EE301 Signals and Systems **In-Class Exam**
Exam 2 **Tuesday, Mar. 30, 2004**

Cover Sheet

Test Duration: 70 minutes.
Coverage: Chaps. 1,2,3, and 4
Open Book but Closed Notes.
Calculators NOT allowed.
This test contains **one** problem with 12 parts.
All work should be done in the blue books provided.
You must show all work for each problem to receive full credit.
Do **not** return this test sheet, just return the blue books.

Consider the continuous-time LTI system with impulse response

$$h(t) = \frac{\sin[5(t-2)]}{\pi(t-2)}$$

(a) Plot the magnitude $|H(j\omega)|$ and phase $\angle H(j\omega)$ (two separate plots) of the frequency response of this system (equal to the Fourier Transform $H(j\omega)$ of the impulse response $h(t)$) as a function of frequency. Show as much detail as possible.
For EACH of the remaining parts of this problem, you must do EACH of the following THREE steps. For all parts, you MUST show all work and explain how you got your answer concisely but with sufficient detail to receive full credit.

(i) determine a simple, closed-form expression for the Fourier Transform of the input

(ii) Plot the magnitude of the Fourier Transform of the input signal

(iii) Determine a simple, closed-form expression for the respective time-domain output of this system to each of the following inputs.

(b) $x_1(t) = \cos(2t+\pi)$

(c) $x_2(t) = \sin(7t+3\pi)$

(d) $x_3(t) = \dfrac{\sin(3t)}{\pi t}$

(e) $x_4(t) = \dfrac{\sin[5(t+2)]}{\pi(t+2)}$

(f) $x_5(t) = \dfrac{d}{dt}x_4(t)$ That is, this input is the derivative of $x_4(t)$ in part (e).

(g) $x_6(t) = \left\{\dfrac{\sin(t)}{\pi t}\right\}^2 \cos(t)$

(h) $x_7(t) = \left\{\dfrac{\sin(2t)}{\pi t}\right\}^2$

(i) $x_8(t) = t\left\{\dfrac{\sin(2t)}{\pi t}\right\}^2$

(j) $x_9(t) = \left\{\dfrac{\sin(t)}{\pi t}\right\}^2 \left\{\sum_{n=-\infty}^{\infty} \delta\left(t - n\dfrac{\pi}{4}\right)\right\}$

(k) $x_{10}(t) = \left\{\dfrac{\sin(t)}{\pi t}\right\}^2 \left\{\sum_{n=-\infty}^{\infty} \delta(t - n2\pi)\right\}$

(ℓ) The input $x_{11}(t)$ is the periodic signal $x(t)$ below.