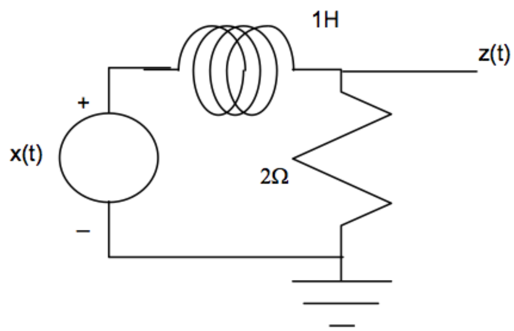
EE213 Practice Final

1) Consider the following circuit. For each part find answer using the convolution integral.

a) Find the zero state response if $x(t) = \exp(-2t)(u(t) - u(t-1))$.

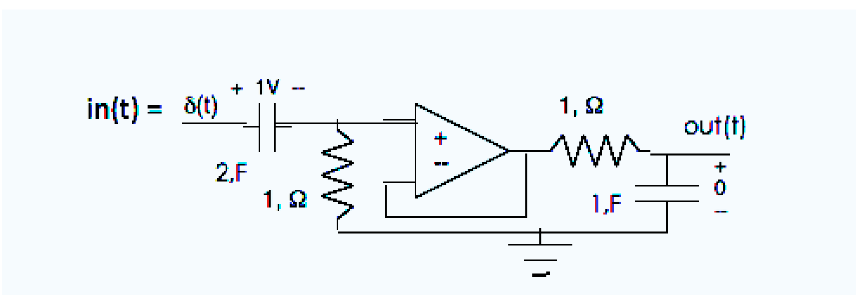
b) Find the natural response, $n(t)$.



2) Consider the circuit below.

a) Find the zero state response.

b) Given initial conditions of 1V across the leftmost capacitor at time 0 and no voltage at time 0 across the rightmost capacitor find the zero input response.

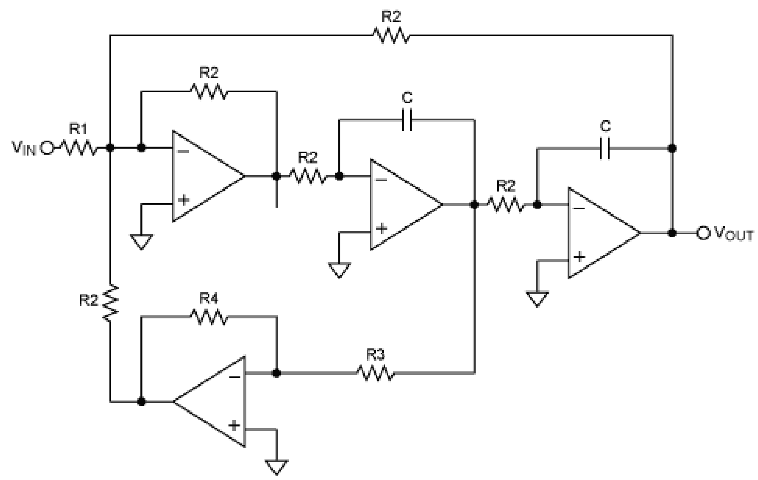


3) Consider the circuit below. Unknown variables are the outputs of each of the opamps.

a) Write matlab code to determine the transfer function $H(s) = V_{OUT}(s)/V_{IN}(s)$. Do not solve for the transfer function.

b) Write matlab code to find the zero state response.

c) Determine the value of the transfer function $H(s)$ at very high and very low frequencies from physical arguments.



4) Consider the circuit in problem 3).

a) Write the state space equations in standard form.

b) Write a matlab script to find the zero input response of this circuit assuming initial conditions with the leftmost capacitor having an initial voltage at time 0 from left to right of 1V and the rightmost capacitor having an initial voltage at time 0 from left to right of 2V.

5)

a) Show matlab commands for finding the transfer function of a filter that has equipripples in the passband and is monotonically attenuating in the stopband with the following specifications; a maximum 2dB attenuation in passband for frequencies greater than 4KHz and at least 40dB attenuation for frequencies less than 3KHz. List matlab commands for plotting the step response and listing all poles and zeros.

b) Discuss how you could implement this filter using biquads and opamp circuits.

c) If the input to the filter is

$$x(t) = \sin(1000t + \pi/4) - \cos(5000t - \pi/3)$$

find the output of the filter $y(t)$.

6 A circuit has the following frequency response.

$$H(\omega) = \frac{j\omega}{(j\omega + 1)(j\omega + 2)}$$

Find the zero state response if the input is

a) $x(t) = 5\cos(3t)$.

b) $x(t) = \exp(t)u(-t)$.

7)

Consider the following pole/zero plots labeled in the figure below; Aiea, Manoa, Nuuanu, and Moanalua. Match them up to the step responses labeled in the bottom figure below; ahi, mahi, onaga, and ono.