UC Berkeley
Department of Electrical Engineering and Computer Sciences

EECS126: Probability in EECS

Problem Set 4
Fall 2013

Issued: Tuesday, September 17, 2013 **Due:** In class Thursday, September 26, 2013

Problem 1. Let $\{X_n, n \geq 0\}$ be a Markov chain with two states, -1 and 1, and $P(-1,1) = P(1,-1) = a$ for $a \in (0,1)$. Define,

$$Y_n = X_0 + X_1 + \ldots + X_n.$$

Is $\{Y_n, n \geq 0\}$ a Markov chain? Prove or disprove.

Problem 2. Problem 15 of Chapter 1, Page 23.

Problem 3. Problem 10 of Appendix A, Page 143.

Problem 4. Problem 1 of Chapter 3, Page 37.

Problem 5. Problem 2 of Chapter 3, Page 37.

Problem 6. Find an approximate solution for problem 3 of Homework 1 without using Matlab when $N = 100$, $p = 0.1$, and $k = 30$.

Problem 7. In order to estimate the probability of head in a coin flip, p, you flip a coin n times, and count the number of heads, S_n. You use the estimator $\hat{p} = S_n/n$. You choose the sample size n to have a guarantee

$$\Pr(|S_n/n - p| \geq \epsilon) \leq \delta.$$

Determine how the value of n suggested by Chebyshev inequality changes when ϵ is reduced to half of its original value? How does it change when δ is reduced to half of its original value?