EECS-861 Random Signals and Noise
Fall Semester 2008
Assignment #6 Due 30 September 2008

Reading: Sections 3.5 - 3.6

1. Prove that if a random process $A(t)$ is SSS, then it is also WSS.

2. An i.i.d. random sequence $A(k)$ where $k$ can take on integer values is one for which all of the component random variables are statistically independent with the same distribution. Is an i.i.d. random sequence strict sense stationary? Justify your answer.

3. For the random process from class notes defined for a single coin toss as:

   $B_2(t, H) = \cos^2(2\pi t), \quad B_2(t, T) = \sin^2(2\pi t),$

   state whether or not it has each of the following stationarity properties, and give a brief explanation/justification for each answer. When appropriate, you may quote results from class notes and from previous assignment solutions.
   
   a. First order strict sense stationary
   b. Constant mean: $\mu_A(t) = \mu_A$
   c. Second order strict sense stationary
   d. Autocorrelation depending only on time difference: $R_{AA}(t, t + \tau) = R_{AA}(\tau)$
   e. Wide sense stationary

4. Repeat problem 3 for the Discrete Random Walk described in class notes.

5. Repeat problem 3 for the Random Binary Wave described in class notes.


8. Repeat part (a) of the last problem, but for the more general case in which the processes are not independent and do not have zero means.


10. Problem 3.17, p. 207, parts (b), (d) and (e). Finding power spectral densities from autocorrelations.

11. Problem 3.18, p. 208, parts (b) and (c). Finding autocorrelations from power spectral densities.

12. Problem 3.20, p. 208. Finding powers from power spectral density. On part (c), the desired power is for frequencies whose magnitude is in $[0,100 \text{ Hz}]$.

13. Problem 3.16, p. 207. Determining whether functions can possibly be power spectral density functions.