CS 3843 Computer Organization Fall 2013

Solution to Quiz 1 Name (Last, First)_____, _____

1. (12 points) For the following questions, show all 12 bits and 3 hexadecimal digits.
   a. (2 points) Find the binary and hexadecimal representation of 75 as a 12-bit unsigned integer.

      Sol: 75=4×16+11=0x04B = 0000,0100,1011

   b. (2 points) Find the binary and hexadecimal representation of -75 as a 12-bit two's complement integer.

      Sol: -75=~[0000,0100,1011]+1=1111,1011,0101 = 0x FB5

   c. (1.5 points) Find the binary and hexadecimal representation of -75 as a 12-bit ones' complement integer.

      Sol: -75=~[0000,0100,1011]=1111,1011,0100 = 0x FB4

   d. (1.5 points) Find the binary and hexadecimal representation of -75 as a 12-bit sign magnitude integer.

      Sol: -75=1000,0100,1011 = 0x84B

   e. (2 points) What is the maximum value that can be represented with 12-bit two's complement?

      Sol: 2^{11}-1=2047

   f. (2 points) What is the maximum value that can be represented with 12-bit unsigned number?

      Sol: 2^{12}-1=4095

2. (4 points) Show how to use shift, adding and subtracting to efficiently multiply by 29.

   Sol:

   Method 1: $x\times29= x\times(32-4+1)=x\times(2^5-2^2+1)=(x<<5) – (x<<2) + x$

   It needs 2 shift and 2 addition/subtraction operations. It is more efficient than Method 2.

   Method 2: $x\times29 = x\times(16+8+4+1) = x\times(2^4+2^3+2^2+1)=(x<<4)+(x<<3)+(x<<2)+ x$

   It needs 3 shift and 3 addition operations

3. (4 points) what is $36 +{}_{6}^{u}48$?

   Sol: $36 +{}_{6}^{u}48 = (36 + 48) mod\ 2^6 = 20$