EE213 Exam 2

April 23, 2014

Closed Book, Justify all work unless otherwise instructed.

Good Luck

NAME_____

student ID number _____

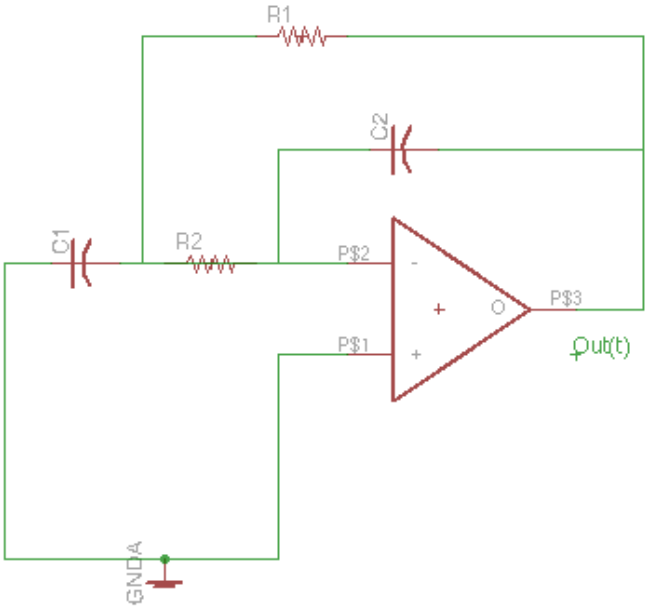
1	**/25**
2	**/25**
3	**/30**
4	**/20**
TOTAL	**/100**

1) (25) Consider the following system where the impulse response is given by $h(t) = \exp(-t)u(t)$ and the input is given by $x(t) = \exp(t)(u(t) - u(t-2))$.

a) Use the convolution integral to compute the output $y(t)$ by hand.

b) For the given impulse response above find the natural response.

2) (25) Consider the circuit below with no input and output voltage given by $out(t)$. Let the leftmost capacitor have an initial voltage $v_{C_1}(0) = 1V$ and the rightmost capacitor have an initial voltage of $v_{C_2}(0) = 2V$. Both voltages are from left to right. Let $C_1 = C_2 = 1F$, $R_1 = 1\Omega$, and $R_2 = 1\Omega$. Find the zero input response.

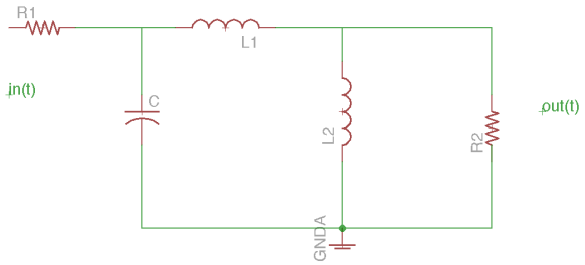


3) (30) Consider the circuit below with input voltage $in(t)$ and output voltage $out(t)$. Here $R_1 = R_2 = 1\Omega$, $C = 1F$, $L_1 = 1H$, and $L_2 = 0.5H$.

a) Determine the state of the system (find $x(t)$) labeling direction of appropriate voltages and currents.

b) Find the state space representation; A, b, c,d.

c) Write MATLAB code to find the total response given the input is $in(t) = \exp(-2t)u()$ and the initial voltage of the capacitor from top to bottom is $v_C(0) = 1V$, the initial current of the inductor from left to right is $i_{L_1}(0) = 1A$, and the initial current of the second inductor from top to bottom is $i_{L_2}(0) = 1A$.



4) (20) Consider the following four transfer functions. For each transfer function find all poles and all zeros. Then match each transfer function with one of the four plots of step responses.

$$H_1(s) = \frac{5}{s^2 + 6s + 5}$$

$$H_2(s) = \frac{s^2}{s^2 + 6s + 18}$$

$$H_3(s) = \frac{6s}{s^2 + 6s + 5}$$

$$H_4(s) = \frac{6s}{s^2 + 6s + 18}$$