1. Consider the same machine tools company in Atlanta from Homework #4 and #5. Recall that the company uses highly specialized components in one of its tools with model number INC-q33. After doing some analysis, the company decided that rather than using a constant demand estimate, it would be more appropriate to model the annual demand with a Normal distribution with mean 5600 and standard deviation 500. The company is currently purchasing one of the components for this tool from a supplier in Michigan which charges $4000 per unit and has a lead time of two weeks. Inventory holding costs are based on an annual interest rate of 20%. If the company cannot meet its demand because of a shortage in these components, there is a penalty cost of $500 per unit.

(Note: Please make sure to compute the mean and standard deviation of demand during lead time. Also, make sure that your units are consistent, i.e., do not mix and match days, weeks, and year in the same formula.)

   a. (10 points) Compute the optimal (Q,R) policy and the cost of this policy. What is the extra cost incurred by the firm due to the uncertainty in demand?
   b. (4 points) Using the policy you found in part (a)
      (i) Find the (average) proportion of order cycles in which no stock-outs occur.
      (ii) Find the (average) proportion of demand that is unmet.

   Explain whether the results you found in parts (i) and (ii) correspond to Type I or Type II service level.
   c. (3 points) If the firm wants to achieve a 90% Type I service level, what are the optimal (Q,R) values and the expected annual cost? What is the imputed shortage cost corresponding to this policy?
   d. (11 points) If the firm wants to achieve a 95% Type II service level, what are the optimal (Q,R) values and the expected annual cost? What is the imputed shortage cost corresponding to this policy?
   e. (4 points) Answer part (c) assuming that the lead time is only one week. Comment on the impact of the lead time on the overall cost of the firm.

2. (8 points) A particular component, part C, is used in two final products, A and B. It takes only one part C to make a unit of product A. However, each product B requires 3 Cs. Plans call for starting 120 units of part type A into production each week. Planned
order releases over the next four weeks for part type B are 60, 100, 80 and 50 units, respectively. In addition, spare-part demand for part C is estimated at 50 units per period. Current inventory for part C is 10. The plant expects to receive 15 units of part C in week 1, and another 10 units in week 2. Find the net requirements for part type C.