Homework #5
Supply Chain Models: Manufacturing & Warehousing (ISyE 3104) – Spring 2002
Due February 14, 2002

Show all your steps to get partial or full credit. Total 15 points.

Question 1

A manufacturer observes a regular demand of 3240 units per year for embossed folders. The setup cost on production is $300, independent of the lot size. The manufacturer produces the folders at a rate of 300 folders per month at a cost of $2 each and sells for $3 each. The holding cost is based on a 7.5 percent annual interest rate.

(a) (7 points) Assuming shortages are not allowed, calculate the optimal production quantity.
(b) (4 points) What is the time between two setups (cycle time)? What is the time spent for production during each cycle?
(c) (2 points) What is the maximum level of inventory on hand?
(d) (2 points) What is the average annual total cost (setup+holding+production)?

\[ \lambda = 3240 \text{ units/yr} \]
\[ A = \$300 \text{ /order} \]
\[ P = 300/\text{month} = 3600/\text{yr} \]
\[ c = \$2 \text{ /unit} \]
\[ h = 0.075 \$ /\$ /\text{yr} \]

\[ a) \quad Q^* = \sqrt{\frac{2K\lambda}{h'}} = \sqrt{\frac{2 \times 300 \times 3240}{0.015}} = 11385 \]

\[ h' = IC(1-\frac{\lambda}{P}) \]
\[ h' = 0.075 \times 2 \left(1 - \frac{3240}{3600}\right) \]
\[ h' = 0.015 \]

\[ b) \quad T = \frac{Q}{\lambda} = \frac{11385}{3240} = 3.51 \text{ yrs} \quad \text{(cycle time)} \]

\[ c) \quad (T-T_1) \times \lambda = (3.51-3.16) \times 3240 = 1134 \text{ units} \]

\[ d) \quad \sqrt{\frac{2K\lambda}{h'} + \lambda c} \]
\[ = \sqrt{\frac{2 \times 300 \times 3240 \times 0.015}{2} + 3240 \times 2} \approx \$6650 \]