

ECE 520.651 Random Signal Analysis

Homework # 5

Due 9:00 AM on Friday, October 12, 2007.

Carefully review Section 18 from Prof. Papamarcou's notes (p65–73) and Section 6.7 from Stark and Woods (p375–383) before starting the homework.

1. Solve problem **6.36** from Stark and Woods.
2. Solve problem **6.37** from Stark and Woods.
3. Solve problem **6.38** from Stark and Woods.

Note in particular that the random variables $X[n]$, $n = 1, 2, \dots$, are *not* independent of each other, but the *joint pdf of all the $X[n]$'s* is not provided either; only the pairwise joint pdf of $X[m]$ and $X[n]$ for every $m, n \geq 1$. This, however, is adequate for showing mean-square convergence. (Why?)

4. Solve problem **6.41** from Stark and Woods.

(d) In your answer to (c), point out where the conclusion fails if x is not a point of continuity of F_X .

5. Let Y_1, Y_2, \dots , be a sequence of pairwise *uncorrelated* random variables, each with mean μ and variance σ^2 . Show that their sample mean $X_n = \frac{1}{n} \sum_{k=1}^n Y_k$ converges to μ in probability. i.e.

$$\lim_{n \rightarrow \infty} P(|X_n - \mu| > \epsilon) = 0 \quad \forall \epsilon > 0.$$

Hint: Does X_n converge in the mean-square sense?

Preview Chapter 5 after you finish the homework. We have already covered Sections 5.1–5.3 and 5.7, and we will resume with the remainder on October 11, 2007.