Name:

ISEN 609: Assignment 1

Due in 3 weeks; Do your own work and do not get help from even the web.

Sign the following:
On my honor, as an Aggie, I have neither given nor received unauthorized aid on this assignment.

_____ (your signature)

A manufacturing setup consists of two distinct machines, each producing one component per hour. Each component is tested instantly and is identified as defective or non-defective. Let α_i be the probability that a component produced by machine i is non-defective, for $i = 1, 2$. The defective components are discarded and the non-defective components are stored in two different bins, one for each machine. When a component is present in each bin, the two are instantly assembled together and shipped out. Bin i can hold at most B_i components (where B_i is a fixed positive integer) for $i = 1, 2$. When a bin is full, the corresponding machine is turned off. It is turned on again when the bin has space for at least one component. Assume that successive components are independent. Model the system as a DTMC by writing down the state X_n, state space S and drawing the transition diagram. Write a program to obtain the steady-state probabilities. For the numerical values (we call these the baseline values) $B_1 = 3$, $B_2 = 4$, $\alpha_1 = 0.7$ and $\alpha_2 = 0.6$, obtain (a) the long-run average number of components in each buffer at the beginning of an hour (before any production) and (b) the throughput (the steady-state number of assembled products shipped out per hour). Perform four numerical experiments by varying one of B_1, B_2, α_1 and α_2 while leaving the others at their baseline values described above. For example, you can vary B_1 from 1 to 10 with $B_2 = 4$, $\alpha_1 = 0.7$ and $\alpha_2 = 0.6$. Likewise, you could vary α_2 from 0.1 to 0.9 while keeping B_1, B_2 and α_1 at the baseline values. Graph (a) and (b), what do you observe? Explain your findings.

Note: You are welcome to turn in a hand-written report. However, be sure to submit your computer code along with the report. Do attach this as the front page of the report.