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CSE 2421
Spring, 2020
Homework 1 – 117 points; grade reported in Carmen as a percentage (i.e. (points earned)/117)

Due Date: Tuesday, January 21, 2020 by 11:30PM. Only submissions via Carmen will be accepted without prior approval. To receive credit, **solutions must be clearly written or typed and appear in the same order as the questions below. If you choose not to break up your binary values into 4-bit nibbles, making it harder to read your work, the graders are authorized to lower your grade by 20%.** (e.g. if you would have received 80% on your homework, you will receive a grade of (80%*.8) or 64%)

Early submissions are allowable although no bonus awarded for early homework. Late submissions accepted for up to 24 hours after due date with 25% penalty (%correct *.75).

All of these exercises are to be completed without the use of any electronic devices. If you choose to ignore this requirement, know that you will likely have exercises very similar to those below on the mid-term where no electronic devices will be permitted. So you can learn how to manually solve these types of problems while doing this homework assignment or while you are taking your mid-term. :-) Choosing to ***validate*** your manually calculated answers via electronic means is highly encouraged.

[21 points] Convert the following then interpret the binary value as both a signed and unsigned value in decimal. Spaces in binary representations are there for readability only; you must use this technique in your answers.

1. 0x39F7B6 to binary
    a. binary value: **0b 0011 1001 1111 0111 1011 0110**
    b. signed interpretation of the binary value: **3798966**
    c. unsigned interpretation of the binary value: **3798966**

2. 0b 1101 0111 1001 1001 to hexadecimal
    a. hexadecimal value: **0xD799**
    b. signed interpretation of the binary value: **-10343**
    c. unsigned interpretation of the binary value: **55193**

3. 0xD5C7C3 to binary
    a. binary value: **0b 1101 0101 1100 0111 1100 0011**
    b. signed interpretation of the binary value: **-2766909**
    c. unsigned interpretation of the binary value: **14010307**

4. 0b 1110 0110 1110 1011 0101 0011 to hexadecimal
    a. hexadecimal value: **0xE6EB53**
    b. signed interpretation of the binary value: **-1643693**
    c. unsigned interpretation of the binary value: **15133523**

5. 0xCD6 to binary
    a. binary value: **0b 1100 1101 0110**
    b. signed interpretation of the binary value: **-810**
    c. unsigned interpretation of the binary value: **3286**

6. 0xF2754882 to binary
    a. binary value: **0b 1111 0010 0111 0101 0100 1000 1000 0010**
    b. signed interpretation of the binary value: **-227194750**
    c. unsigned interpretation of the binary value: **4067772546**

7. 0b 0100 0010 1010 0001 1110 0001 0100 1111 to hexadecimal
    a. hexadecimal value: **0x42A1E14F**
    b. signed interpretation of the binary value: **1117905231**
    c. unsigned interpretation of the binary value: **1117905231**

8. [20 points] Complete the following table. Binary values must be split into 4 bit nibbles for easier reading/grading. **Use enough binary digits so that there is no doubt about what value is being represented.** (i.e. positive vs negative value) **Binary values MUST be represented with a minimum of 8 bits and all binary values must be represented with a number of bits divisible by 4.** (i.e. minimum of 8 bits, but could be 12, 16, 20, etc.) I suggest that when the decimal value is given, that you first convert to binary, then to hex. When given the hexadecimal value, convert to a binary representation first, then, based on what the binary representation tells you with respect to MSB, you can determine the correct signed decimal value.

Decimal	Hexadecimal	Binary
12	0xC	0b 0000 1100
-15	0xF1	0b 1111 0001
110	0x6E	0b 0110 1110
102	0x66	0b 0110 0110
2914	0xB62	0b 0000 1011 0110 0010
-422	0xFE5A	0b 1111 1110 0101 1010
1655	0x677	0b 0110 0111 0111
52757	0xCE15	0b 0000 1100 1110 0001 0101
-2122	0xF7B6	0b 1111 0111 1011 0110
188	0xbc	0b 0000 1011 1100

9. [28 points] Complete the table below showing the effects of the different shift operations. Use 8 bits for the binary representations. Note that each operation is based off of x in leftmost column.

					Logical		Arithmetic
	x		x<<1		x>>1		x>>1
Hex	Binary	Hex	Binary	Hex	Binary	Hex	Binary
0xE3	0b 1110 0011	0xC6	1100 0110	0x71	0b 0111 0001	0xF1	0b 1111 0001
0x6A	0b 0110 1010	0xD4	1101 0100	0x35	0b 0011 0101	0x35	0b 0011 0101
0x94	0b 1001 0100	0x28	0010 1000	0x4A	0b 0100 1010	0xCA	0b 1100 1010
0xA5	0b 1010 0101	0x4A	0100 1010	0x52	0b 0101 0010	0xD2	0b 1101 0010

10. [28 points] Complete the table below showing the effect of the different shift operations. Use 16 bits for the binary representations. Note that each operation is based off of x in the leftmost column.

					Logical		Arithmetic
	x		x<<2		x>>2		x>>2
Hex	Binary	Hex	Binary	Hex	Binary	Hex	Binary
0xB414	0b 1011 0100 0001 0100	0xD050	0b 1101 0000 0101 0000	0x2D05	0b 0010 1101 0000 0101	0xED05	0b 1110 1101 0000 0101
0x8556	0b 1000 0101 0101 0110	0x1558	0b 0001 0101 0101 1000	0x2155	0b 0010 0001 0101 0101	0xE155	0b 1110 0001 0101 0101
0x124C	0b 0001 0010 0100 1100	0x4930	0b 0100 1001 0011 0000	0x0493	0b 0000 0100 1001 0011	0x0493	0b 0000 0100 1001 0011
0x4794	0b 0100 0111 1001 0100	0x1E50	0b 0001 1110 0101 0000	0x11E5	0b 0001 0001 1110 0101	0x11E5	0b 0001 0001 1110 0101

11. [20 points]Complete the table below showing the effects of the different bitwise operations. **All solutions should be shown in hexadecimal format.** You may have to convert each value to its binary representation to perform the operations and then convert back to represent it in hexadecimal.

x	y	x & y	x | y	x ^ y	x ^ 0x44	y ^ 0x77
0xE3	0xAA	0xA2	0xEB	0x49	0xA7	0xDD
0x7F	0x63	0x63	0x7F	0x1C	0x3B	0x14
0x87	0xA7	0x87	0xA7	0x20	0xC3	0xD0
0x3A	0x42	0x02	0x7A	0x78	0x7E	0x35