Department of Electrical and Computer Engineering
The University of Alabama in Huntsville

CPE 381: Fundamentals of Signals and Systems for Computer Engineers

Homework #2

Due: Monday, March 1 at 9:35 am
Please submit your work as PDF on Canvas

Student name:

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

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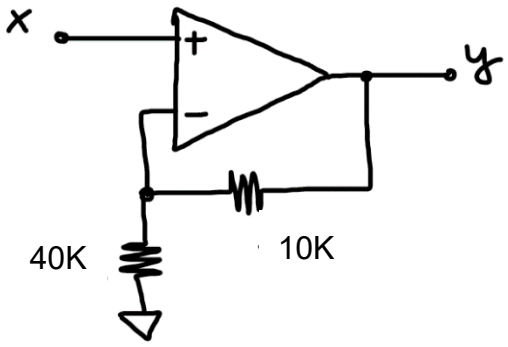
1. (10 points) What is the transfer function of the following circuit:



2. (20 points) Simulate the effect of multipath in wireless communication. Generate dumped sine wave $x(t)$ with amplitude A=2 and frequency f=200Hz 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

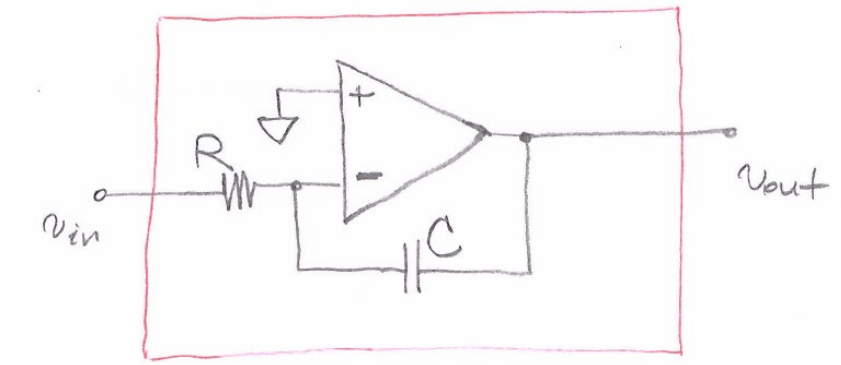
$$y(t) = x(t) + 0.4x(t\text{-}0.1) + 0.2x(t\text{-}0.4)$$

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. How step response depends on the capacitance of the capacitor?

4. (15 points) Find transfer function of the following circuit. What is the output voltage at t=0.4s, for R=10KΩ and C=1 nF?



5. (20 points)

Use Matlab symbolic computation to find the Laplace transform of a real exponential

$$x(t) = 4e^{-2t}\cos(8t)\,u(t)$$

Plot the signal and the poles and zeros of their Laplace transform.

Repeat the analysis and plot the results for $x(t) = 4e^{-4t}\cos(8t)\,u(t)$

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 Θ =0, Θ = -π/2, and Θ = π/4.