ECE Communication Networks 1
Homework Assignment 2
Fall 2006

Problems

1. Bertsekas and Gallagher, Problem 3.7
2. Bertsekas and Gallagher, Problem 3.11
3. Bertsekas and Gallagher, Problem 3.16
4. Bertsekas and Gallagher, Problem 3.20
5. Consider the transition probability matrix

$$P = \begin{pmatrix} 0.8 & 0.2 & 0.0 \\ 0.8 & 0.2 & 0.2 \\ 0.0 & 0.8 & 0.2 \end{pmatrix}$$

for a discrete time Markov Chain. (a) Draw the Markov chain, and (b) compute the steady-state vector using at least 2 different approaches.

6. (HARD) Consider a renewal (birth) process with interarrival times τ_j. Let $W_0 = 0$, and generally define the waiting time $W_n = \sum_{k=1}^{n} \tau_k$ for $n \geq 1$. Associate the counting process $N(t)$ with the renewal process, where $N(t)$ is the number of events that have occurred between time 0 and time t (where $N(0) = 0$). Assume the interarrival times are i.i.d. and follow a pdf $f_\tau(t)$. Let $\phi_\tau(z)$ be the probability generating function of $f_\tau(t)$, then show that

$$Pr[W_n \leq t] = \frac{1}{2\pi j} \int_{c-j\infty}^{c+j\infty} \frac{\phi_t^n(z)}{z} e^{zt} dz.$$