State machines

An embedded system is used to control the environment condition in a room. It is composed by a temperature sensor, a CPU, and an actuator that can control the air conditioner or the heat pump. The sensor senses the room from an Erlang distributed amount of time ($Erlang_{<\lambda=0.1\ s^{-1},k=3>}$). Then the CPU works for a uniform distributed amount of time ($Uniform_{<a=10\ s,\ b=20\ s>}$), and after that: it returns sensing with probability $p_1 = 50\%$, it activates the air conditioning with probability $p_2 = 30\%$, or turns on the heat pump with probability $p_3 = 20\%$. The actuations take an exponentially distributed amount of time, respectively with rates ($Exp_{<\lambda=0.03\ s^{-1}>}$) for the heat pump and ($Exp_{<\lambda=0.05\ s^{-1}>}$) for the air conditioning.

- Draw a state machine based model of the system
- Implement it in a programming language of your choice
- Compute the probability of the system being sensing, using the CPU, actuating the air conditioning or the heat pump.
- Determine the sensing frequency (throughput) of the system, measured in times the system enters the sensing state per time unit.