3 are being considered. Find the reduction in total safety stock value by assuming that the new cycle service level is a demand-weighted average of individual cycle service levels

$$\{(\mu_1 \text{CSL}_1 + \mu_2 \text{CSL}_2 + \mu_3 \text{CSL}_3)/(\mu_1 + \mu_2 + \mu_3)\}.$$

Assume that the lead time information stated for the regions is still valid after centralization.

- c) What will be the revised CSL for the centralized system if the total stock value is kept the same as the value found in a)?
- d) I) What is the average order size for each region in the decentralized system - part a)? What is the expected ordering fixed cost in each region? Total expected ordering cost for all regions?  
 II) What is the average order size for the centralized system - part b)? What is the total expected ordering cost for the centralized system?  
 III) What is the difference in fixed ordering costs?
- e) Learn to discuss the following: Effect of a decrease in the correlation coefficient; effect of a possible decrease in the lead time with centralization; effect of a possible reduction in the variability of the lead time with centralization. (To learn – no obligation – you can do all the computations with excel and play with different parameters.)