ECE 440L
Spring 2013

Lab Practical 2: Practice Questions

The following are some practice questions to facilitate preparation for this week's Lab Practical. The actual Practical may not include all the questions on this practice exam, and it may have additional questions that do not appear on this practice exam. However, these practice questions cover important topics and are designed so that if you understand them well, you should do well on the Practical.

1. You will be given a sum of two signals, one AM and one FM, on Jack A or B. You will then be asked to do the following:
   a. Identify which signal is AM and which is FM.
   b. Answer questions about both signals.
   c. Demodulate the FM signal to recover its message.
2. Synchronous demodulation refers to the process of multiplying a modulated signal (AM, FM, BPSK, or other) by the original carrier to recover the baseband message. Understand this process thoroughly. In particular…
   a. Draw a block diagram for a synchronous receiver. (Blocks include an oscillator, low pass filter, and multiplier, though not necessarily in that order.)
   b. Derive a mathematical expression for the output of the receiver when the receiver's carrier has a *phase* error relative to the incoming carrier.
   c. Derive a mathematical expression for the output of the receiver when the receiver's carrier has a *frequency* error relative to the incoming carrier.
   d. Understand the motivation for phase lock loops, and be able to explain the basic principles of how they work, including block diagrams.
3. Digitization is very important in modern information systems. Understand and be able to apply the following concepts:
   a. Given a spectrum of an analog waveform, draw the spectrum of a sampled version of this waveform for various choices of sample frequency.
   b. Be able to predict (mathematically or graphically) the aliased, apparent frequency of a sine wave sampled below the Nyquist rate.
   c. Understand quantization (relationships between number of bits, voltage resolution, quantization error, etc.).
4. Understand BPSK and Spread-Spectrum (SS).
   a. Be able to draw block diagrams of BPSK and SS modulators and demodulators. Know the purpose of each block and how all the signals look in the time- and frequency-domains.
   b. Be able to build BPSK and SS modulators and demodulators using the TIMS modules in labs. Know how to set bandwidths and other settings on all system components.