CPE 381: Fundamentals of Signals and Systems for Computer Engineers

Homework #2
Due: Monday, February 17 at 9:35 am
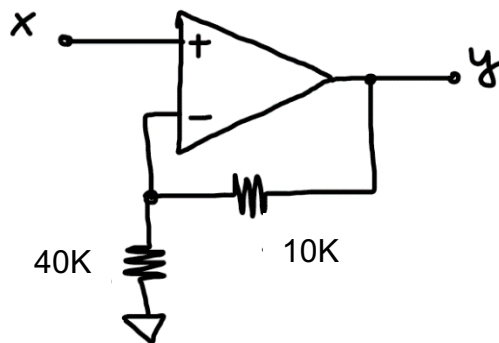Please bring hardcopy to the class and upload softcopy to Canvas

Student name:

1	2	3	4	5	6	7	Total
10	20	10	15	20	10	15	

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1. (10 points) What is the transfer function of the following circuit:

2. (20 points) Simulate the effect of multipath in wireless communication. Generate dumped sine wave $x(t)$ with amplitude A=1 and frequency f=400Hz sampled at F_s= 11,025Hz with time constant 1 second (i.e. e^{-t}). Assume that the signal is transmitted over three paths, so that the received signal is
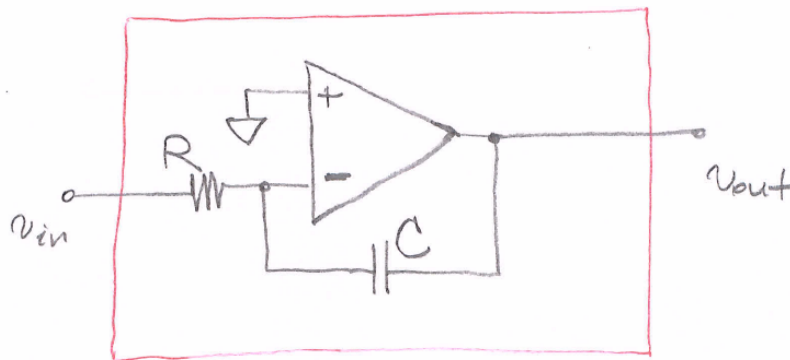
$$y(t) = x(t) + 0.4x(t\text{-}0.2) + 0.2x(t\text{-}0.4)$$

Determine the number of samples corresponding to delay using sampling frequency Fs.
Plot the function x(t) and output y(t) and use *sound* function in Matlab to listen to original and received signals.

3. (10 points)
Find impulse response of capacitor and its unit step response.

4. (15 points) Find transfer function of the following circuit

5. (20 points)

Use Matlab symbolic computation to find the Laplace transform of a real exponential
$$x(t) = 5e^{-2t} \cos(8t) u(t)$$
Plot the signal and the poles and zeros of their Laplace transform.
Repeat the analysis and plot the results for $x(t) = 5e^{-4t} \cos(8t) u(t)$
Discuss the changes in the s plane and describe their effect on function in time domain.

6. (10 points)
Describe the basic properties of the one sided Laplace transform.

7. (15 points)
Find and use the Laplace transform of $e^{j(\Omega_0 t + \Theta)} u(t)$ to obtain the Laplace transform of
$$x(t) = \cos(\Omega_0 t + \Theta) \cdot u(t)$$

Consider the special cases for $\Theta = 0$ and $\Theta = -\pi/2$.