CODING THEORY, MATH 567
PROBLEM SET 2
DUE: MONDAY FEBRUARY 12

(1) **§2.1, Exercise 2:** Construct a binary ($r = 2$) instantaneous code with codeword lengths 1,2,2,3,3, or show that such a code does not exist.

(2) **§2.1, Exercise 5:** Construct a ternary ($r = 3$) instantaneous code with codeword lengths 1,1,2,2,3,3,3, or show that such a code does not exist.

(3) **§2.1, Exercise 8:** Is the code $C = \{0, 10, 1100, 1101, 1110, 1111\}$ instantaneous? Is it uniquely decipherable?

(4) **§2.1, Exercise 9:** Is the code $C = \{0, 10, 110, 1110, 1011, 1101\}$ instantaneous? Is it uniquely decipherable?

(5) **§2.1, Exercise 10:** Suppose that we want an instantaneous binary code that contains the codewords 0, 10 and 110. How many additional codewords of length 5 could be added to this code?

(6) **§2.1, Exercise 16:** Let C be instantaneous. Prove that the following are equivalent:
   (a) C is *maximal instantaneous* in the sense that no codeword can be added to C and still maintain the property of being instantaneous.
   (b) Every finite string of code symbols is the prefix of some string of codewords in C.
   (c) Equality holds in Kraft's inequality.

   Hint: you may also add a part (d): If L is greater or equal than any codeword length, then every string of length L has a prefix that is a codeword.

Date: Winter 2007.