SYSC3006 Lab 2 Report [redacted]

Prelab Questions

1) A single binary value can represent a signed and an unsigned integer value because of how you interpret them. Binary 1000 can represent decimal 8 or -8 depending on whether you use conventional binary or 2's complement. Computers will treat binary numbers as unsigned, but humans can choose to interpret the digits as signed and design a system around that. Zero stands a middle ground as in either conventional binary or 2's complement it doesn't matter if it's signed or unsigned.
2) -Adder: Takes 2 binary words and adds them together, includes a carry in and carry out.

   -Subtractor: Subtracts one binary word from another, has a borrow in to decrease the output by 1 and a borrow out that indicates a negative output.

   -Multiplier: Multiplies 2 binary words, adds a carry in to the output, has a carry out that sends the upper level binary digits of the output.

   - Divider: Divides one binary word by another by inputting the upper and lower parts of the dividend and 1 divisor, outputs the result and the remainder.

   -Negator: Outputs the 2's complement negation of the input.

   -Comparator: Compares 2 binary words and has 3 outputs for greater than, equal to, or less than.

   -Shifter: Shifts the input by the designated distance.

   -Bit adder: Counts how many 1s are in the input.

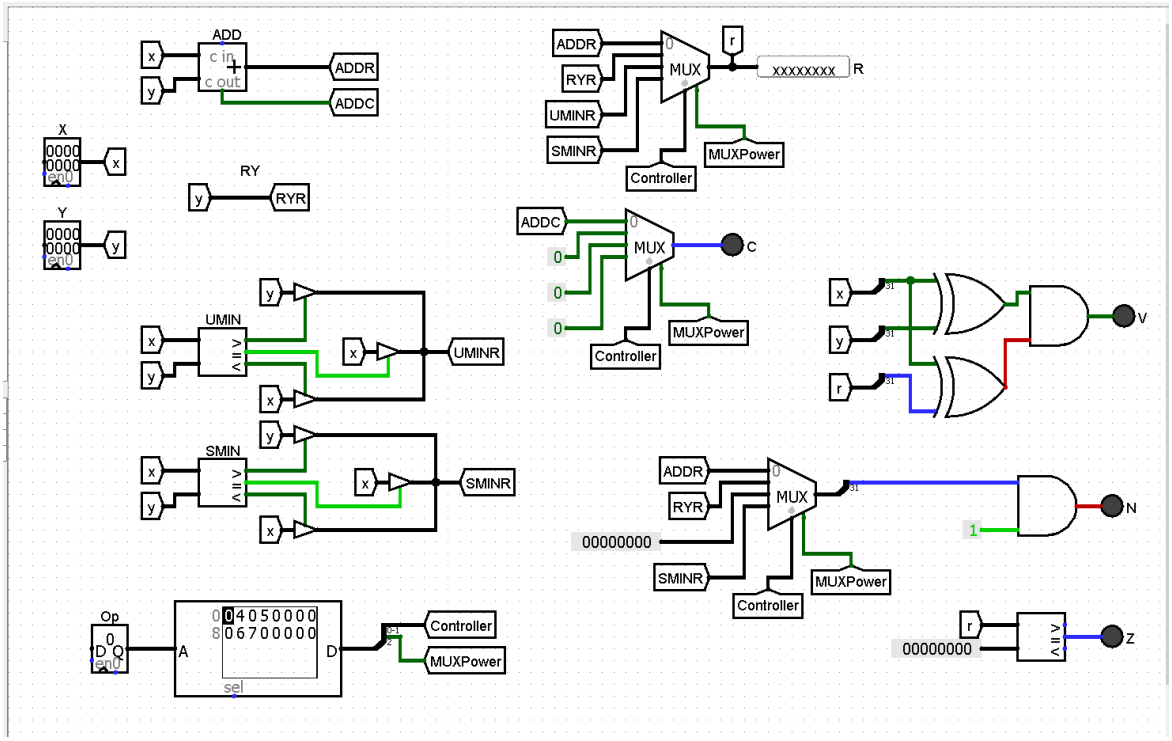
   -Bit finder: Shows if input has a 1 and outputs index of lowest 1.

3) Separate UMIN and SMIN operations are included because negatives in 2's complement look like large unsigned binary words. Ex:

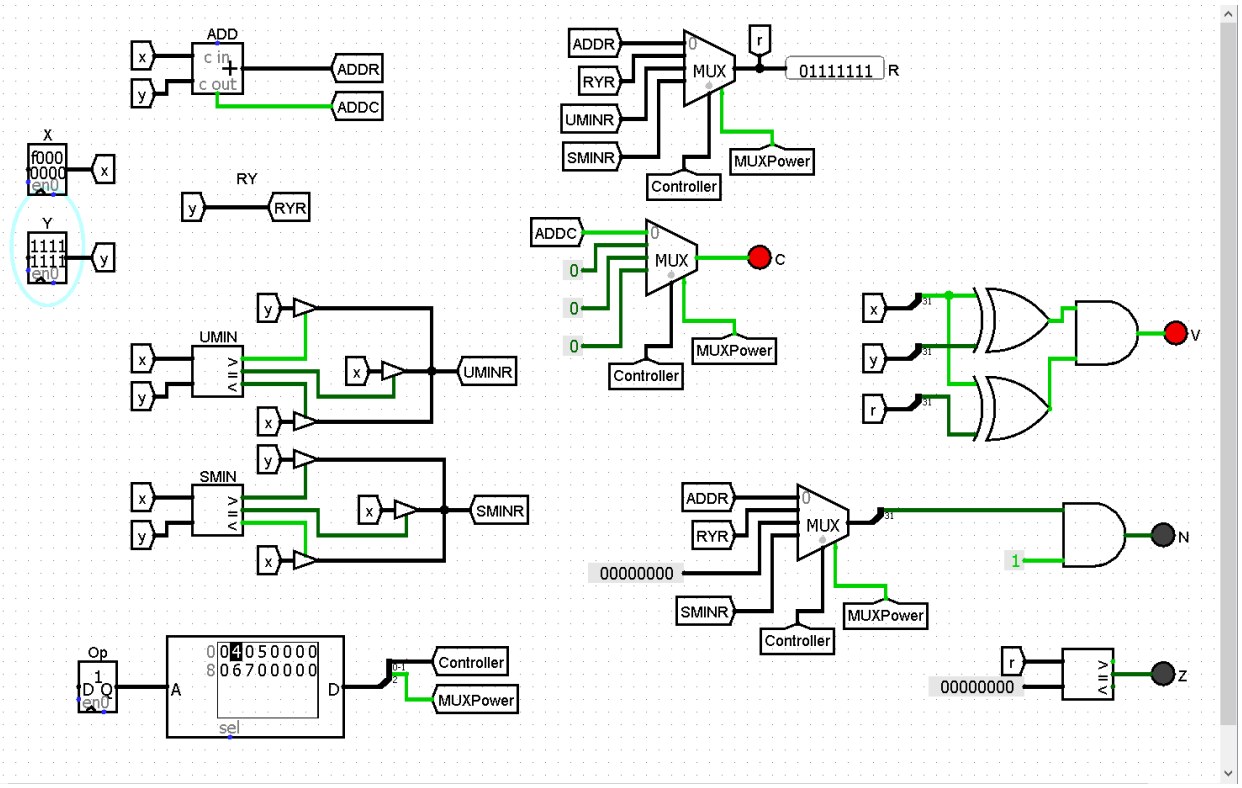
Unsigned:	4	2	1		
X	1	0	0	=	4
Y	0	0	1	=	1
Y<X					
Signed:	-4	2	1		
X	1	0	0	=	-4
Y	0	0	1	=	1
X<Y					

4) Test cases

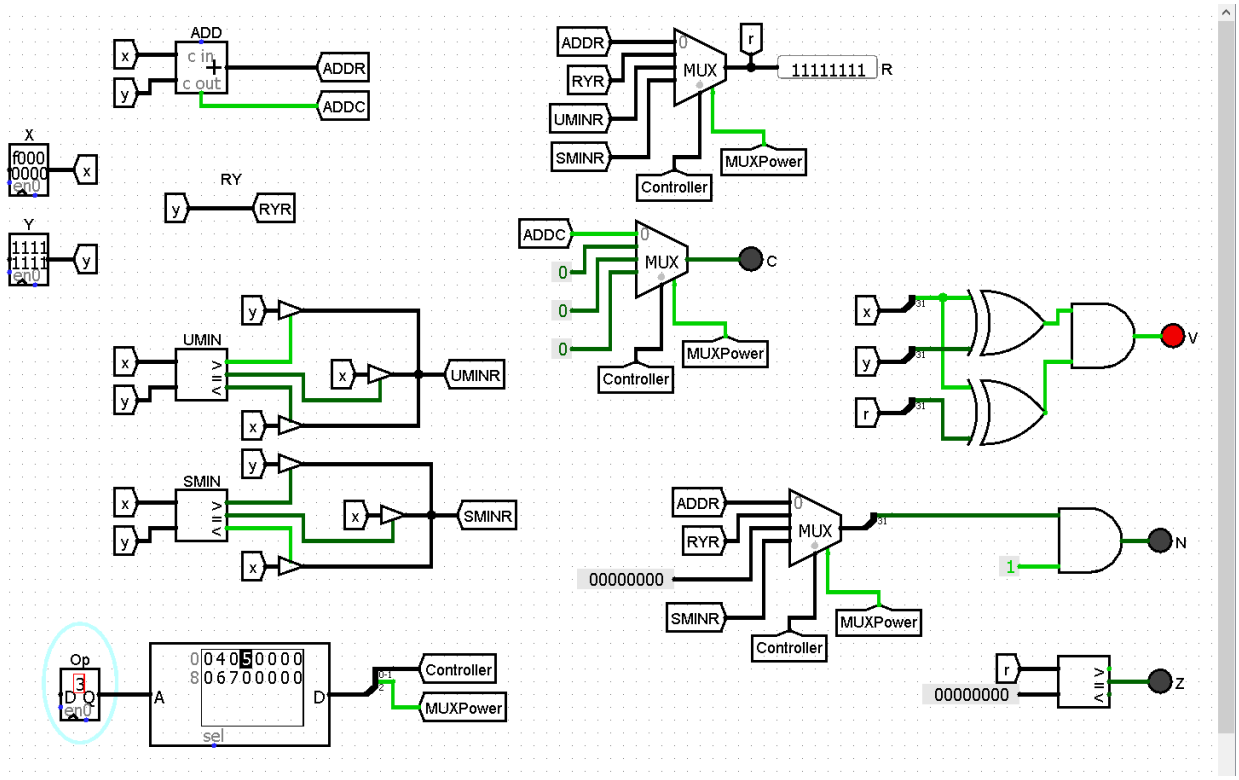
NOP: No inputs should create any outputs or flags.



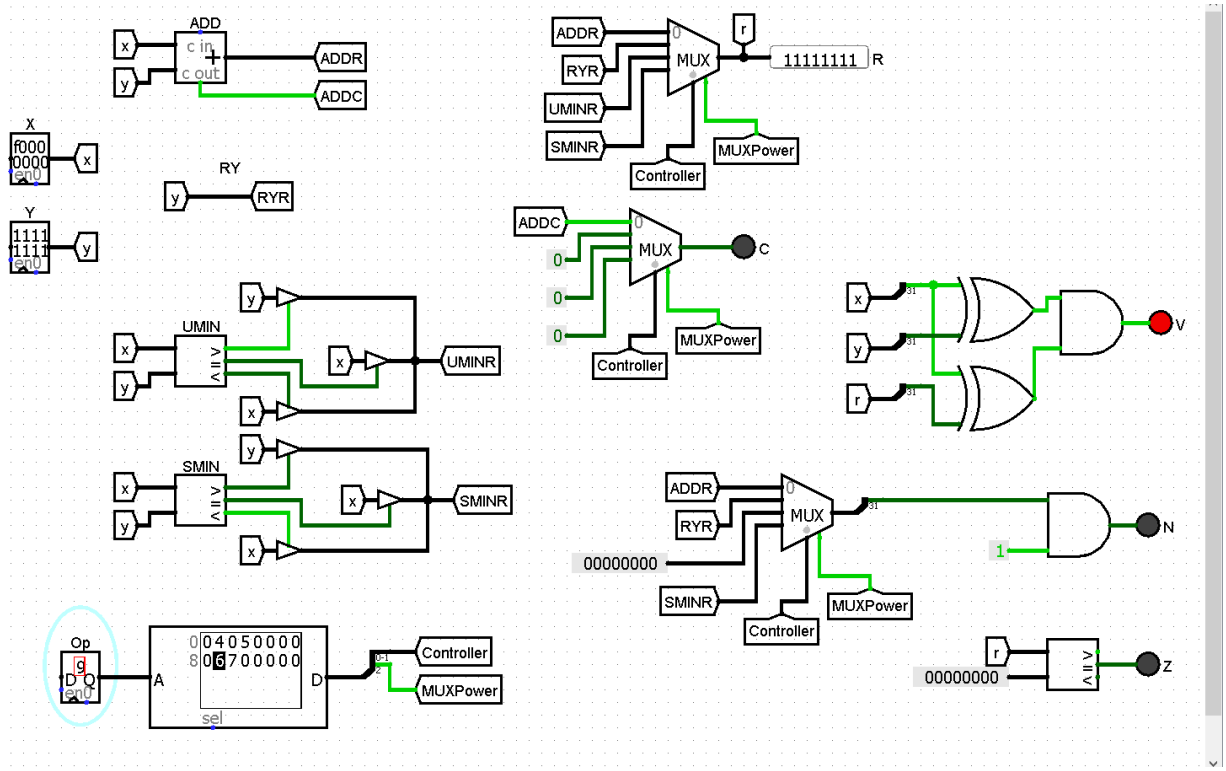
ADD: Test for any numbers that would cause a carry out (X = f000 0000, Y = 1111 1111)



RY: test that output matches Y (anything works)



UMIN: Test that an input without a leading 1 is smaller than an input with a leading 1 (X = f000 000, Y = 1111 1111, R = 1111 1111)



SMIN: Test that an input with a leading 1 is smaller than an output without a leading 1 (X = f000 000, Y = 1111 1111, R = f000 0000)