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, February 20 at 9:35 am
Please upload softcopy of your work and published Matlab scripts to Canvas

Student name:

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

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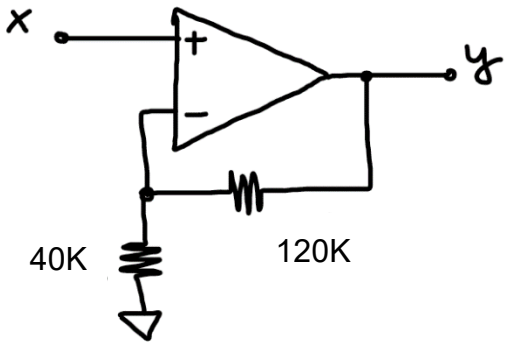
1. (10 points) What is the transfer function of the following circuit:



2. (20 points) Simulate the effect of multipath in wireless communication. Generate damped sine wave $x(t)$ with amplitude A=1 and frequency f=400Hz sampled at F_s= 11,025Hz with the time constant of 0.5 seconds (i.e. $e^{-t/\tau}$). Assume that the signal is transmitted over three paths, so that the received signal is

$$y(t) = x(t) + 0.5x(t\text{-}0.2) + 0.25x(t\text{-}0.5)$$

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

3. (20 points) Consider the signal x(t) = cos(0.4π·*t*) + 4·cos(2π·*t* /7), −∞ < t < ∞.

(5 points) Is $x(t)$ periodic? If it is, what is the period T_0 of $x(t)$? T_0 = _____

(15 points) What is the average power of $x(t)$? P_{ave} = _____

Verify that the power P_x is the sum of powers of two components P_1(cos(0.4π·*t*)) and P_2(4·cos(2π·*t* /7)).
Note: you have to prove that the power of the sum is equal to the sum of powers; therefore, the power of x(t) must be calculated, not substituted.

4. (10 points)

a) Plot the signal

$$x(t) = e^{-t}\mathrm{u}(t)$$

What are the energy and the power of x(t)?

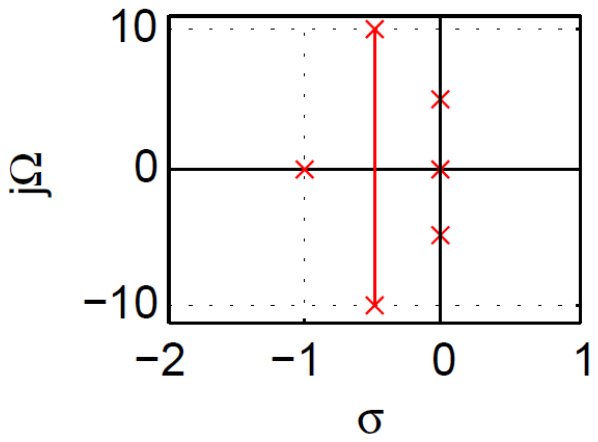
5. (10 points)

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 and Θ = -π/2.

6. (20 points) Represent time domain signals corresponding to the poles in the *s* plane below:



7. (10 points) Describe the basic properties of the one sided Laplace transform.