Inventory Control and Production Planning (IE 410)

First Mid-Term Exam

November 19th, 2007

Exercise 1 (35 degrees)

A certain item has an annually demand of 250 units. It is purchased with unit cost of $2,500 and ordering cost of $400. The annual inventory holding cost is 20 percent.

1- Compute the optimal quantity that should be ordered, and the corresponding annual average cost.
2- The supplier offers the following all-units discount:

Quantity	Unit price ($)
$Q < 15$	3,000
$15 \leq Q < 30$	2,500
$30 \leq Q$	2,000

Evaluate the new optimal quantity to be ordered.

Exercise 2 (30 degrees)

A company orders two items. Item 1 costs $80, and has a yearly demand of 500 units. Item 2 costs $10, and has a yearly demand of 160 units. The company has to spend $50 to process the order of either of these items. The inventory carrying cost rate is 25 percent per year. The company has a budget limitation of $5000 for investment in inventory.

1- Calculate the optimal quantities to be stored.
2- Would the previous result remain optimal if the budget limit was equal to $4500?

Exercise 3 (35 degrees)

An item is manufactured at a rate of 4,000 units per year, and at a cost of $80 per unit. There is a set-up cost of $60 which is associated with each production run. The annual inventory holding cost is equal to 20 percent. The annual demand is equal to 1,000 units.

1- Compute the economic production quantity.
2- Assume that shortages are allowed with shortage cost of $2 per unit per month. Evaluate the new optimal production quantity, and determine the optimal maximum backorder level.

We recall that:

$$Q^* = \sqrt{\frac{2AD}{h(1-\frac{D}{\psi})} - \frac{(\pi D)^2}{h(h+\widehat{\pi})}} \sqrt{\frac{h+\widehat{\pi}}{\widehat{\pi}}} \qquad b^* = \frac{(hQ^* - \pi D)(1-\frac{D}{\psi})}{h+\widehat{\pi}}$$