

ISyE 3104 - Homework 6
Due: October 4, 2007
(30 points)

Consider the same machine tools company in Atlanta from Homework #4. Recall that the company uses a highly specialized component in one of its tools with model number INC-q33. The sales for this model show a fairly steady demand of 1400 per quarter. Inventory holding costs are based on an annual interest rate of 20% and the company works 50 weeks in a year.

1. The company currently purchases these components from a producer (Supplier X) in Michigan at a unit price of \$4000. It costs the company \$10,000 to place an order. The company is considering backordering some of the demand to reduce its overall cost. Suppose the cost of backordering one unit of demand for one year is \$1200.

- a. (5 points) What is the optimal ordering quantity considering the backordering option?
- b. (1 point) What is the maximum inventory level in a cycle?
- c. (1 point) What is the maximum shortage level in a cycle?
- d. (1 point) What is the cycle length?
- e. (2 points) What is the total annual cost?
- f. (2 points) Explain why the optimal order quantity with backordering option is different than the quantity you found earlier. (To answer this question, you may also want to compare the holding and fixed costs under backordering and no-backordering options.)

2. Instead of purchasing these components from Supplier X, the company considers an alternative supplier (Supplier Y), which charges a fixed cost \$8,000 per order and offers a discount schedule as follows:

- \$4200/unit for $Q \leq 400$
- \$4150/unit for additional units between $400 < Q \leq 600$
- \$4100/unit for additional units $Q > 600$

If the company orders from Supplier Y (assuming the company wants to meet all of its demand on time, i.e., no backordering):

- a. (12 points) What is the optimal order quantity?
- b. (1 point) What is the time between orders?
- c. (2 points) What is the annual cost?

3. (3 points) Suppose company X offers you an all-unit discount schedule with unit costs c_1 and c_2 and breakpoint B . Suppose company Y offers you an incremental discount schedule with the same unit costs and breakpoint. Assuming both companies charge you the same fixed cost of ordering, and you have constant demand over time, which company would you prefer? If you cannot decide based on this limited information, explain what kind of additional information you would need to make a decision.