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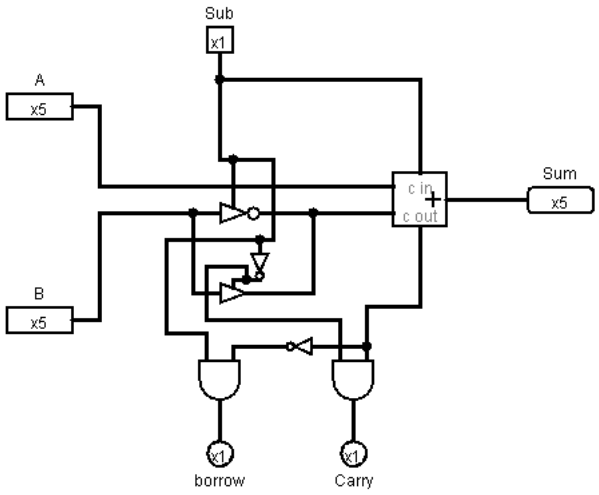
Lab 4 - Digital Logic
November 3, 2013

Lab 4

Part 1 - Adder-Subtracter

- 1)

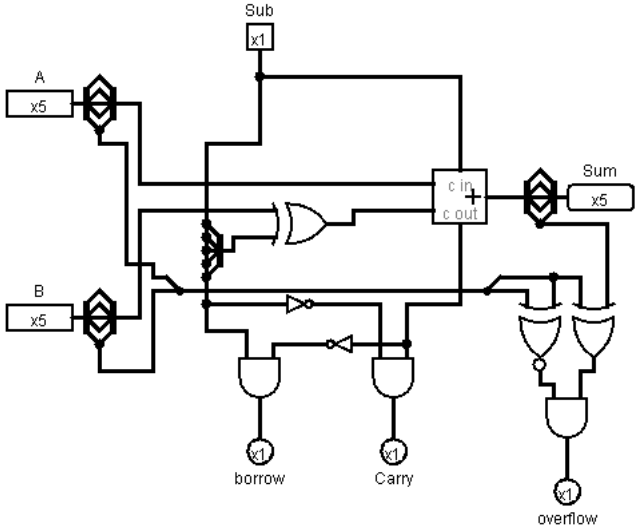


- 2)
  So the Adder-Subtracter subtracts B from A (in other words, perform A - B) and in part it does this by inverting the bits in B and adding it to A. However, to make it line up mathematically, you have to add 1 to A.

- 3)

A	B	Sub	Sum
x	y	0	$x + y$
x	y	1	$x - y$

- 4)



- 5)

signA	signB	signSum	overflow
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

Part 2 - Two-Port Adder

- 5-bit two-port adder circuit:
- 1)
  The Xor gate essentially works like a bitwise inverter when Sub = 1 and like a gate that doesn't change anything when Sub = 0.
- 2)
  The wiring of the splitter near the Xor gate takes whatever the value of Sub is and replicates it over 5-bits. So if Sub = 1, then the splitter outputs 11111.
- 3)
  There are 5 control bits.
- 4)
  Two, Addition and subtraction. I'm not sure what Acc is doing here, its doesn't seem to change anything. I can't get the register to change to the input value at all.

- 5) By changing the Rmux control signal, one can choose one of the four input. The chosen signal will be added to the register value if Sub = 0, or subtracted from the register value if Sub = 1.