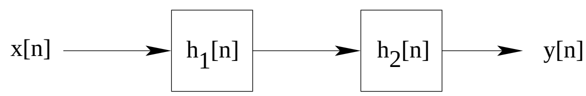
# EE 341 - Exam 2

## October 27, 2004

Name: ______________________________

Closed book. Show all work. Partial credit will be given. No credit will be given if an answer appears with no supporting work. You may use one page of notes, the handouts on time-domain solutions to differential and difference equations, and a calculator.

1. Consider the cascade interconnection of two LTI systems shown below:




The impulse response of system 1 is

$$h_1[n] = u[n] - u[n-2]$$

The impulse response of system 2 is

$$h_2[n] = \frac{1}{2}\delta[n] - \delta[n-1] + \delta[n-2] - \frac{1}{2}\delta[n-3]$$

Find the overall impulse response of the system; i.e., find $y[n]$ when $x[n] = \delta[n]$.

2. Consider the signal

$$x(t) = 3\ \cos(t) + 5\ \sin(5t - \frac{\pi}{6}) - 2\ \cos(8t - \frac{\pi}{3})$$

   (a) What is the period of $x(t)$

   (b) What is the fundamental frequency of $x(t)$

   (c) Write the exponential Fourier series for $x(t)$.

3. Compute the Fourier transforms of the following signals. Note: You should not have to do any integrals.

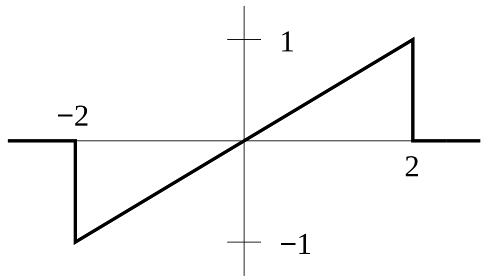
   (a) $x(t) = t\, e^{-2t} \cos(4\, t)\, u(t)$

   (b)

$$x(t) = \begin{cases} 1 + \cos(\pi\, t) & |t| < 1 \\ 0 & \text{otherwise} \end{cases}$$

4. Below are some continuous-time signals. Answer the questions about the Fourier transforms of the signals. Be sure to explain your answers.

   (a)

      i. Is $X(\omega)$ real?

      ii. Is $X(\omega)$ imaginary?

      iii. Is $\int_{-\infty}^{\infty} X(\omega)\, dw$ equal to zero?

      iv. Is $X(\omega)$ periodic?

   (b) $x(t) = \delta(t-2)$

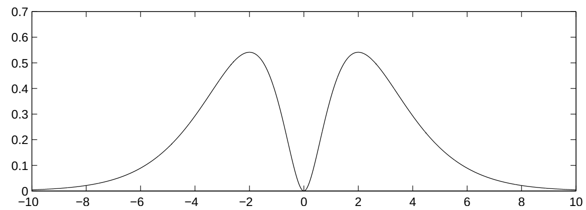
      i. Is $X(\omega)$ real?

      ii. Is $X(\omega)$ imaginary?

      iii. Is $\int_{-\infty}^{\infty} X(\omega)\, dw$ equal to zero?

      iv. Is $X(\omega)$ periodic?

(c)

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