Name:

ISEN 609: Assignment 2

Due in 2 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 custom manufacturing setup consists of a machine that processes jobs according to the following policy: as soon as the number of jobs in the system becomes zero, the machine is power off instantaneously. Then when the number of jobs reach N, the machine is powered on, but the time to power on takes $\exp(\alpha)$ time. Then the machine continues to process until the number of jobs reach zero when the machine is powered off. Jobs arrive according to $PP(\lambda)$ and the processing times of jobs are IID $\exp(\mu)$ random variables. The setting is similar to the passport applications in the post-office problem we saw, except there the staff member arrived instantaneously but here it takes $\exp(\alpha)$ time. Model the system as a CTMC by writing down the state $X(t)$, state space S and drawing the rate diagram. Write a program to obtain the steady-state probabilities. For the numerical values (we call these the baseline values) $N = 3$, $\lambda = 4$ per hour, $\mu = 5$ per hour and $\alpha = 60$ per hour, obtain (a) the long-run average number of jobs in the system; and (b) the machine's utilization, i.e. long-run fraction of time the machine processes jobs. Perform two numerical experiments by varying one of N (between 1 and 10) and α (between 10 and 100 in steps of 10) while leaving the other at its baseline value described above. 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.
Comment: See if you can solve this problem by allowing for an infinite state space. If you are having problems, feel free to truncate the state space.