READ:
1. Trivedi – 6.1 – 6.4, 7.11 – 7.6

DUE DATE: Monday, Nov. 15, 2004

PROBLEMS:

PROBLEM 1: Stationary Distribution of a DTMC

Consider an ergodic DTMC (Discrete Time Markov Chain) whose transition matrix is given by:

\[
\begin{bmatrix}
\frac{1}{2} & \frac{1}{2} & 0 \\
\frac{1}{3} & 0 & \frac{2}{3} \\
0 & \frac{1}{5} & \frac{4}{5}
\end{bmatrix}
\]

1. Draw the state transition diagram.
2. The system is initially in state 1 (i.e., \( p(0) = [1 0 0] \)) Find \( p_1, p_2, p_3 \) (i.e., the probability of being in each of the states after 1, 2 and 3 steps).
3. Determine the long term probabilities of being in each state.

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PROBLEM 2: Trivedi; Problem 1, Page 355

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PROBLEM 3: Trivedi; Problem 2, Page 365

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PROBLEM 4: Trivedi; Problem 2, Page 373

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**PROBLEM 5:** Consider the cyclic queueing model shown below which has multiprogramming level 3 (there are a constant number of 3 programs in the system). Service times are exponentially distributed with the mean service rates for the CPU being $b_1$ and for the I/O devices being $b_2$.

1. Define a set of states for the system. These state definitions should (eventually) permit you to obtain CPU utilization, throughput, mean queue length and I/O utilization.
2. Given the set of states in 1., draw the state transition diagram.
3. Develop the set of local balance equations and solve them for the probability of being in each state.
4. Determine the CPU utilization, throughput, mean queue length and I/O utilization.
5. Say that the rates for $b_1$ and $b_2$ are 2.0 and 1.0 jobs per unit time. Determine the CPU utilization, throughput, mean queue length and I/O utilization. Explain the answers. Do they make sense?

PROBLEM 6: Continue to work on the project. Write a short (couple of paragraph) progress report and be prepared to present your progress report in class. By the time this HW is due you should be about 80% done with your groups part of the project.