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ECE-205

Exam 2

Fall 2011

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

Problem 1 __________/22

Problem 2 __________/20

Problem 3 __________/15

Problems 4 _________/18

Problem 5 __________/25

Total _______________

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1) (22 points) Fill in the non-shaded part of the following table.

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

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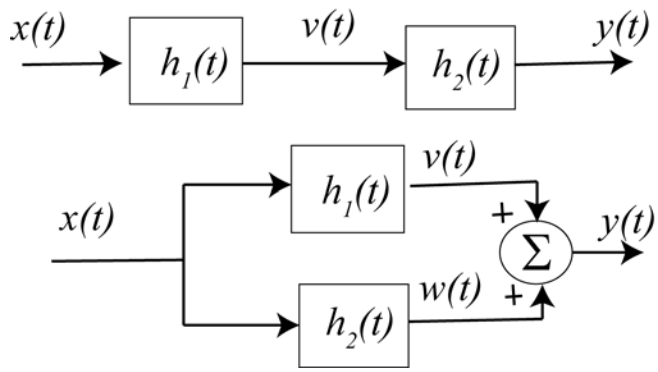
2) (20 points) For the following interconnected systems,

i) determine the overall impulse response (the impulse response between input *x(t)* and output *y(t)*) and

ii) determine if the system is causal.



a) $h_1(t) = \ \delta(t+2),\ h_2(t) = \delta(t-1)$

b) $h_1(t) = \ u(t+1),\ h_2(t) = u(t-2)$

Parallel Connections:

Series Connections:

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3) (18 Points) Determine the impulse response for the following systems. Don't forget any necessary unit step functions

a) $y(t) = x(t-1) + x(t+1)$

b) $y(t) = \int_{-\infty}^{t} e^{-(t-\lambda)} x(\lambda+3) d\lambda$

c) $2\dot{y}(t) + y(t) = 3x(t)$

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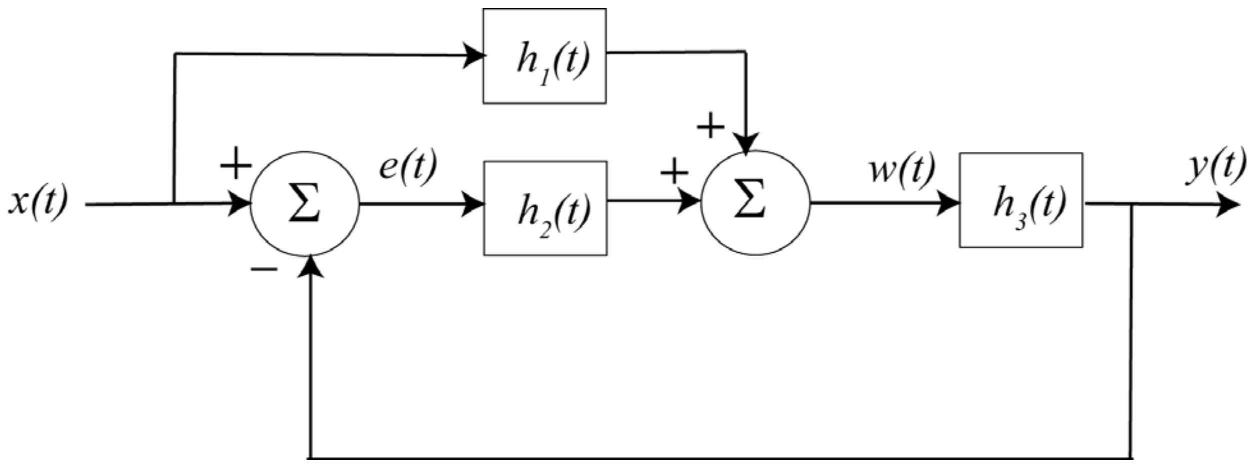
4) (15 points) The input-output relationship for the following system can be written as

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

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



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5) (25 points) Consider a linear time invariant system with impulse response given by

$$h(t) = e^{-(t+1)}u(t+1)$$

The input to the system is given by

$$x(t) = [u(t-1) - u(t-2)] - 2[u(t-3) - u(t-4)]$$

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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