REVIEW PROBLEMS No. 7

Textbook: Problems 8.4, 8.6

Problem S5.1: A processor operates according to a discrete clock cycle, where in each clock cycle a new job arrives with probability p. All jobs require exactly 2 cycles from the processor. Jobs that arrive to find the processor busy with another job wait in a queue that has an infinite capacity.

1. Formulate a Markov chain representation for the system.
   Hint 1: A chain whose state is simply the number of jobs in the system does not satisfy the Markov property.
   Hint 2: Expanding the state to include not just the number of jobs in the system, but also the current stage of the service time of the job currently in service, if any, might help.
2. Does the chain admit a limiting distribution, and if yes under which conditions? Rigorously justify your answer.
   Hint: Little's Law might again help.