**You need to know the following topics for test 1 of DSP**

1. Given a signal *x*(*t*) and certain parameters then you should be able to do the following:
   1. Find the sampling rate without aliasing
   2. Determine the quantization level and the bit rate per sample
   3. Find the maximum quantization error and the energy of the quantization error.
   4. Find the quantized value of a given sample for a given quantization method
   5. Find the binary representation of the quantized sampled based on a given coding method
2. Determine the possible sampling frequency for a bandpass signal.
3. Given *x*(t) which could be a continuous harmonic or exponential signal and the sampling rate, then you should be able to do the following
   1. Find the digital frequency *F*, *Ω*, and the fundamental period *N*0.
   2. Find *x*[*n*]
   3. If the signal is under-sampled then find the aliased frequency for the continuous and digital signal
4. Given *x*[*n*] you should be able to do the following
   1. Find the energy or the power of the signal
   2. Plot the signal after shifting and/or compression operation on the signal.
   3. Resample the signal and plot the up-sampled or the down-sampled signal
5. Given a difference equation you should be able to do the following:
   1. Draw the block diagram of the system
   2. Determine if the system is linear or not, causal or not, stable or not, time invariant or not.
6. Given a differential equation with initial conditions you should be able to find the difference equation with the digital initial conditions.
7. Given the difference equation and initial conditions you should be able to find the zero-input response
8. Given the difference equation you should be able to find the unit impulse response *h*[*n*].
9. Given the impulse response of the system *h*[*n*] and the input *x*[*n*] you should be able to find the zero-state response *y*[*n*] using convolution definition and/or properties with the table.