

## EE 231

## Homework 13

Due November 25, 2009

1. Explain in words and write the HDL statements for the operations specified by the following register transfer notations;

(a)  $R1 \leftarrow R1 - 1, R2 \leftarrow R1$

(b)  $R3 \leftarrow shr R3$

(c) If  $(S = 0)$  then  $(R0 \leftarrow shr R0)$  else  $(R0 \leftarrow shl R0)$

2. Construct a block diagram and an ASMD chart, and write a Verilog program, which counts the amount of money deposited in a coin sorter. The coin sorter will accept pennies, nickel, dimes and quarters. Only one coin will go through the sorter at a time, and that coin will be detected for exactly one clock cycle. There should be enough bits to hold ten dollars worth of coins.

The datapath should consist of a register to hold the total amount, a combinational circuit which can add 1, 5, 10 or 25 to the register, and a display showing how much money is in the register.

The controller should have a reset input to reset the count to zero.

3. The figure below shows a state diagram for a sequential circuit. Find the corresponding ASM chart. The inputs to the circuit are  $x_1x_0$ , and the outputs are  $z_1z_0$ .

