1. **(10 points)** A company makes a complete line of valves. These valves are supplied directly to customers from the factory warehouse. The valves are made in lots and the same production facilities are used to make the valves. One particular valve has the following properties: The demand rate is constant at 1,000 units per year. The setup cost for each production run is $50 and the unit variable cost of production is $2. The annual cost of capital is calculated based on a 20% interest rate. The production rate is 5,000 units per year. A period of 2 months is required from the time that a production requisition is received at the factory until finished units begin to come off the production line. It is desired to determine the optimal lot size and the warehouse reorder point based on the assumption that stock-outs are not permitted.

   (a) **(2 points)** Find the optimal production lot size and compare to the EOQ when production rate is infinite.

   (b) **(3 points)** What is the time between two production runs? How much of it is spent for uptime, how much of it is spent for downtime?

   (c) **(3 points)** What is the maximum level of on hand inventory in the warehouse? In how many days does the on hand inventory at the warehouse reach the maximum level after a production order is given?

   (d) **(2 points)** What is the reorder point of the warehouse in terms of the on-hand inventory?

2. **(10 points)** Suppose that the computer parts manufacturer in Homework 5 has decided to manufacture the subassemblies in their facility. There is a single machine that manufactures these subassemblies, which is operated by a worker that performs the setup tasks. The worker is paid $15 per hour for the setup and there is an additional fixed cost of $50 for initiating the setup of each run. Recall that the inventory costs are calculated using capital costs at an annual rate of 20%. The manufacturer uses a rotation policy for the production of the subassemblies. The demand, unit cost, setup time, and production rate for each assembly is given in the following table:

<table>
<thead>
<tr>
<th>Subassembly</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual demand</td>
<td>300</td>
<td>180</td>
<td>900</td>
<td>600</td>
</tr>
<tr>
<td>Unit cost</td>
<td>$75</td>
<td>$50</td>
<td>$125</td>
<td>$100</td>
</tr>
<tr>
<td>Setup time (hours)</td>
<td>12.5</td>
<td>7.5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Annual production rate</td>
<td>9,000</td>
<td>7,200</td>
<td>4,500</td>
<td>6,000</td>
</tr>
</tbody>
</table>

   (a) **(2 point)** Verify that a single machine is sufficient to satisfy the demand for all labels.

   (b) **(3 points)** Find the optimal length of the rotation cycle.

   (c) **(3 points)** Determine the optimal production lot size for each subassembly. How much of the cycle time is spent for uptime and how much is spent for downtime?

   (d) **(2 points)** What are the total optimal annual setup and holding costs?
3. *(10 points)* Read the article “Out of space” by Erick C. Jones, Maurice D. Cavitt and Angela Garza, Industrial Engineer, February 2011, pages 45–49. The article can be accessed through the Georgia Tech Library by searching in the ABI/INFORM database (http://search.proquest.com/abicomplete/index), or simply by searching by title in the library homepage. In answering the following questions, please do not copy and paste text from the article. Use your own words.

(a) (3 points) Name three advantages of using RFID technology for inventory audits in the ISS.

(b) (3 points) In the EOQ policy applied by the ISS, what is the additional consideration involved in the calculations in comparison to the traditional EOQ model? What aspect of the demand requires this additional consideration?

(c) (4 points) Consider an auto parts store. Based on the discussion in the article, which of the following cases is more likely to result in holding more inventory compared to the others? Explain your reasoning in 3-4 sentences.

i. When a barcode scanning system is used and demand is known in advance

ii. When weekly manual inventory counts are applied and demand is known in advance

iii. When a barcode scanning system is used and demand is uncertain

iv. When weekly manual inventory counts are applied and demand is uncertain