Final

Name: _____ ID: _____

Problem I (40 pts):

A furniture company manufactures desks, chairs, and side tables. Each desk uses four units of wood, each chair uses three units of wood, and each side table uses 1.5 units of wood. A desk contributes $400 to profit, a chair contributes $250, and a side table contributes $100. Marketing restrictions require that the number of chairs produced be at least twice the number of desks produced, whereas there should be one side table for each four chairs. There are 3000 units of wood available.

a) Formulate the problem that maximizes the company's profit.
b) Use Excel™ Solver™ to model the problem and find the optimal solution.

Problem II (60 pts):

The city is considering improving its hazardous waste and bulk item drop off area to improve service. Cars arrive to the drop off area at a rate of 10 per hour according to a Poisson process. Each car contains items for drop off. There is a 10% chance that the car will contain 1 item, a 50% chance that the car will contain 2 items, and a 40% chance that the car will contain 3 items. There is an 80% chance that an item will be hazardous (e.g., chemicals, light bulbs, and electronic equipment) and a 20% chance that the item will be a bulk item, which cannot be picked up in the curbside recycling program. Of the 80% of items that have hazardous waste, about 10% is for electronic equipment that must be inspected and taken apart.

A single worker assists the citizen in taking the material out of their car and moving the material to the recycling center. This typically takes between 0.5 and 1.5 minutes per item (uniformly distributed) if the item is not a bulk item. If the item is a bulk item, then the time takes a minimum of 1 minute, most likely 2.5 minutes, with a maximum of 4 minutes per item triangularly distributed. The worker finishes all items in a car before processing the next car.

Another worker will begin sorting the items immediately after the item is unloaded. This process takes 1–2 minutes per item uniformly distributed. If the item is electronic equipment, the items are placed in front of a special disassembly station to be taken apart.

The same worker who performs sorting also performs the disassembly of the electronic parts. Items that require sorting take priority over items that require disassembly. Each electronic item takes between 8 and 16 minutes uniformly distributed to disassemble.

The hazardous waste recycling center is open for 7 hours per day, 5 days per week. Model the problem using Arena™.