IC220: HW 5a

Due: 8 Mar 2019

Full Name: _____ **Alpha:** _____

Circle Your Section: Aviv/1001 Aviv/2001 Aviv/4001 Choi/5001 Missler/5002

Total Points: 80

Preliminary: Carefully do the assigned reading for Chapter 2 (2.1-2.3,2.5-2.10,2.12)

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1. Convert the given decimal numbers to their binary representation
   (a) **[5 points]**

	5 (4-bits)	-7 (4-bits)
Unsigned		
Sign Magnitude		
One's Compliment		
Two's Compliment		

   (b) **[5 points]**

	-3 (4-bits)	-3 (6-bits)
Sign Magnitude		
One's Compliment		
Two's Compliment		

2. Assume the following is in binary two's complement form:
   (a) **[1 point]** 001011

   (b) **[2 points]** 111011

3. Apply the negation operator to the binary values, and show the resulting binary value, in two's complement.
   (a) **[1 point]** -(001011)

   (b) **[1 point]** -(111011)

4. Suppose we use 8-bits to represent a two's complement binary number.
   (a) **[5 points]** What is the largest number that can be presented? (Give answer in binary **and** decimal)

   (b) **[5 points]** What is the smalles number that can be presented? (Give answer in binary **and** decimal)

5. [**10 points**] Complete the following 6-bit, two's complement additions. Indicate if there is an overflow or not.

(a)

```
    010101
+   001101
------------
```

(b)

```
    111111
+   111101
------------
```

(c)

```
    010011
+   001110
------------
```

(d)

```
    010011
+   111110
------------
```

6. [**10 points**] Complete the following 6-bit, two's complement **subtraction**. Indicate if there is an overflow or not.

(a)

```
    011101
-   100101
------------
```

(b)

```
    111111
-   111101
------------
```

(c)

```
    010011
-   001110
------------
```

(d)

```
    010011
+   111110
------------
```

7. **[5 points]** Convert the (decimal) 269 into a 32-bit two's complement binary number. *(Note, you can use a calculator for this, but you'd be expected to do this by hand, without a calculator, on a exam.)*

8. **[5 points]** Convert the (decimal) -45 into a 32-bit two's complement binary number. *(Note, you can use a calculator for this, but you'd be expected to do this by hand, without a calculator, on a exam.)*

9. Convert the following 32-bit binary, two's complement number into decimal. *(Note, you can use a calculator for this, but you'd be expected to do this by hand, without a calculator, on a exam.)*

   (a) **[5 points]**

   ```
   1111 1111 1111 1111 1111 1111 1000 0110
   ```

   (b) **[5 points]**

   ```
   0000 0000 0000 0000 0000 0101 0110
   ```

10. **[5 points]** Multiply the following binary numbers together. (Assume unsigned).

(a)

```
     010011
x       110
------------
```

(b)

```
      10101
x       101
------------
```

11. [**5 points**] Convert the following C code to MIPS. Note: use **integers** not floats here! Also, use **mult** instruction that we learned in class that takes just 2 arguments.

```
int cube(int x){
  return x*x*x;
}
```

12. [**5 points**] Convert the following C code to MIPS. Note: use **integers** not floats here! Also, use **mult** instruction that we learned in class that takes just 2 arguments.

```
int log(int x, int b){
   int r = 0;
   while (x < b){
      x = x*x;
      r+=1;
   }
   return r;
}
```