Embedded Real-Time Systems (AME 3623)
Homework 2

February 11, 2009

This homework assignment is due on Tuesday, February 24th at 5:00pm. Your work may be handed in electronically (use the Homework 2 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: 010111010. What is the decimal equivalent? What is the hexadecimal equivalent? Show your work.

2. (5pts) Given the binary number: 110110111. What is the decimal equivalent? What is the hexadecimal equivalent? Show your work.
3. (5pts) Given the decimal number: 486. 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: 524. What is the binary equivalent? Show your work.
Consider the following circuit with input $CLK$:

1. (10pts) Assume that the initial state is: $Q_0 = 0$, $Q_1 = 0$, $Q_2 = 0$ 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?
3. (10pts) Assume that the initial state is: $Q_0 = 1, Q_1 = 0, Q_2 = 1$. Show the timing diagram for $Q_0, Q_1$ and $Q_2$ as the clock ($CLK$) is pulsed (show 6 transitions).

4. (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?

5. (10pts) What is the mathematical function of this circuit?
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 \( X = 0 \). Show the timing diagram for \( Q_0 \) and \( Q_1 \) as the clock \( (CLK) \) is pulsed.

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 \( X = 0 \)?

4. (10pts) Assume the same initial state as above, and assume that \( X = 1 \). Show the timing diagram for \( Q_0 \) and \( Q_1 \) as the clock (\( CLK \)) is pulsed.

5. (10pts) What is the sequence of values that this circuit produces?
6. (10pts) What is the function of this circuit when $X = 1$?

**Question 4**

How much time did you spend on this homework assignment?