

# EE 567

## Homework 12

Due Tuesday, November 26, 2019

**Work all 2 problems.**

**Problem 1 (from Sklar, Digital Communications, 2nd ed.).** Assume that a repeat-back jammer is located  $d = 30$  km away from the communicator. Assume further that the jammer can monitor any uplink transmission from the communicator to a nearby satellite. How fast must the communicator hop his frequency to evade the repeat-back jammer? Assume that the jammer can change its jamming frequency in zero time and that the only differential delay between the communicator's uplink signal and the jamming uplink signal is the propagation delay from the communicator to the jammer.

**Problem 2. Short answers (no derivations needed).**

- a. List one advantage of digital communications over analog communications.
- b. What advantage do we gain in transmitting communication signals at high frequencies instead of low frequencies?
- c. What are the two primary kinds of error that lead to pointing losses by an antenna?
- d. In cascading filters in a receiver do you want to place most of the gain in the first filter or the last filter in the cascaded chain (or does it matter)? Why?
- e. Write down the formula for probability of bit error for BPSK modulation in AWGN.
- f. When using a frequency hopping spread spectrum system why would you not want to dwell very long at a particular frequency before hopping to another frequency?