Fall 2003 **CMSC 311: Homework 8** Kruskal and Scolnik

Practice problems for Midterm. These will NOT be graded.

Problem 1. Write a MIPS program that reads a word from location 1000_{10}, reverses the bits in the word, and then writes the word back (to location 1000_{10}).

Assume, for example, the original the word is

00000000000000000000000011011001.

It should finish as

10011011000000000000000000000000.

Problem 2. Write a MIPS program that reads an integer from location 1021_{10} and determines if it is prime. If so the program writes a 1 back to the location; otherwise it writes a 0.

Problem 3. Assume we would like to produce a computer circuit for the following:

The circuit stores a three digit binary number that is guaranteed to have an even number of 0's (001, 010, 100, 111). While value v is stored, the circuit "outputs" a two-bit number $z = z_1 z_0$ that represents the index of the middle 1. So, 001 outputs 00, 010 outputs 01, 100 outputs 10, and 111 outputs 01.

At each clock pulse v can potentially change. There is an input x, which is a three-bit number that says whether the associated bit of v should be inverted (where a 1 means invert the bit). So, for example, $x = 110$ would mean invert the leftmost two bits v; thus $x = 110$ would change $v = 010$ into $v = 100$.

(a) Draw the Mealy machine associated with this circuit.

(b) Give the excitation table using D flip-flops.

(c) Draw the circuit using D flip-flops.

(d) Give the excitation table using T flip-flops.

(e) Draw the circuit using T flip-flops.