

MEEN 2210 Electromechanical Engineering Systems Spring 2011

Class Quiz #1 Class Period # 2 January 24, 2011

Name: \_\_\_\_\_ Section: \_\_\_\_\_

Point Values: Questions 1-5 (5 pts. each); Questions 6-7 (10 pts. each); Question 8 (25 pts.); Question 9 (30 pts.)

1. Sampling at a rate less than the Nyquist rate is known as \_\_\_\_\_.
2. The Nyquist Sampling Theorem states that to avoid aliasing, a signal should be sampled \_\_\_\_\_.
3. The binary sequence  $10001_2$  represents the decimal number \_\_\_\_\_.
4. With each additional quantization bit, a signal's signal-to-noise ratio increases by approximately how many dB? \_\_\_\_\_.
5. If a signal is sampled below the Nyquist rate, the resulting error in the sampled signal is called \_\_\_\_\_.
6. What is quantization?
7. What does it mean when we say that a signal is band-limited?
8. Suppose you decide to sample a sequence of three sinusoidal tones using a sampling frequency  $f_s$  of 5000 Hz. If the frequencies of the tones are 300 Hz, 2000 Hz, and 4500 Hz, when you recover the tones from the samples, what three frequencies will you observe?

9. You would like to store a digital audio recording of someone speaking. You have only 1 Gbyte ( $10^9$ ) of storage available to you. Assume that the minimum quality of the audio must be 54 dB (SNR) and that the individual's frequency range is below 3500 Hz. What is the maximum length of time of speech that can be stored on this device?