END3032 – SYSTEMS SIMULATION

THE COTTON SPINNING LOOMS PROBLEM

Laboratory Practice #9

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Problem Definition (Exercise 6.12)[1]

A room has 10 cotton spinning looms. Once the looms are set up, they run automatically. The setup time is **exponentially** distributed, with mean **10 minutes**. The machines run for an average of **40 minutes**, also **exponentially** distributed. Loom operators are paid **$10 an hour**, and looms not running incur a cost of **$40 an hour**.

Make a simulation model and answer the following questions.

(1) How many loom operators should be employed to minimize the total cost of the loom room?

(2) If the objective becomes "on the average, no loom should wait more than 1 minute for an operator" how many people should be employed?

(3) How many operators should be employed to ensure that, on average, at least 7.5 looms are running at all times?

Hint: Model by an M/M/c/10/10 queue with ($\lambda = 1/40$, $\mu = 1/10$, N=K=10) and design scenarios for different number of operators (c=1, c=2, etc.).

[1]Banks, J., Carson II, J.S., Nelson, B.L., Nicol, D.M. (2005). Discrete-event system simulation. Pearson Prentice Hall.