CPE 381 **Midterm Exam**

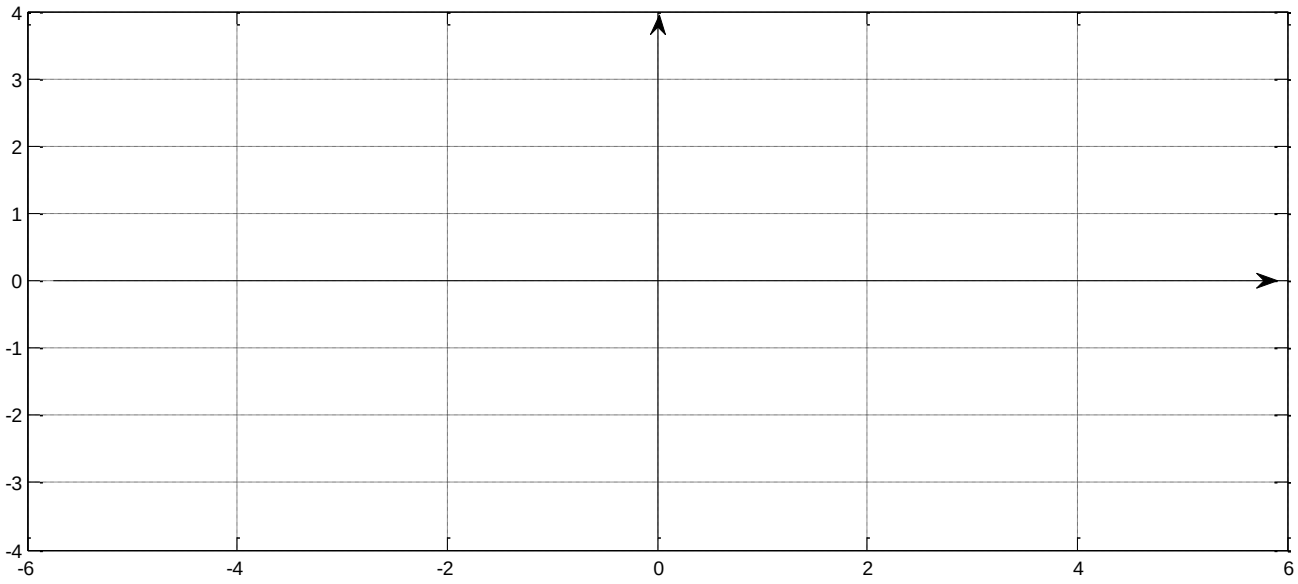
Student name:

.....

1 10	2 12	3 13	4 15	5 10	6 15	7 15	8 10	Total

1. (10 points) How much memory do you need to store a two minute audio recording with 20,000 Hz sampling rate using 16-bit AD converter?

2. (10 points) Plot function $x(t) = e^{-t} \cdot 3\cos(2\pi t) \cdot u(t)$



(2 points) What is the value of $x(t)$ for $t = 0$? x(t) = _____

3. Consider the periodic signal x(t) = cos(2π 2 *t*) + 2 cos(2π 3 *t*), −∞ < t < ∞.

(6 points) What is the period T_0 of $x(t)$? T_0 = _____

(3 points) What is fundamental frequency of $x(t)$? f_0 = _____

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

4. (15 points) Let x[n] = {0, 1, 1, 1, 0} and h[n] = {-0.5, 1, -0.5}.
Compute and plot the convolution y[n] = x[n] * h[n].

5. (10 points) Describe Time Shifting and Frequency Shifting properties of one-sided Laplace Transform.

6. (15 points) The impulse response of an LTI system is given by $h(t) = e^{-2t}u(t)$. Find the output of the system y(t) for the input x(t) = u(t).

7. (15 points) Determine the fundamental frequency ω_0 of

$$x(t) = 1 + 4 \cdot \cos\left(\frac{2\pi}{3} t\right)$$

and the Fourier series coefficients a_k such that

$$x(t) = \sum_{k=-\infty}^{\infty} a_k e^{jk\omega_0 t}$$

8. (10 points) Represent magnitude and phase line spectra of raised sine signal:

$$x(t) = B + A \cdot \sin(\Omega_0 t)$$