EE126, Fall 2000
Midterm #1
Professor Chang-Hasnain

Problem #1 (20 pts)

Given P[A|B] = a
   P[B] = b
   P[(B^c)|(A^c)] = e

Express P[B|A] in terms of a, b, e.

Problem #2 (20 pts)

A telephone transmission system typically consists of an equipment called a multiplexer, which is capable of multiplexing M active phone lines at a given time. Consider an active phone line transmits 1 packet per fixed time period T, and an inactive phone line, 0 packet per T.

Consider an apartment complex with 48 phone lines; the probability of each line transmitting signal is *p*, and not transmitting signal is *1-p*, where *p* = 1/3. Let X be the number of packets transmitted per T, and X is a binomial random variable.

(Hint: P[X=k] = {n!/[(n-k)!k!]}*(*p*^k)*[(*1-p*)^(n-k)])

(a) (6 pts) Write down the expressions of the pdf and cdf of X

(b) (7 pts) What is P[X>24] ? Express this in formula; you don't need to provide numeric value.

(c) (7 pts) If this apartment decides to use an M-line multiplexer for its transmission system and M
(Hint: fraction of lost packes = number of discarded packets/total number of packets produced)

Problem #3 (20 pts)

A biased coin is tossed. What is the probability that you have to flip it exactly 8 times to see exactly 3 heads? P(Heads)=0.6.

Problem #4 (20 pts)

There are 5 accidents/month on a highway. Accidents on this highway are distributed as a Poisson random variable. Find the probability there will be no accidents in a given year.

Problem #5 (20 pts)

Tom and Paul roll (2) dice alternatively starting with Tom. Consider they use two fair 6-faced dice. The player who rolls 6 first wins. They continue to roll until one of them wins. Find the probability that Tom wins.

Problem #6 Extra Credit (10 pts)

The occurrence of event B makes A less likely (i.e. P(A|B)&#60P(B)). Does the occurrence of event A make B more likely, less likely, or doesn't it matter? Justify your answer.
