Homework #1

1. For the hand simulation of the simple processing system done in lab, define another time persistent statistic as the total number of parts in the system, including any parts in the queue and those in service. Augment the table for tracking the simulation (Table 2-2 in the Arena text) to track this new global variable, add new statistical accumulators to get its time average and maximum, and compute these new values at the end.

2. Consider a batch manufacturing process where a machine processes jobs in batches of 3 units. The process starts only when there are 3 or more jobs in the buffer in front of the machine. Otherwise, the machine stays idle until the batch is completed. Assume that job inter-arrival times are equally likely between 2 and 8 hours. Batch service times are equally likely between 5 and 15 hours.

Simulate the system manually for 3 batch service completions and calculate the following statistics:

i) Average number of jobs in the buffer (excluding the batch being served).

ii) Probability distribution of number of jobs in the buffer (excluding the batch being served).

iii) Machine utilization.

iv) Average job waiting time (time in buffer).

v) Average job system time (total time in the system, including processing time)

vi) System throughput (number of departing jobs per unit time.)

**Approach** After each arrival, schedule the next inter-arrival time, and when each batch goes into service, schedule its completion time. To obtain these quantities, use a deterministic inter-arrival time, $\lambda = 5$ (the average of 2 and 8) and a deterministic service time $\mu = 10$ (the average of 5 and 15). The first arrival occurs at $t = 5$.

This is due in one week.