بسم الله الرحمن الرحيم

Department of Statistics & Operations Research
College of Science
King Saud University

OR-322
Final Examination
Second Semester 1433 – 1434 H

Remark: 1 year = 12 months = 52 weeks = 360 days

Question 1:
(a). Answer the following with *True* or *False*

- (a) If the demand has a probability function that changes over time then it is called dynamic demand.
- (b) Shortage period means that $IL \leq 0$.
- (c) When demand is constant, the total purchase cost during unit time increases as Q increases.
- (d) The set-up/ordering cost does not depend on the size of order.
- (e) Reorder point is the time between placing an order and the delivery of the order.

(b). Write down the **formulas** for the following:
1. Stock turnover.
2. Average cost of inventory.
3. Value of inventory per unit of time.

Question 2:
A company receives the demand of an item as 1200 unit/year. Each unit costs the company 50 SR to buy. Placing an order costs 20 SR. The company can hold a unit of item for one year at a cost of 10% of its price.

1. Assuming zero delivery time, find $\mathbf{Q}^*$.
2. Assuming that the delivery takes 2 weeks, what is the **reorder point**?
3. Assuming that the delivery takes 2 weeks, what is the **reorder time** of the 2nd order?
4. **How many** optimal orders must be made in one year?
5. With optimal order quantity, what is the **inventory level** after 3 weeks, 3 months?

Question 3:
A retailer gets his supply of a product from a factory that gives a units price as follows:

$$p = \begin{cases} 30 \ SR \ ; & 0 < Q < 100 \\ 28 \ SR \ ; & 100 \leq Q < 300 \\ 23 \ SR \ ; & 300 \leq Q < 700 \\ 21 \ SR \ ; & 700 \leq Q < 1000 \end{cases}$$

The retailer estimates the demand on his product to be 1200 units per year. Every time it costs 20 SR order fees and 50 SR for delivery. If he holds each unit for 25% of the unit price SR per month.

1. What is the **optimal ordering quantity**?
2. What is the **optimal time** between orders?
3. If the delivery takes 5 days, at what **point** in the inventory he should place an order under the optimal policy?

Question 4:
A company is concerned with the space occupied by the three items which have the characteristics shown in the table below. Reorder cost for the item is constant at 1000 SR while holding cost is 20% of the cost for a year. If the company wants to allocate an average of 600 mt^3 space to the items. What would be the **best quantities** to order?

Item i	Unit price (p_i)	Demand (D_i)	Unit space (a_i)
1	100	500	2
2	200	400	4
3	300	200	6

Question 5:
If the demand is uniformly distributed over [0, 10]. Find the **optimal order quantity** and the optimal **reorder point** for a continuous review model (probabilistic) with the following data: D = 1000 units, h = 1 SR, g = 2 SR and k = 10 SR.

Question 6:
A company buys 6000 units of an item every year. Each unit costs the company 30 SR to buy. It costs 75 SR to Place an order. The company can hold a unit of item for one month at a cost of 0.5 SR. The management estimated that the cost of not satisfying the demand on time to be 6% of unit cost per month.

(1). What is the **optimal ordering quantity** of inventory?
(2). **How many** units in shortage per cycle under the optimal policy?
(3). Calculate the **inventory** period.
(4). Calculate the **shortage** period.
(5). At most how long a customers can wait to receive their demand.

Question 7:
A company receives an yearly demand on an item 400 units. The EOQ comes 100 by using EOQ formula. Find

(1). the average inventory level in any cycle.
(2). the average inventory level in [1 month, 2 months]
(3). the average inventory level in [4 months, 6 months]
(4). the average inventory level in [5.7 months, 8.5 months]