MSCI 334 (W23) Operations Planning and Inventory Control

Assignment 1

Deadline: 11:30 pm, Jan 27, 2023 **Total Points:** 100

Instruction: The assignment should be uploaded on **Crowdmark as a pdf file**. In case of using Excel in solving a question, you need to take the screenshots of Excel pages and include in the pdf file submitted on Crowdmark.

Questions 1. (20 points)

Demand of an item is 400 units per month. The ordering cost is $30 per order. The purchasing cost is $28 per unit and the monthly capital, taxes, storage, and spoilage costs average 2% of the unit cost.

a) What is the EOQ and on average how many orders will be placed each year?
b) What is the optimal annual inventory holding cost and the optimal total inventory cost?

Question 2. (20 points)

The ABC Company produces baking powder. The baking powder can be produced at a rate of 20,000 pounds per week. Annual demand for the good is 0.9 million pounds per year. The fixed cost of setting up for a production run of the good is $2,600, and the variable cost of production is $1.80 per pound. The company uses an annual interest rate of 20 percent to account for the cost of capital and the costs of storage. The handling of the inventory costs 0.05 dollars per pound per month.

a. What is the optimal size of the production run?

b. What proportion of each production cycle consists of uptime and what proportion consists of downtime?

c. What is the average annual cost of holding and setup attributed to this item? If the baking powder sells for $4.00 per pound, what is the annual profit the company is realizing from this item?

Question 3. (30 points)

The Gilbreth family drinks a case of Royal Cola every day, 365 days a year. Fortunately, a local distributor offers quantity discounts for large orders as shown in the table below, where the price for each category applies to every case purchased. Considering the cost of gasoline, Mr. Gilbreth estimates it costs him about $5 to go pick up an order of Royal Cola. Mr. Gilbreth also is an investor in the stock market, where he has been earning a 20 percent average annual return. He considers the return lost by buying the Royal Cola instead of stock to be the only holding cost for the Royal Cola.

Discount Category	Quantity Purchased	Price (per Case)
1	1 to 49	$4.00
2	50 to 99	$3.90
3	100 or more	$3.80

(a) Determine the optimal order quantity according to the EOQ model with quantity discounts. What is the resulting total cost per year?

(b) With this order quantity, how many orders need to be placed per year? What is the time interval between orders?

Question 4. (30 points)

MBI is a manufacturer of personal computers. All its personal computers use a 3.5-inch high-density floppy disk drive which it purchases from Ynos. MBI operates its factory 52 weeks per year, which requires assembling 100 of these floppy disk-drives into computers per week. MBI's annual holding cost rate is 20 percent of the value (based on purchase cost) of the inventory.

Regardless of order size, the administrative cost of placing an order with Ynos has been estimated to be $50. A quantity discount is offered by Ynos for large orders as shown below, where the price for each category applies to the items in that category (Incremental discount).

Discount Category	Quantity Purchased	Price (per Disk Drive)
1	1 to 99	$100
2	100 to 499	$ 95
3	500 or more	$ 90

(a) Determine the optimal order quantity according to the EOQ model with quantity discounts. What is the resulting total cost per year?

(b) With this order quantity, how many orders need to be placed per year? What is the time interval between orders?