SOLUTIONS

Quiz #1

ECEn 380: Signals & Systems

Fall 2015

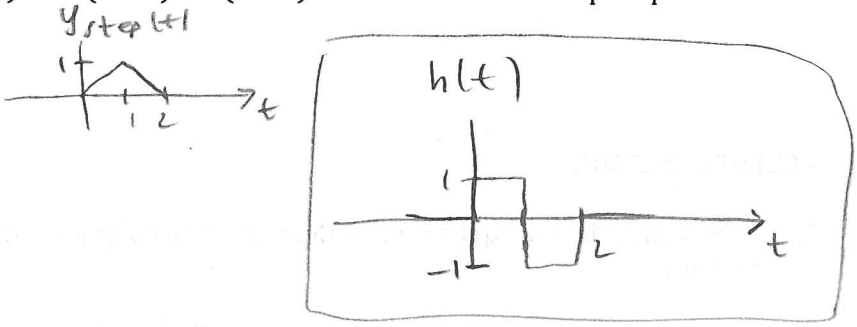
Closed book, closed note, closed neighbor, no calculators allowed. *Time limit is 12 minutes. 20 points + 2 extra credit points possible.*

HOMEWORK SECTION:

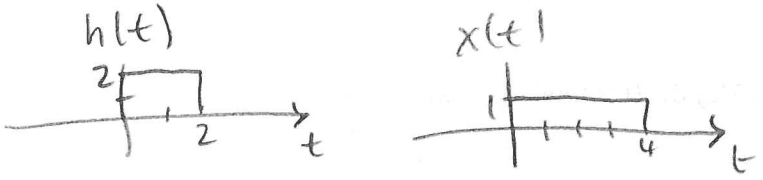
1. Find the average power in the signal $x(t) = (2 - 3j)e^{j(14\pi t - \pi)}$. (2 pts)

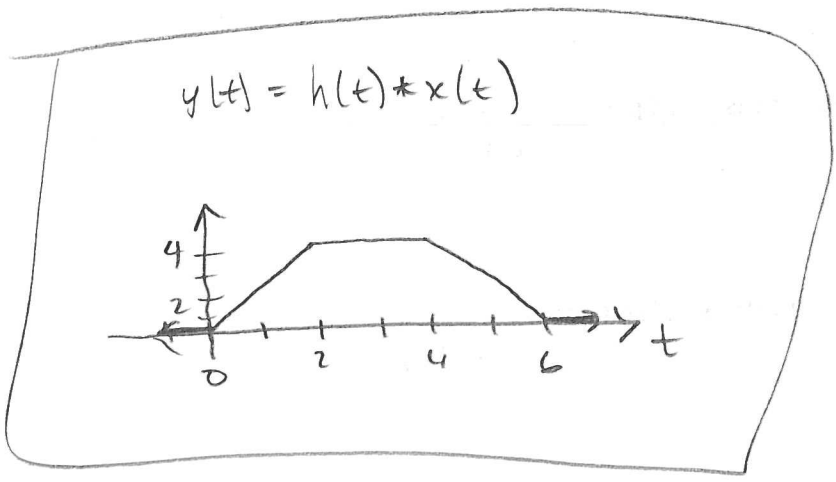
$$P_{AV} = \frac{1}{T_0}\int_{\text{ONE PERIOD}} |x(t)|^2 dt = 4 + 9 = \boxed{13}$$

2. **Graph (and appropriately label)** the impulse response $h(t)$ of an LTI system whose step response is $y_{step}(t) = r(t) - 2r(t-1) + r(t-2)$. HINT: Sketch the step response first. Look familiar? (2 pts)



3. An LTI system has impulse response $h(t) = 2u(t) - 2u(t-2)$. **Graph (and appropriately label)** the output of this system to the input $x(t) = u(t) - u(t-4)$. (2 pts)





4. Determine whether the following systems are linear and/or time-invariant. Use the following key to answer your questions:

   A: System is **neither linear nor time-invariant**.
   B: System is **linear**, but it is **not time-invariant**.
   C: System is **not linear**, but it is **time-invariant**.
   D: System is **LTI**.

   (a) $y(t) = \int_0^t x(\tau)d\tau$ (2 pts) B

   (b) $\frac{d}{dt}y(t) - 3y(t) = -2\frac{d}{dt}x(t) + 3x(t)$ (2 pts) D

   (c) $y(t) = \int_{t-2}^{t+2} x(\tau)d\tau$ (2 pts) D

   (d) $y(t) = \int_{-\infty}^{t} x(\tau)d\tau$ (2 pts) D

LECTURE SECTION:

5. Answer the following questions: HINT: Just think about what $h(t)$ looks like for these two systems.

   a. Is the system from 5(c) causal? (2 pts) NO

   b. Is the system from 5(c) BIBO stable? (2 pts) YES

   c. Is the system from 5(d) causal? (2 pts) YES

   d. Is the system from 5(d) BIBO stable? (2 pts) NO