Embedded Real-Time Systems (AME 3623)
Homework 1

February 13, 2010

This homework assignment is due on Tuesday, February 9th at 5:00pm. Your work may be handed in electronically (use the Homework 1 digital dropbox on D2L) or in hardcopy form (in person or in office).

This assignment must be done individually: do not share/discuss your answers with others or look at the answers of others.

Question 1

1. (5pts) Given the binary number: 110100101. What is the decimal equivalent? Show your work.

2. (5pts) Given the binary number: 011011111. What is the decimal equivalent? Show your work.
3. (5pts) Given the decimal number: 45. What is the binary equivalent? Show your work (all of the steps of the algorithm that we discussed in class).

4. (5pts) Given the decimal number: 567. What is the binary equivalent? Show your work.
Question 2

Consider the following circuit with input $CLK$:

1. (10pts) Assume that the initial state is: $Q_0 = 0$, $Q_1 = 0$, $Q_2 = 1$. Show the timing diagram for $Q_0$, $Q_1$ and $Q_2$ as the clock ($CLK$) is pulsed (show 6 transitions).

2. (10pts) Interpreting $Q_2$, $Q_1$, $Q_0$ as a 3-bit binary number (with $Q_0$ as the 1’s digit), what is the sequence of values that this circuit produces?
Question 3

Consider the following circuit with inputs $CLK$ and $X$:

1. (10pts) Assume that the initial state is: $Q_0 = 1$ and $Q_1 = 0$. Assume also that $X = 1$. Show the timing diagram for $Q_0$ and $Q_1$ as the clock ($CLK$) is pulsed (for 6 transitions).

2. (10pts) Interpreting $Q_1, Q_0$ as a 2-bit binary number (with $Q_0$ as the 1’s digit), what is the sequence of values that this circuit produces?
3. (10pts) What is the mathematical function of this circuit when $X = 1$?

4. (10pts) Assume the same initial state as above, and assume that $X = 0$. Show the timing diagram for $Q_0$ and $Q_1$ as the clock ($CLK$) is pulsed (for 6 transitions).

5. (10pts) What is the sequence of values that this circuit produces?
6. (10pts) What is the function of this circuit when $X = 0$?

**Question 4**

How much time did you spend on this homework assignment?