Homework #5
Supply Chain Models: Manufacturing & Warehousing (ISyE 3104) - Fall 2001
Due October 11, 2001

Show all your steps to get credit. (Total points)

Reading assignment: Read Chapter 5.

1. A local retail store sells 10,000 cases of soda each year. The manager of the retail store is trying to determine how many cases of soda should be ordered each time an order is placed. It costs $20 to process an order. The purchase price of one case of soda is $4.40 and the cost of carrying one case of soda in inventory for one year is 20% of the purchase price.

(a) (10 points) Find the optimal order quantity for the retail store. How many orders should be placed each year? Calculate the total annual cost for the retail store including the cost of purchasing.

(b) (15 points) The supplier has offered the following incremental discount schedule:
- For orders up to 400 cases, price per case is $4.40.
- Price per case is $4.20, for additional units between 401 cases and 800 cases.
- Price per case is $4.00, for units exceeding 800 cases.
What is the optimal order quantity in this case? How many orders should be placed each year? Calculate the total annual cost for the retail store including the cost of purchasing.

2. (20 points) Payless Shoe Source has capacity to store 400 pairs of shoes in one of its Atlanta locations. They divided the shoes into five major categories: men’s casual, men’s formal, women’s casual, women’s formal, and children’s. The weekly demands and average prices for the shoes in these categories are given below:

<table>
<thead>
<tr>
<th>Category</th>
<th>men’s casual</th>
<th>men’s formal</th>
<th>women’s casual</th>
<th>women’s formal</th>
<th>Children’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>60</td>
<td>20</td>
<td>100</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>Price</td>
<td>14</td>
<td>18</td>
<td>16</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

The ordering cost for each of these categories is $100 and the holding cost is computed based on a 20% interest rate. What lot sizes should the store be ordering for each category such that they do not exceed the storage space availability at any time? Try at least three different values for θ. To try more values and to find a better solution, you may want to use a spreadsheet. (There are 52 weeks in a year.)

3. A bottling plant uses its machinery to bottle four different types of soft drinks. Demand rates for these drinks are 26000, 42000, 15000, and 23000 cases per year. Daily production rates are 2500, 3000, 1700 and 1600 cases, whereas the setup times are 6, 4, 8 and 4 hours, respectively. Setup cost is $200 per hour. Assume 250 working days per
year and 8 hours per day. The annual interest rate is 21%. The variable cost of bottling a case is 30 cents.

(a) (10 points) What is the optimal rotation cycle time?
(b) (10 points) How large should the lots be?
(c) (5 points) What is the average annual cost of holding and setup?