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ECE-205

Exam 2

Fall 2015

Calculators and computers are not allowed. You must show your work to receive credit.

Problem 1 __________/22

Problem 2 __________/15

Problem 3 __________/18

Problem 4 __________/25

Problem 5 __________/25

Total ________________

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1) (22 points) Fill in the non-shaded part of the following table. You should assume $0^- < t < \infty$ (t starts just before time zero, so we include all of any delta functions at the origin.)

	Linear? (Y/N)	Time Invariant? (Y/N)	BIBO Stable? (Y/N)
$y(t) = tx(t) + 2$			
$\dot{y}(t) + ty(t) = \cos(t)x(t)$			
$y(t) = x(1-t)$			
$y(t) = \int_{-\infty}^{t} e^{\lambda} x(\lambda) d\lambda$			
$y(t) = \int_{0}^{t} e^{-\lambda} x(\lambda) d\lambda$			
$y(t) = \cos\left(\frac{1}{x(t)}\right)$			
$h(t) = \delta(t)$			
$h(t) = e^{t}u(t)$			

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2) **(15 points)** Simplify the following as much as posible. Be sure to include any necessary unit step functions

$$y(t) = \delta(t-2) * \delta(t-1)$$

$$y(t) = \int_{-\infty}^{t+1} \delta(\lambda - 2) d\lambda$$

$$y(t) = e^{t}\delta(t-2)$$

$$y(t) = h(t) \star \delta(t)$$

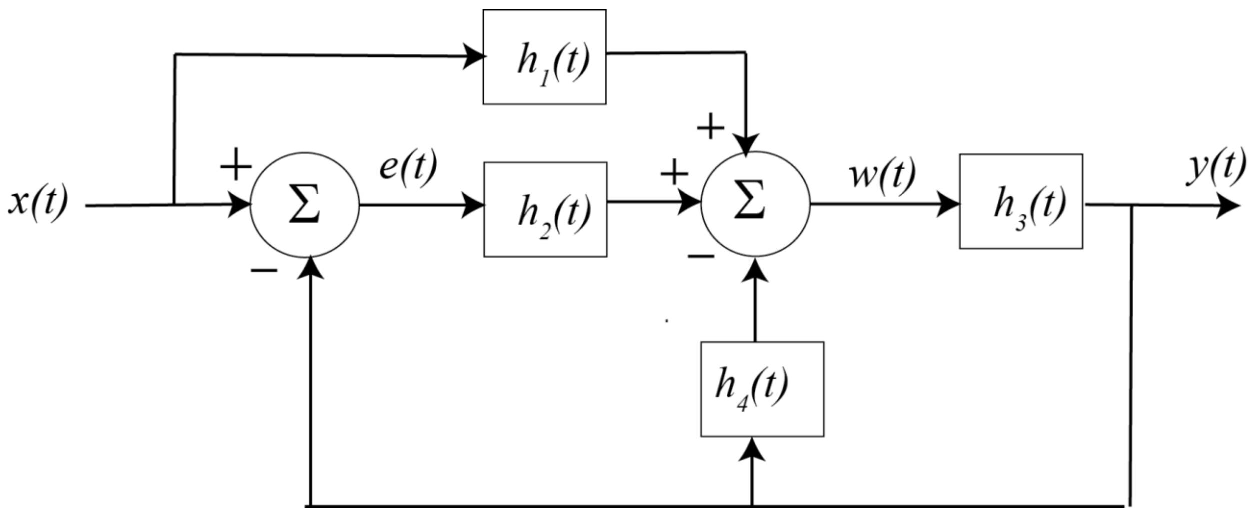
$$y(t) = \int_{-\infty}^{\infty} \delta(\lambda - 2)\delta(t-\lambda) d\lambda$$

3) (18 points) The input-output relationship for the following system can be written as

$$y(t) * A(t) = x(t) * B(t)$$

Determine $A(t)$ and $B(t)$.

Hint: Determine an expression for *e(t)*, then *w(t)*, then *y(t)*



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4) (20 points) Consider a linear time invariant system with impulse response given by

$$h(t) = t[u(\mathrm{t}+1) - u(t-3)]$$

The input to the system is

$$x(t) = e^{-t}[u(t) - u(t-2)]$$

Using ***graphical evaluation***, determine the output $y(t)$ Specifically, you must

- Flip and slide $h(t)$, ***NOT*** $x(t)$
- Show graphs displaying both $h(t-\lambda)$ and $x(\lambda)$ for each region of interest
- Determine the range of t for which each part of your solution is valid
- Set up any necessary integrals to compute $y(t)$. Your integrals must be complete, in that they cannot contain the symbols $x(\lambda)$ or $h(t-\lambda)$ but must contain the actual functions.
- Your integrals **cannot contain any unit step functions**
- ***DO NOT EVALUATE THE INTEGRALS!!***

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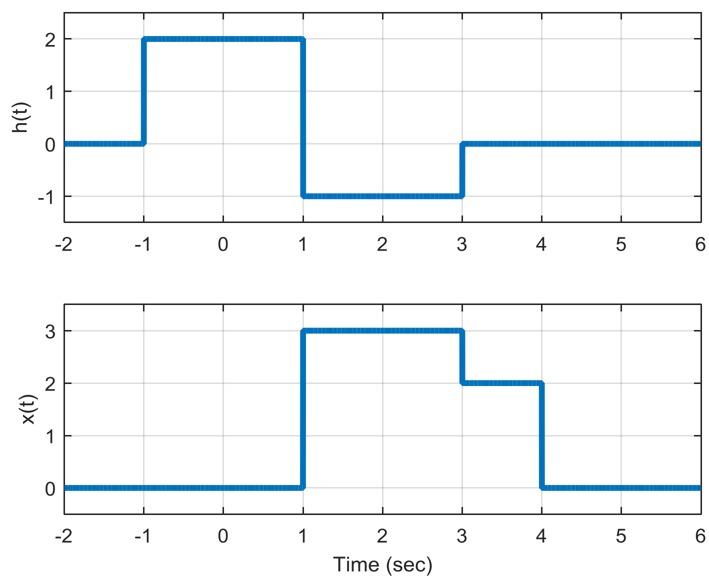
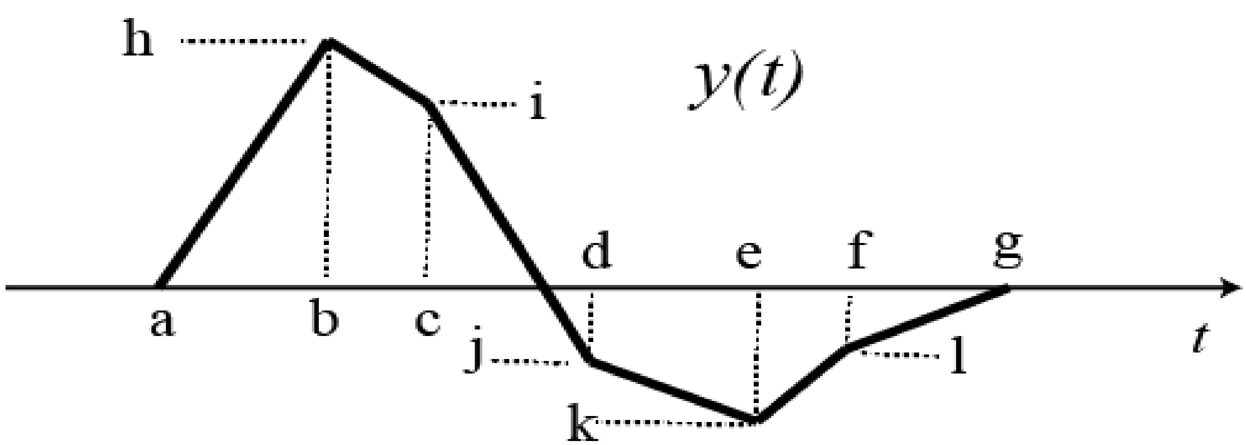
5) (26 Points) An LTI system has input, impulse response, and output as shown below. Determine numerical values for the parameters *a-l*. Note that parameters *a-g* correspond to *times*, and *h-l* correspond to *amplitudes*.

Hints:

- *Note that the output is not drawn to scale, it just represents the general shape of the output.*
- *A good way to check your answer is to flip and slide one of them, then flip and slide the other one.*
- *It is probably much easier to get the times correct than the amplitudes.*





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