Problem Set 2 (due Tuesday, October 2)

(Problem numbers indicated below refer to the problems in the second edition of the course text. The problem numbers in parentheses refer to the problems in the first edition of the course text.)

1. (10 points) Frequency-hopping spread spectrum
   Problem 7.4 (Chapter 7, Problem 4).

2. (6 points) Spreading codes in CDMA
   Problem 7.7 (Chapter 7, Problem 7).

3. (4 points) Generation of m-sequences
   Problem 7.12 (Chapter 7, Problem 12).

4. (4 points) Parity codes
   Consider a simple (3,1) linear block code where each codeword consists of three data bits and one parity bit.
   (a) Find all codewords in this code.
   (b) Find the minimum distance of the code.

5. (4 points) Walsh codes
   Demonstrate that codes in a $8 \times 8$ Walsh matrix are orthogonal to each other. What are the advantages and limitations of using Walsh codes in spread spectrum applications?

6. (10 points) Convolutional encoding
   Consider the convolutional encoder with $n = 3$, $k = 1$, and $K = 3$, defined by $v_{n1} = u_n$, $v_{n2} = u_n \oplus u_{n-1} \oplus u_{n-2}$, and $v_{n3} = u_n \oplus u_{n-2}$.
   (a) Draw a shift-register diagram for the encoder.
   (a) Draw a trellis diagram for the encoder.

7. (4 points) Block error correction codes
   Problem 8.11 (Chapter 8, Problem 11).

8. (8 points) Interleaving
   Problem 8.19 (Chapter 8, Problem 19).