INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY

HYDERABAD

Lab Report-3

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Course: Digital Systems and Microcontrollers Lab

Contents

1 Experiment - 1

1.1 Objective

To make a Half Adder circuit using AND and XOR gates

1.2 Equipment Required

- Digital Test Kit
- IC 7486 (XOR)
- IC 7408 (AND)
- Connecting Wires

1.3 Schematic

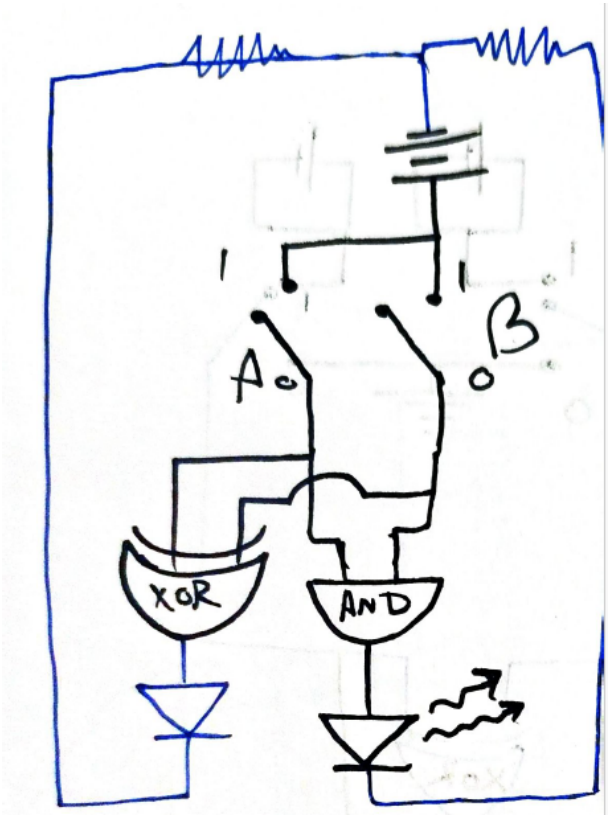

Figure 1: Schematic of Half Adder

1.4 Procedure

1.4.1 Half Adder

1. Place the required ICs on the breadboard
2. Connect Vcc and ground to the ICs

3. Connect the two inputs A and B to the XOR and AND gates
4. The output of the XOR gate is the Sum, and the output of the AND gate is the Carry
5. Connect LEDs to these outputs to see the result

1.5 Half Adder Truth Table

A	B	Sum (S)	Carry (C)
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

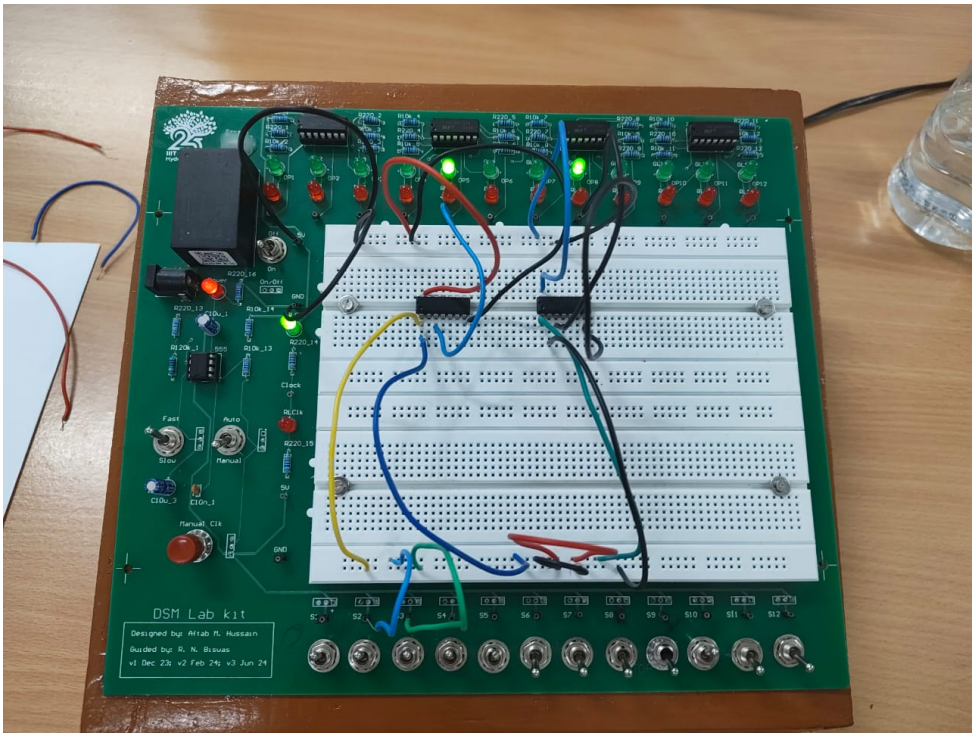

Figure 2: Half Adder

1.6 TinkerCAD

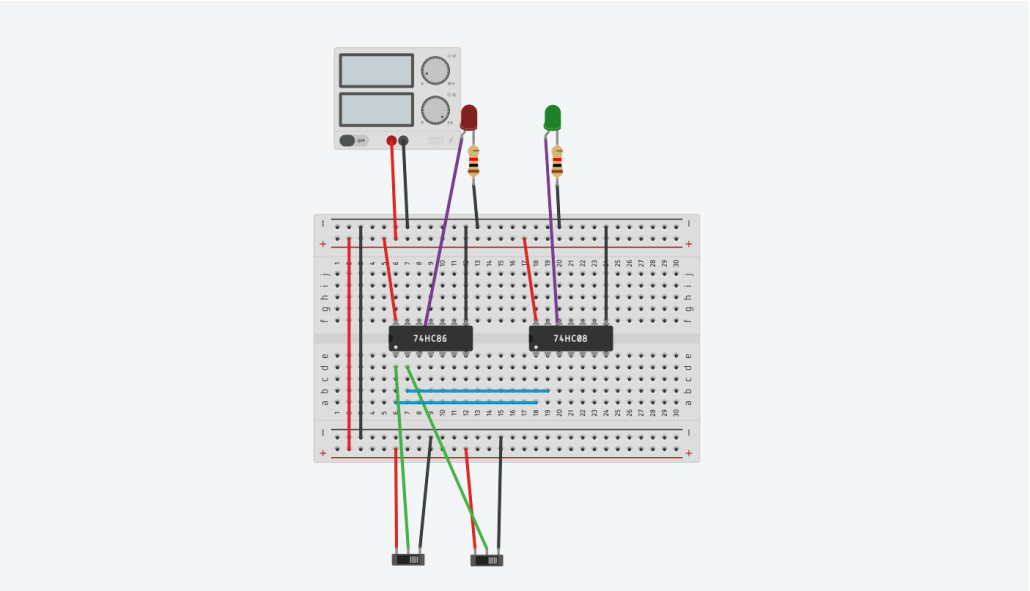

Figure 3: Half Adder

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1.7 Conclusion

We made Full Adder circuit and checked that it worked according to its truth table

2 Experiment-2

2.1 Objective

To make a Full Adder circuit using 2 AND,2 XOR and 1 OR gate

2.2 Equipment Required

- Digital Test Kit
- IC 7486 (XOR)
- IC 7408 (AND)
- IC 7432 (OR)
- Connecting Wires

2.3 Schematic

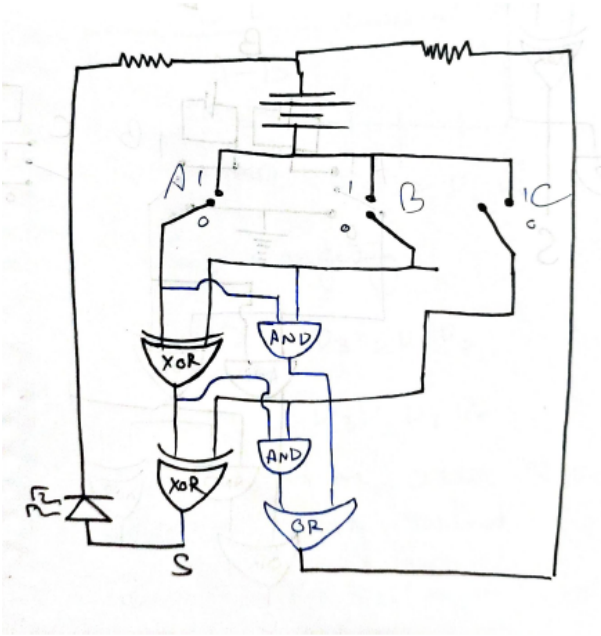

Figure 4: Schematic of Full Adder

2.4 Procedure

1. We will use two Half Adders. The first Half Adder takes A and B as inputs
2. The sum of the first Half Adder is connected to an input of the second Half Adder, with the other input being the Carry-in (C_{in}). The output of this second half adder is the final Sum
3. The Carry of the first Half Adder is connected to an OR gate. The other input to the OR gate is the Carry from the second Half Adder

4. The output of the OR gate is the final Carry-out (C_{out})
5. Connect LEDs to the final Sum and Carry-out. Check the truth table

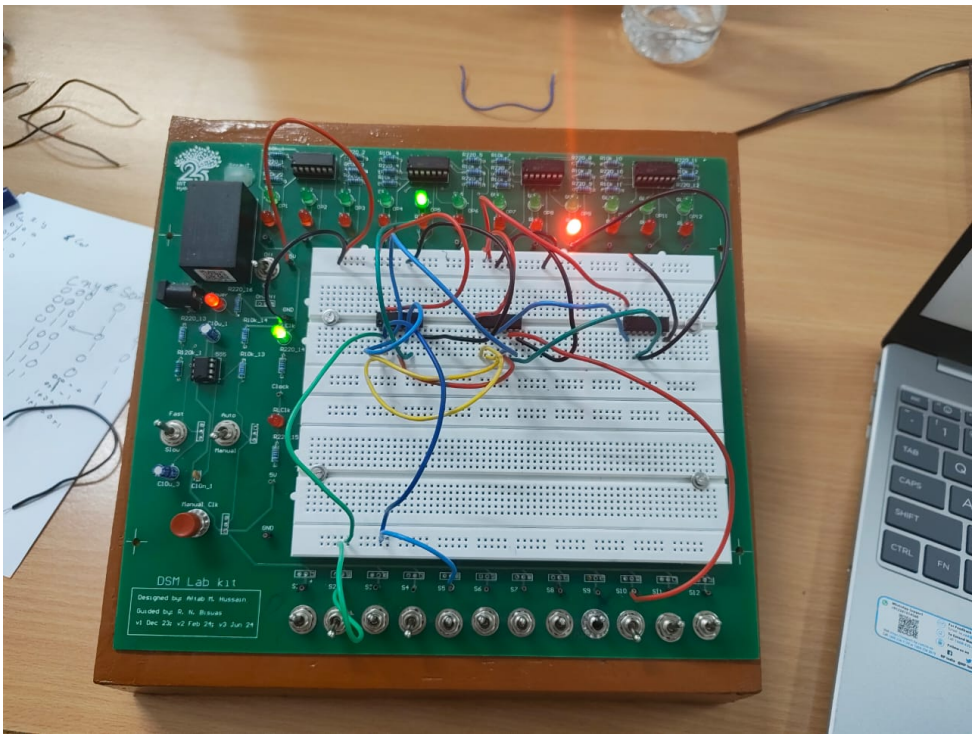

Figure 5: Full Adder

2.5 Truth Tables

2.5.1 Full Adder Truth Table

A	B	C_{in}	Sum (S)	C_{out}
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

2.6 TinkerCAD

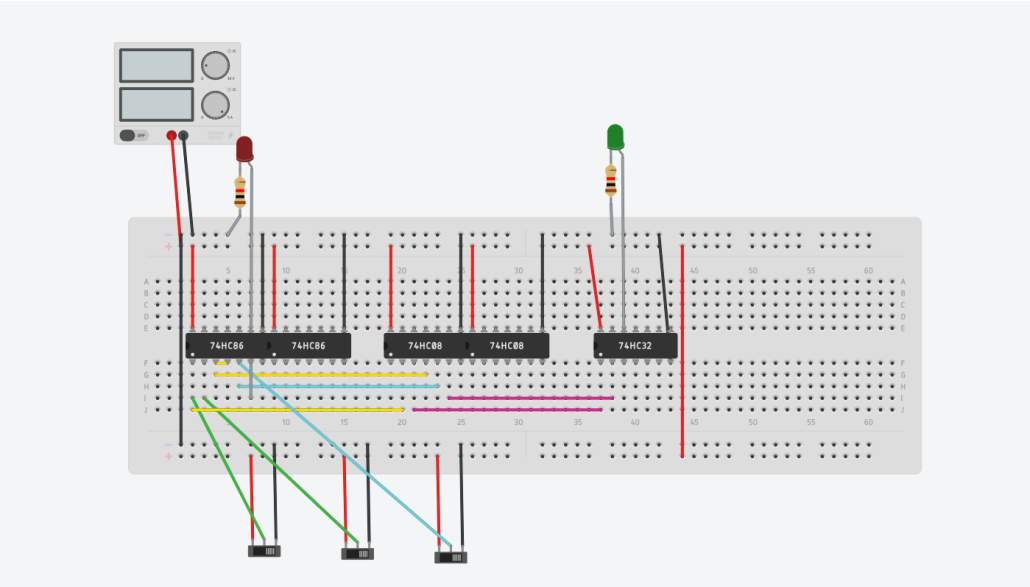

Figure 6: Full Adder

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2.7 Conclusion

We made Full Adder circuit and checked that it worked according to its truth table

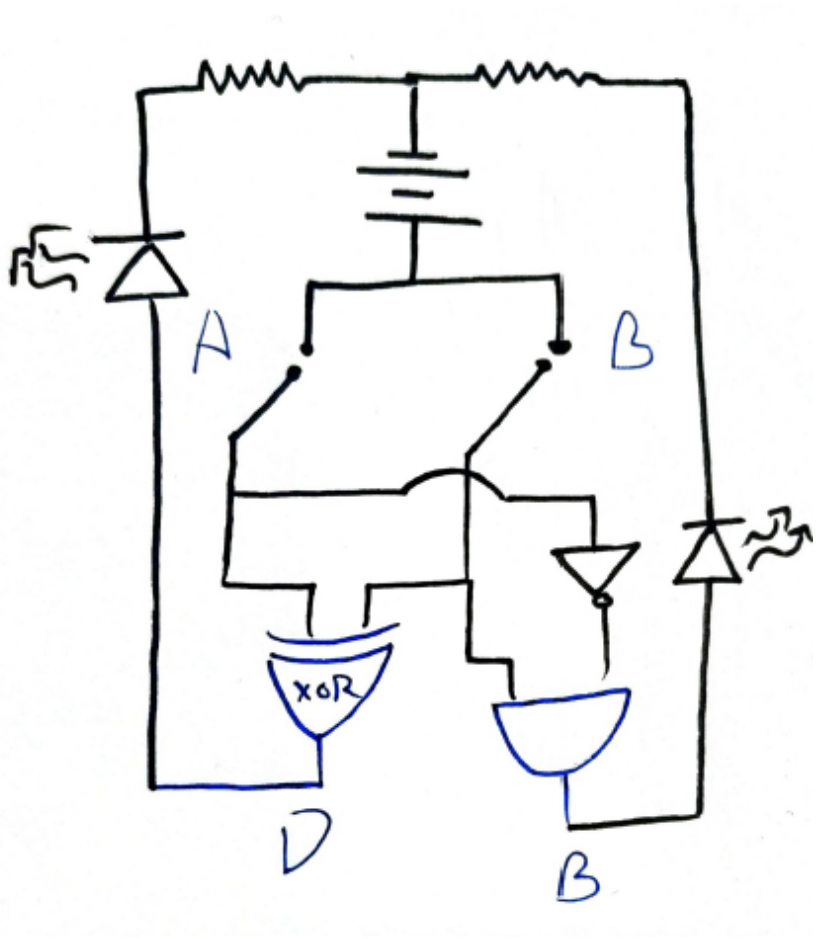

Figure 7: Schematic of Half Subtractor

3 Experiment - 3

3.1 Objective

To make a Half Subtractor circuit using AND,XOR and NOT gate

3.2 Equipment Required

- Digital Test Kit
- IC 7486 (XOR)
- IC 7404 (NOT)
- IC 7408 (AND)
- Connecting Wires

3.3 Schematic

3.4 Procedure

3.5 Half Subtractor Implementation

1. Place the required ICs on the breadboard
2. Connect Vcc and ground to the ICs
3. Connect input A to the XOR and NOT gates Connect input B to the XOR gate and the AND gate
4. The output of the NOT gate is connected to the other input of the AND gate
5. The output of the XOR gate is the Difference and the output of the AND gate is the Borrow
6. Connect LEDs to the outputs

3.6 Half Subtractor Truth Table

A	B	Difference (D)	Borrow (B)
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

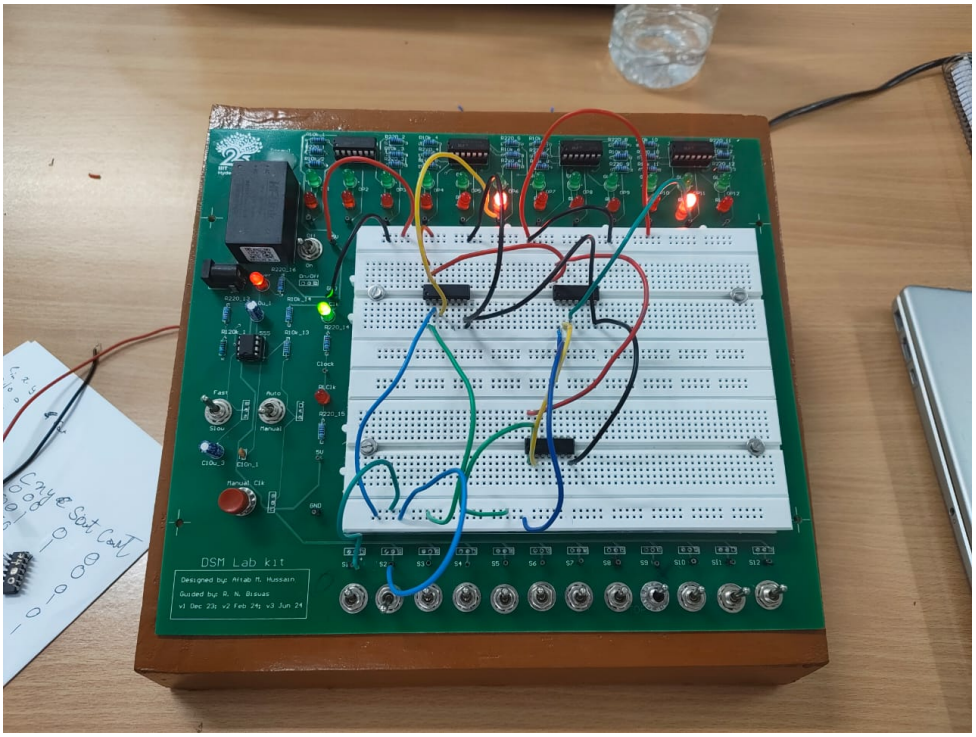

Figure 8: Half Subractor

3.7 TinkerCAD

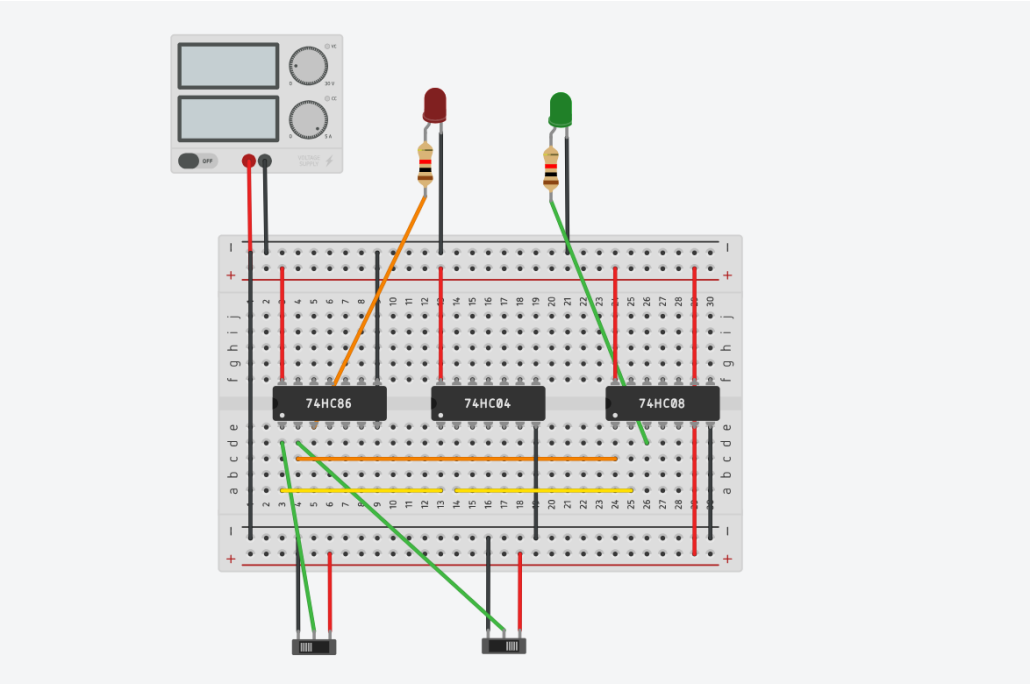

Figure 9: Half Subractor

Here

4 Experiment-4

4.1 Objective

To make a Full Subtractor circuit using 2 AND,2 XOR,NOT and OR gate

4.2 Equipment Required

- Digital Test Kit
- IC 7486 (XOR)
- IC 7404 (NOT)
- IC 7408 (AND)
- IC 7432 (OR)
- Connecting Wires

4.3 Schematic

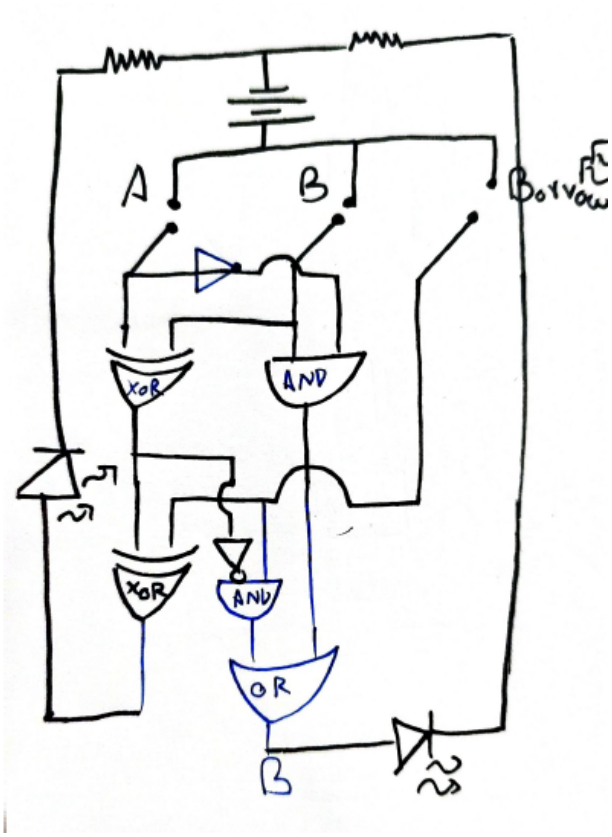

Figure 10: Schematic of FUll Subtractor

4.4 Procedure

1. We will use two Half Subtractors,The first Half Subtractor takes A and B as inputs
2. The Binary full subtractor takes 3 bits of input
3. The Borrow of the first Half Subtractor is connected to an OR gate,The other input to the OR gate is the Borrow from the second Half Subtractor
4. The output of the OR gate is the final Borrow-out (B_{out}).
5. Connect LEDs to the final Difference and Borrow-out and check the truth table

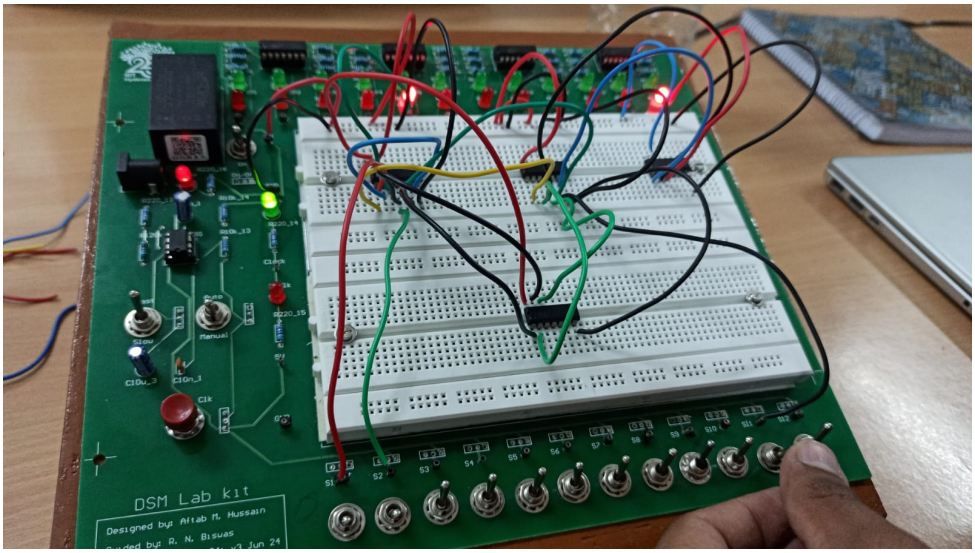

Figure 11: Full Subtractor

4.5 Truth Table

4.6 Full Subtractor Truth Table

A	B	B_{in}	Difference (D)	B_{out}
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

4.7 TinkerCAD

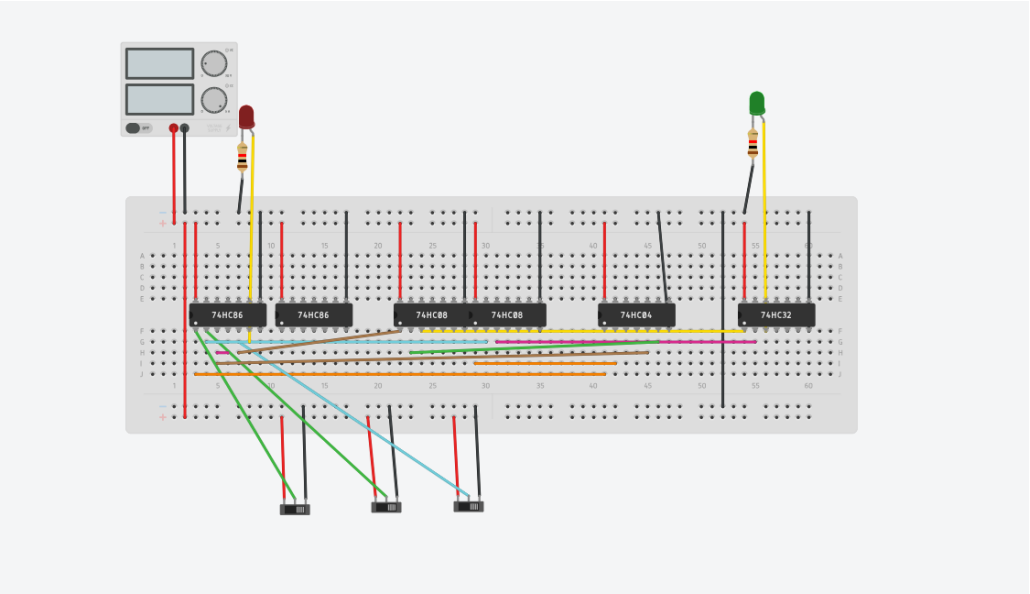

Figure 12: Full Subtractor

4.8 Conclusion

We made the Full Subtractor circuit and checked that it worked. We learned that a Full Subtractor can be made using two Half Subtractors.