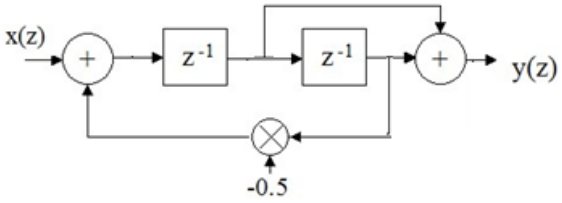
EE 311 **Name_____**

Hour Exam 1 **February 2, 2018**

1. Describe, in English, the process of convolution with respect to a signal being processed through a system.

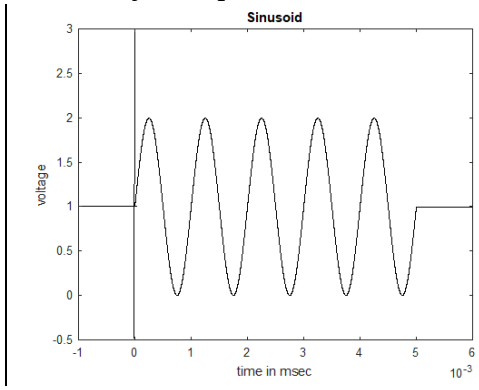
2. Find the transfer function in z for the following system.



3. Use a convolution table to determine the output for a system whose impulse response is given by h(n) = {1, 2, 0.5, 0, 0, 0, …} if the input is given by
x(n) = {0.5, 1.5, 1.0, 0, 0, …}

4. If I have a transfer function in z and I substitute z = j show that the magnitude of the resulting complex number will be the magnitude of the frequency response of the system at fs/4.

5. Suppose I have a sinusoid with a 1 msec period that begins at 0 seconds and ends 5 msec later at 5 msec as shown in the figure below. If I do the Fourier transform on this signal what frequencies or range of frequencies would you expect to see.



6. Find the difference equation corresponding the following transfer function in z.

$$H(z) = 0.85\frac{z-1}{z^3+2z^2-4z+3}$$

7. Since the exponential form of the Fourier series is simply another way of writing the trigonometric form, why does the exponential form include frequency terms that range from -∞ to +∞ instead of from 0 to +∞ as does the Fourier series?

8. The FFT is a computer algorithm for doing the discrete Fourier transform in a computationally efficient manner. To achieve this efficiency the FFT relies on the periodicity of the DFT. What characteristic of the DFT forced it to be periodic in both time and frequency? You may explain this in mathematical terms or in physical terms.

9. Suppose you have a transfer function H(z) and you note that H(1) = -8. If a step function whose height is 0.5 is applied to the system what will be the final value of the output of the system.