Middle East Technical University

Department of Electrical and Electronics Engineering

EE 531 – HW #4

Due: Jan. 12, 2015

(to be collected before final exam)

1. (Textbook) Exercise 4.8

2. (Textbook) Exercise 4.9

3. (Textbook) Exercise 4.10

4. (Textbook) Exercise 4.12

5. (Textbook) Exercise 4.15 (Feel free to have a look at your EE501 notes!)

6. (Textbook) Exercise 4.26

7. (Çınlar, Intro. Stoch. Processes, Problem 8.17) Consider two gamblers whose capitals sum to 7 dollars, so that as soon as one has seven dollars the other is ruined and the game stops. Plays form independent trials with even chances for winning and losing. Let X_n be the capital of the first gambler at the end of the *n*th play.

a) Show that X is a Markov chain with the state-space $E = \{0,...,7\}$ and transition probabilities $P_{i,i-1} = P_{i,i+1} = 1/2$ for $i = \{1,...,6\}$ and $P_{00} = P_{77} = 1.$

b) Compute the probability F_{i0} of eventual ruin for the first player for each possible initial capital i.

c) Assume first player starts with 6 dollars. Compute the probability that he loses 5 dollars during the game, i.e. comes to the brink of a total loss; but ends up bankrupting the other player, i.e. eventually reaching the state $i = 7.$ (Hint: To calculate $F_{61} = P\{\text{ever reaching}\, 1 \,|\, \text{starting at}\, 6\}$, you may convert state 1 to an absorbing state.)