UC Berkeley
Department of Electrical Engineering and Computer Sciences

EE126: Probability and Random Processes

Problem Set 1
Fall 2015

Issued: Thursday, August 27, 2015 **Due:** Thursday, September 03, 2014

Problem 1. Find an example of 3 events A, B, and C such that each pair of them are independent, but they are not mutually independent. Show the calculations.

Problem 2. Alice and Bob want to choose between the opera and the movies by tossing a fair coin. Unfortunately, the only available coin is biased (though the bias is not known exactly). How can they use the biased coin to make a decision so that either option is equally likely?

Problem 3. Show that if $\Pr(A|B) > \Pr(A|\bar{B})$, then $\Pr(B|A) > \Pr(B|\bar{A})$. Here $\bar{A}$ denotes the complementary event of A.

Problem 4. Alice has a high fever and go to the doctor to identify the cause. 3% of the people have H1N1, 20% of the people have the flu, and the rest have neither. Suppose that 100% of the H1N1 people have a high fever, 50% of the flu people have a high fever, and 2% of the people who have neither, have a high fever. Is it more likely that Alice has H1N1, the flu, or neither?

Problem 5. There are m people passing a ball to each other. At the beginning, Bob has the ball. In each round, the person who has the ball passes this ball equally likely to one of the other $m-1$ people. What is the probability that in the nth round, the ball is passed from Bob?

Problem 6. Figure 1 is the reliability graph of a system. The links of the graph represents components of the system. Each link is working with probability p and defective with probability $1-p$, independently of the other links. The system is operational if the nodes S and T are connected. Calculate the probability that the system is operational.

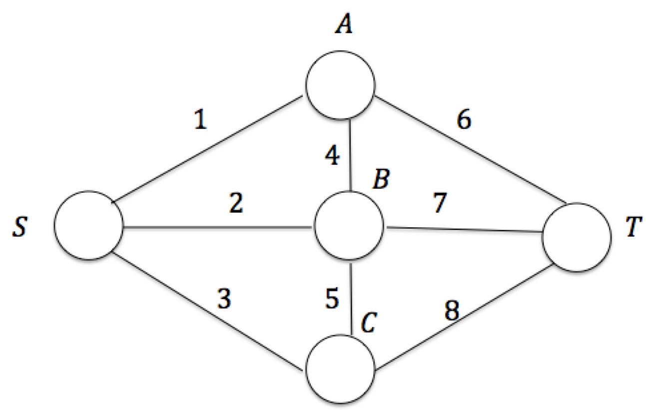

Figure 1: reliability graph