ECE 603 Fall 03

HW # 9

1. Let $\{X_n\}_{n\geq 1}$ be a sequence of i.i.d. random variables satisfying $Pr(X_n=1) = Pr(X_n=-1) = 1/2$. Answer the following questions.

(a) Show that

$$\phi_{X_n}(j\upsilon) = \cos\upsilon$$

(b) Find the characteristic function of

$$Y_n = \frac{X_1 + X_2 + \cdots + X_n}{\sqrt{n}}$$

(c) Show that

$$\lim_{n\to\infty}\left(\ln \phi_{Y_n}(j\upsilon)\right) = -\frac{\upsilon^2}{2}$$

(d) Show that $Y_n \to Y$ in distribution where $Y \sim N(0,1)$.

2. Ch. 9 Problem 2
3. Ch. 9 Problem 11
4. Ch. 9 Problem 13
5. Ch. 9 Problem 14
6. Ch. 10 Problem 1
7. Ch. 10 Problem 5
8. Ch. 10 Problem 10
9. (see next page)

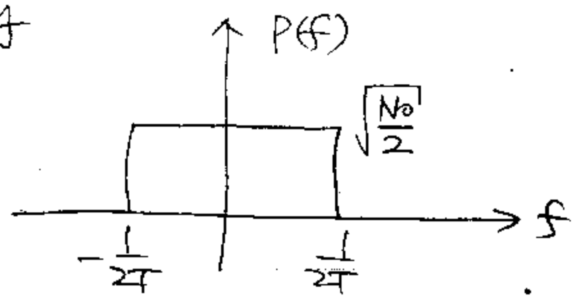
Suppose that $\{X_n\}_{n=-\infty}^{\infty}$ is a sequence of i.i.d. random variables satisfying

$$X_n \sim N(0,1).$$

A random process $Y(t)$ is defined as

$$Y(t) = \sum_{n=-\infty}^{\infty} X_n \, p(t-nT)$$

where $p(t)$ has its Fourier transform given by



Answer the following questions.

(a) Find $E\{Y(t)\}$

(b) Show that

$$R_{YY}(t_1,t_2) = \begin{cases} \dfrac{N_0}{2} \, \dfrac{\sin \frac{\pi(t_1-t_2)}{T}}{\frac{\pi(t_1-t_2)}{T}}, & t_1 \neq t_2 \\[2ex] \dfrac{N_0}{2}, & t_1 = t_2 \end{cases}$$