

**COMP SCI/SFWR ENG 4/6E03 — Questions for 11/18
tutorial**

1. Consider the following system, consisting of a CPU and two I/O devices. Processing times at the CPU have mean $1/\mu_0$. After processing at the CPU, a job immediately returns to the CPU with probability p_0 , uses I/O device one (I/O1) with probability p_1 or uses I/O device two (I/O2) with probability p_2 . Processing times at I/O1 and I/O2 are exponentially distributed with means $1/\mu_1$ and $1/\mu_2$, respectively. After processing is complete at the I/O devices, jobs return to the CPU. Let $\mu_0 = 2$ per second, $\mu_1 = \mu_2 = 1.2$ per second, $p_0 = 0.1$, $p_1 = 0.3$ and $p_2 = 0.6$. The CPU employs Processor Sharing, the I/O devices FCFS. Three jobs circulate through the network.
 - (a) Using the BCMP notes, give an expression for the steady-state probability distribution for this network (there is only one class here, so things simplify).
 - (b) Calculate the utilization of the CPU.
2. Repeat the previous question, if we add one job of a different type to the network. This job repeatedly uses the CPU, then I/O1, then I/O2 (repeating this cycle forever). The mean processing times at these three devices are 10 per second, 1.2 per second and 1.2 per second, respectively.