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ECE-205

Exam 2

Fall 2012

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

Problem 1 __________/18

Problem 2 __________/15

Problem 3 __________/18

Problems 4 _________/10

Problem 5 __________/15

Problem 6 __________/24

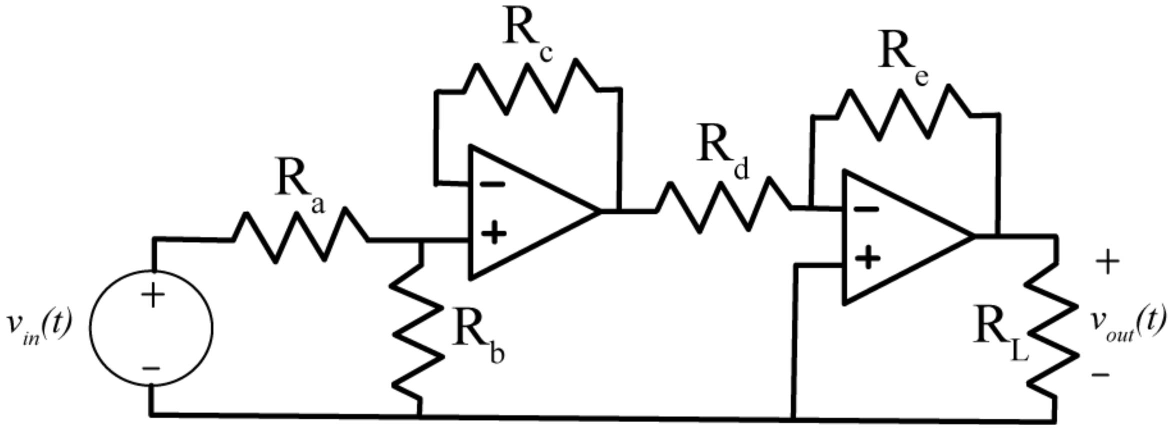
Total ______________

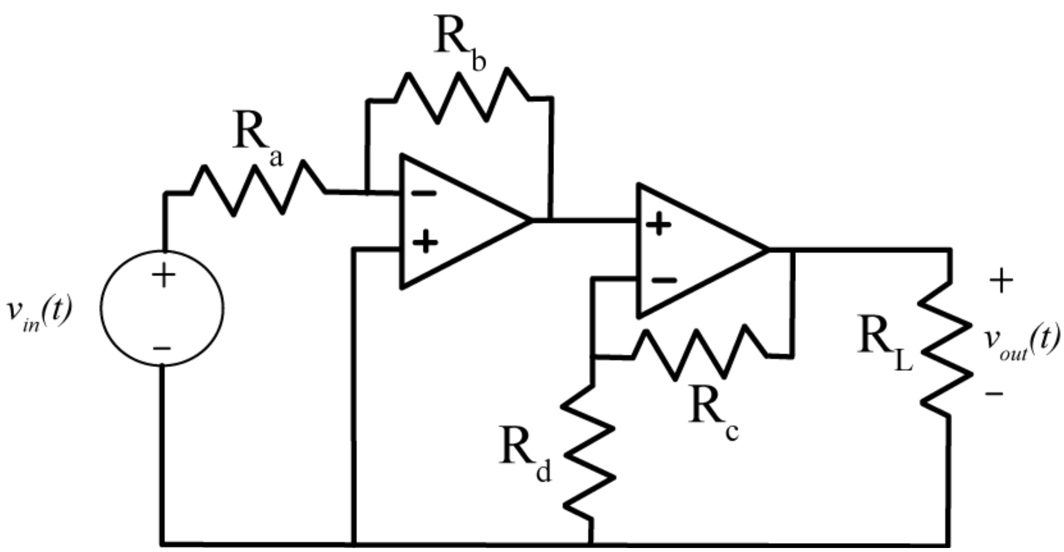
Name ____ Mailbox __________________

1) (18 points) Fill in the non-shaded part of the following table.

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

2) (15 points) For the following two op-amps circuits, we can write $v_{out}(t) = G\, v_{in}(t)$. Determine the value of G for each circuit.





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

c) $\frac{1}{3}\dot{y}(t) + y(t) = 2x(t)$

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4) (10 points) For an LTI system with impulse response $h(t) = e^{-(t-1)}u(t-1) + \delta(t-2)$ determine the system output using **analytical evaluation** (directly evaluating the integrals) for input $x(t) = e^{-t}u(t)$

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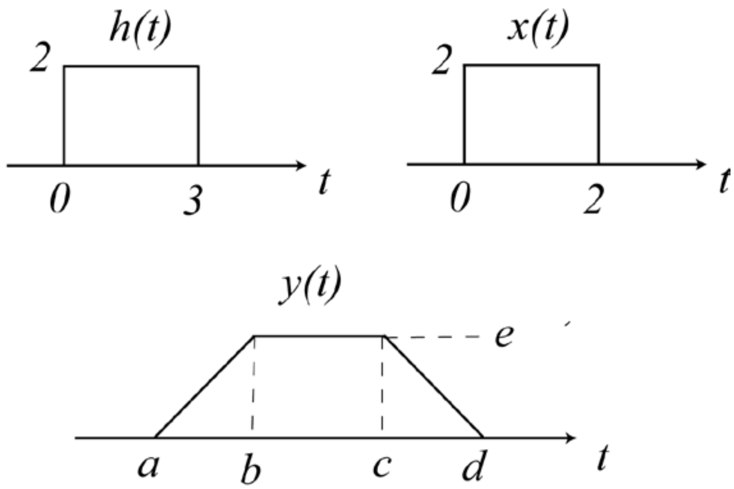
5) (15 Points) An LTI system has impulse response, input, and output as shown below. Determine numerical values for the parameters *a*, *b*, *c*, *d*, and *e*.



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6) (24 points) Consider a linear time invariant system with impulse response given by

$$h(t) = e^{-(t+2)}u(t+2)$$

The input to the system is given by

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

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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