16.317: Microprocessor Systems Design I

Spring 2014

Homework 1

Due **Wednesday, 2/5/14**

Notes:

- While typed solutions are preferred, handwritten solutions are acceptable (except for Question 3b).
- Any handwritten solutions that are scanned and submitted electronically must be clearly legible and combined into a single file—simply sending a picture of each scanned page is not an acceptable form of submission.
- This assignment is worth 50 points, rather than 100 points, due to its relative simplicity.

1. (20 points) Given each of the binary or hexadecimal number below, determine what the decimal value is if the number is (i) an unsigned integer, and (ii) a signed integer. Note that, in some cases, your answers for both will be the same.

a. 01110111_2
b. 10101100_2
c. CDh (or 0xCD—recall that, in x86 assembly notation, the "h" at the end of a number signifies that the previous value is in hexadecimal)
d. 3A2FH
e. FEEDH

2. (15 points) Assume the contents of memory are shown below. All values are in hexadecimal. The table shows four bytes per line; the given address is the starting address of each line.

   Each block in the table contains a single byte, with the low and high bytes per line indicated as shown. Each byte has its own address, so the byte at address 22000h is 20h, address 22001h is 13h, address 22002h is 80h, and address 22003h is 40h.

   You should assume all multi-byte values are stored in little-endian format.

Address	Lo			Hi
22000h	20	13	80	40
22004h	FF	AF	BC	13
22008h	99	88	77	66
2200Ch	A8	B1	F0	43
22010h	78	D6	32	33
22014h	34	35	12	16
22018h	93	03	7C	EF

a. (5 points) What is the hexadecimal value of the byte at address 2200Ah? Convert this value to decimal.
b. (5 points) What is the hexadecimal value of the 16-bit value starting at address 22013h? Would a 16-bit access to this location be aligned?
c. (5 points) What is the hexadecimal value of the 32-bit value starting at address 22006h? Would a 32-bit access to this location be aligned?

3. (15 points) This simple exercise tests your ability to create a project in Visual Studio, add a program that has been provided for you, and execute that program. See the brief Visual Studio tutorial posted on the schedule page for directions on creating a Visual Studio project.

Download the program `hw1_p3.c` posted on the course schedule page. Create a new Visual Studio project, and add this file to your project, either by adding it as an existing item, or by creating a new C file inside your project and copying the contents of `hw1_p3.c` into your new file.

Answer the following questions about this program:

a. (6 points) Describe the general operation of this program and its purpose. What type of input values does it read in? What type of output values does it generate?
b. (9 points) Run this program to generate screenshots or printouts of the program output with each of the following input values: 15, 317, and 999. Submit those screenshots as part of your homework solution.