ELC 2137 Lab 04: Subtractor

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Summary

In this lab we modified our full adder from the last lab, to make the two bit adder/subtractor in this lab. The only adjustment we had to make to our previous adder was to add two additional XOR gates with new inputs and a mode input (previously Cin).

Q&A

1) Why did we use two full adders instead of a half adder and a full adder?

We used the 2 full adders we built in the last lab instead of a half adder and full adder, because it was a simple modification.

2) How many input combinations would it take to exhaustively test the adder/subtractor?

4069

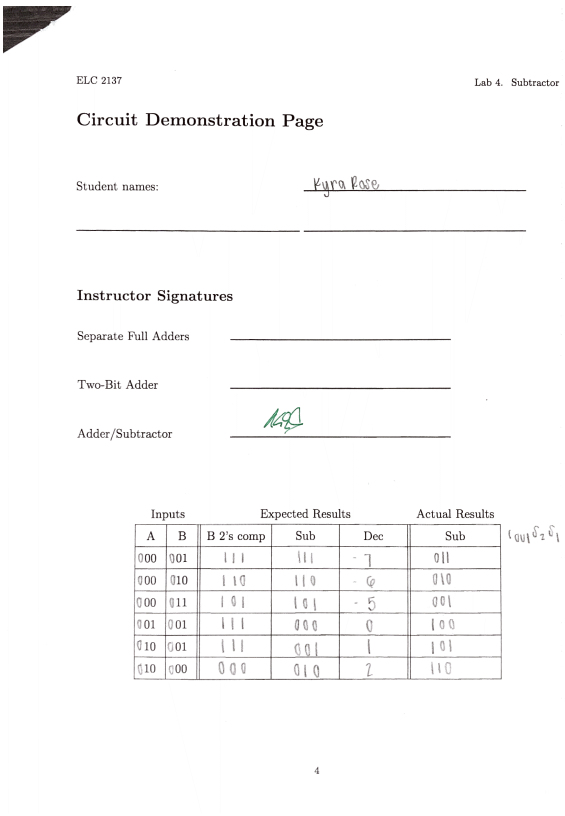
3) Why were the combinations given in the truth table chosen?

These values test all the possible combinations in one test.

4) Do the results from your adder/subtractor match what you would expect from theory? Explain any discrepancies.

Yes, the results match what I would expect from theory. When you look at the truth table you can see that the last two bits of the subtracted answer match the last two bits of the B inputs 2 compliment. The first bit of the answer is the only different bit, which makes sense because the first bit in the 2 compliment is a sign bit.

Results



ELC 2137 Lab 4. Subtractor

Circuit Demonstration Page

Student names: Kyra Rose

Instructor Signatures

Separate Full Adders _____

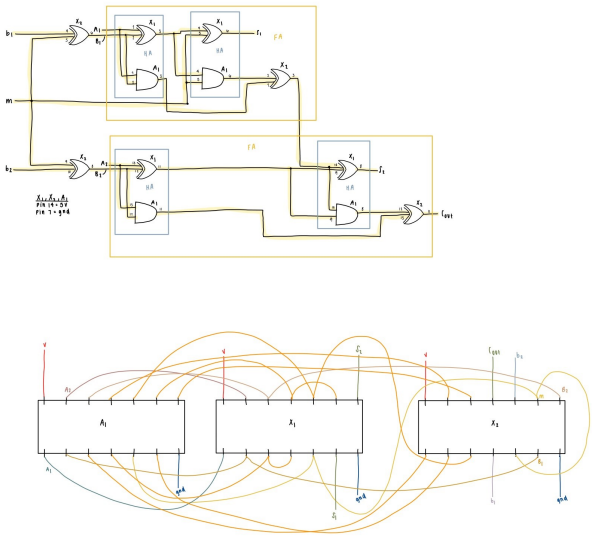
Two-Bit Adder _____

Adder/Subtractor _____

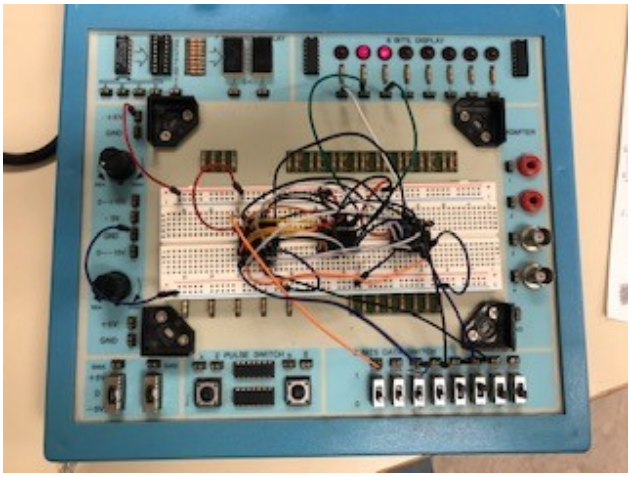
Inputs		Expected Results			Actual Results	
A	B	B 2's comp	Sub	Dec	Sub	$(Q_2 Q_1)_2$
00	01	111	111	-1	011	
00	10	110	110	-2	010	
00	11	101	101	-3	001	
01	01	111	000	0	100	
10	01	111	001	1	101	
10	00	000	010	2	110	

4

Circuit Demonstration Page



Subtractor Wiring Diagram and Schematic



Subtractor

Code

Listing 1: Direct Verilog code example

```
\begin{center}

   \includegraphics[width=0.5\textwidth]{circuit demo page 4}

   \caption{Circuit Demonstration Page}
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```
    \includegraphics[width=0.5\textwidth]{schematic}

    \caption{Subtractor Wiring Diagram and Schematic}

    \includegraphics[width=0.5\textwidth]{subtractor}

    \caption{Subtractor}

\end{center}
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