Embedded Real-Time Systems (AME 3623)
Homework 1

February 9, 2011

This homework assignment is due on Thursday, February 17th 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: 10110101. What is the decimal equivalent? Assume that this is an unsigned number. Show your work.

2. (5pts) What is the hexadecimal equivalent of the above binary number?

3. (5pts) Assume that we interpret the above number is a signed 8-bit number (two's complement). Is it positive or negative? What is the decimal equivalent? Show your work.

4. (5pts) Given the binary number: 1001011011111. What is the decimal equivalent? Assume an unsigned integer of 16 bits. Show your work.

5. (5pts) What is the hexadecimal equivalent of the above binary number?

6. (5pts) Assume that we interpret the above number is a signed 16-bit number. Is it positive or negative? What is the decimal equivalent? Show your work.

7. (5pts) Given the decimal number: 98. What is the binary equivalent? Show your work (all of the steps of the algorithm that we discussed in class).

8. (5pts) Given the decimal number: 867. What is the binary equivalent? Show your work.

Question 2

1. (10pts) Given the following code, what are the final values of variables b and c. Give your answers in hexadecimal.

```
uint8_t a = 0xA5;
uint8_t b = a | 0x10;
uint8_t c = a || 0x10;
```

2. (10pts) Given the following code, what are the final values of variables b and c. Give your answers in hexadecimal.

```
uint8_t a = 0xA5;
uint8_t b = a | 0x33;
uint8_t c = a + 0x33;
```

3. (10pts) Given the following code, what are the final values of variables b and c. Give your answers in hexadecimal.

```
uint8_t a = 0x3C;
uint8_t b = a & 0x11;
uint8_t c = a && 0x11;
```

4. (10pts) Given the following code, what are the final values of variables b and c. Give your answers in hexadecimal.

```
uint8_t a = 0xF0;
uint8_t b = a & 0x42;
uint8_t c = a - 0x42;
```

5. (10pts) Given the following code, what are the final values of variables b and c. Give your answers in hexadecimal.

```
uint8_t a = 0x5A;
uint8_t b = a ^ 0xF0;
uint8_t c = a ^ 0x0F;
```

Question 3

1. (10pts) Briefly explain the distinction between the *value* and the *address* of a memory element.

2. (10pts) Briefly describe the conditions under which you would store program variables in EEPROM.

3. (10pts) What device inside the microprocessor is responsible for handling the multiplication of two integers?

Question 4

How much time did you spend on this homework assignment?