Question 1:

Consider a hot-dog seller who runs her stand 12 hours every day. She gets a new batch of hot-dogs at the end of every second day, and due to quality considerations, at that point she must dispose any remaining hot dogs of the previous batch (she gives these unsold hot dogs to a local food bank).

The seller purchases the hot dogs at the price of $1.00 and sells them at the price of $2.50. Also, while she is open, customers arrive according to a Poisson process with rate 20 customers per hour. Finally, her stand cannot store more than 700 hot dogs.

Please, answer the following questions:

1. What is an optimized replenishment batch for this operation?
2. What is the expected profit per batch?
3. What is the probability that there will be more than 100 unsold hot dogs in any given batch, if the seller operates according to your findings in part (i) above?

Question 2:

A local store sells white dress shirts that bear the store label and are fabricated by a manufacturer at New York City. The shirts cost $30 each and sell for $80. The cost of processing an order and receiving a new shipment amounts to $120, and it takes three weeks to receive a shipment. Monthly demand is approximately normal with mean 120 and st. deviation 32. Also, the holding cost is computed based on an annual interest rate of 20%.

Currently the store maintains its inventory for these shirts according to the following policy: The owner tries to maintain a “two-months’ supply” in stock, and when the inventory drops below this level, a new order is placed for another “two-months’ supply”.

Please, answer the following questions:

1. What are the Q and r values for the inventory of this particular item that are currently used by the store?
2. What fill rate is being achieved with the current policy?
3. Determine optimized values for Q and r that will ensure a fill rate of 99%.
4. Determine the average annual gain that will result from the adjustment of the Q, r parameters according to your results in part (ii) above.

Some remarks: In your work, assume that weekly demand is also normally distributed, and these weekly demands are independent from week to week. Also, you can use the “standard” approximations for the involved quantities of the (Q, r) model that were presented in the corresponding lectures. (Please refer statistical tables)