DIGITAL SYSTEMS AND MICROCONTROLLERS - LAB REPORT 3

28/8/25

Yashaswi Priya

2025114007 GROUP-11 TABLE-7

Experiment 1

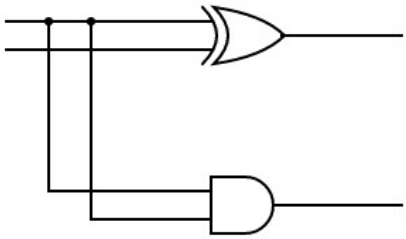
Objective:

Making a BINARY HALF ADDER

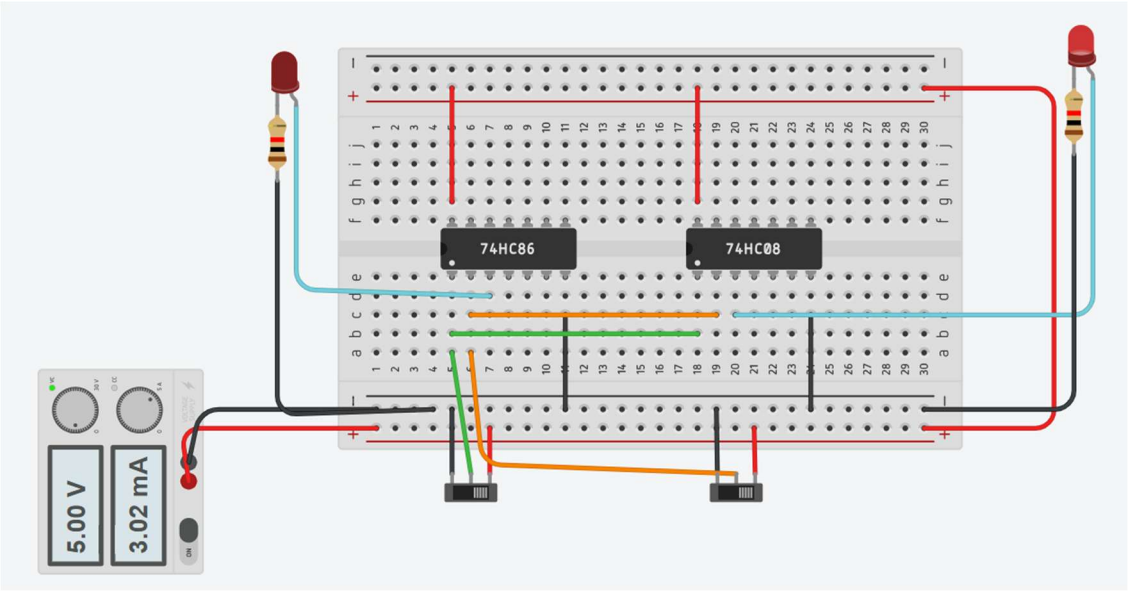
Electronic components used:

1. Digital Test Kit
2. Connecting Wires
3. ICs: XOR: 7486, AND: 7408

Reference circuit:



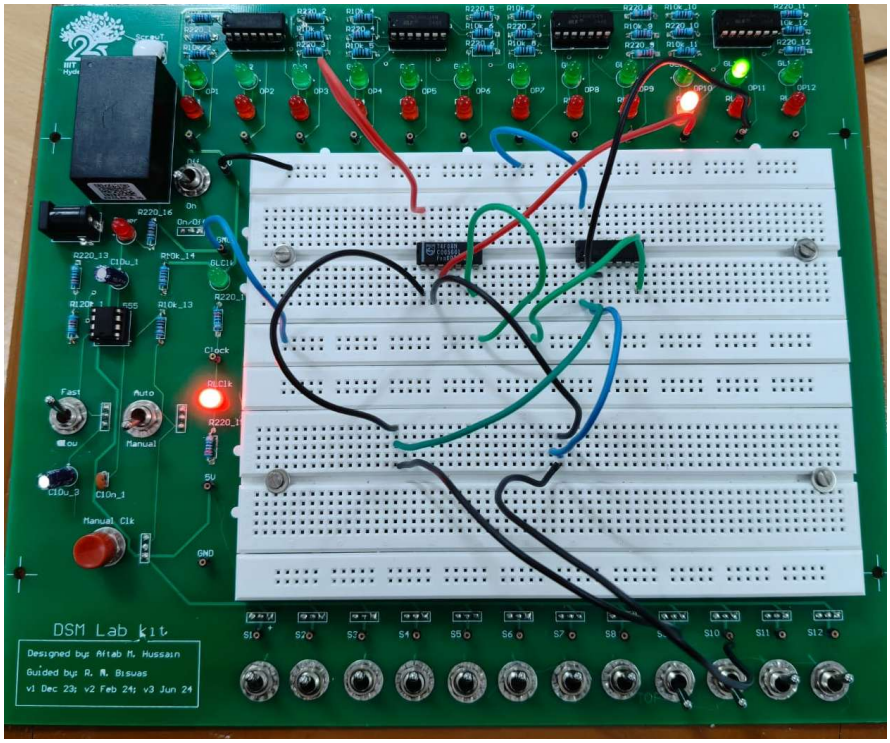
Tinkercad Reference circuit:



Procedure:

1. Connect the VCC (14) and GND (7) pins of the ICs to the VCC and GND lines of the Digital Test Kit respectively.
2. Use the XOR Gate to get the SUM of the two inputs and the AND Gate to get the CARRY.

Observation:



Conclusion:

A	B	SUM	CARRY
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

Therefore, the SUM is A XOR B and the CARRY is A AND B.

Link to TinkerCAD simulation:
https://www.tinkercad.com/things/8FbFa42OycN-lab3exp1?sharecode=CxUJktv9uD3f9NCHJqVUL5DDCLj_6RwJk0w1rU-bFgk

****The TinkerCAD link does not work properly sometimes. If there's an issue with the same, please tell me and I can send you the login details of my Tinkercad Account.

Experiment 2

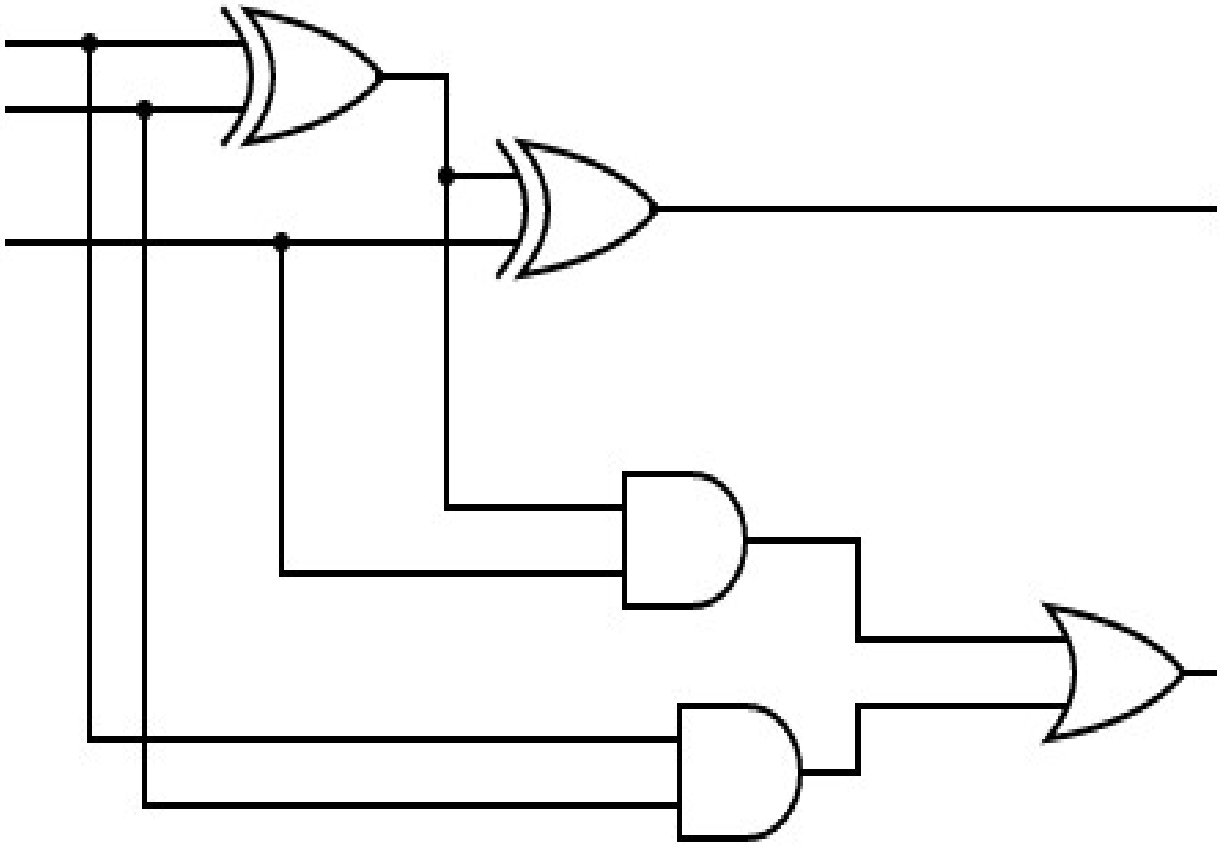
Objective:

To make a BINARY FULL ADDER.

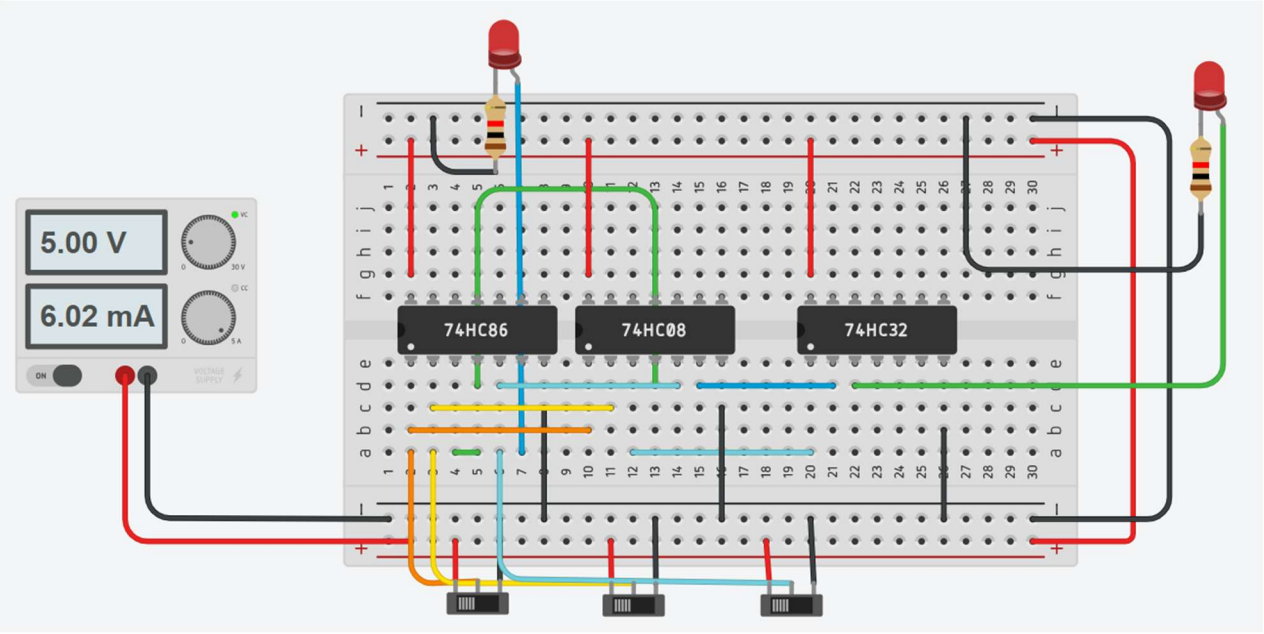
Electronic components used:

1. Digital Test Kit
2. Connecting Wires
4. ICs: XOR: 7486, AND: 7408, OR: 7432

Reference circuit:



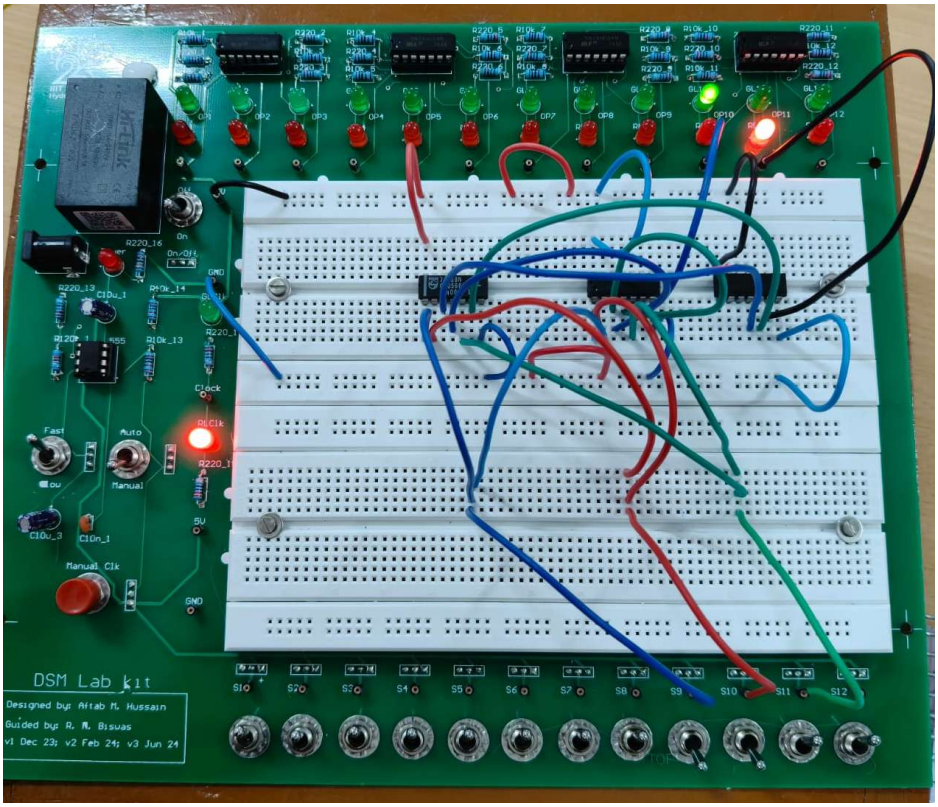
Tinkercad Reference circuit:



Procedure:

1. Connect the VCC (14) and GND (7) pins of the ICs to the VCC and GND lines of the Digital Test Kit respectively.
2. Use the XOR Gate on all 3 of the inputs to get the final SUM.
3. For the CARRY, use the AND Gate on inputs A and B.
4. Then AND the value of XOR A and B to the Cin value.
5. Finally, OR the two outputs of the AND Gate.

Observation:



Conclusion:

A	B	Cin	SUM	CARRY (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

Therefore, we XOR A B and C to get the SUM.
The CARRY is A.B + (A XOR B).C

Link to TinkerCAD simulation:
https://www.tinkercad.com/things/0oBb64xVKEc-lab3exp2?sharecode=6iRNnhZmbkPPRkloZZXhpTCvd3uMAV4Jd37aPOeHJZY

**Site used to make circuit reference diagrams: https://www.circuit-diagram.org/editor/
****The TinkerCAD link does not work properly sometimes. If there's an issue with the same, please tell me and I can send you the login details of my Tinkercad Account.

Experiment 3

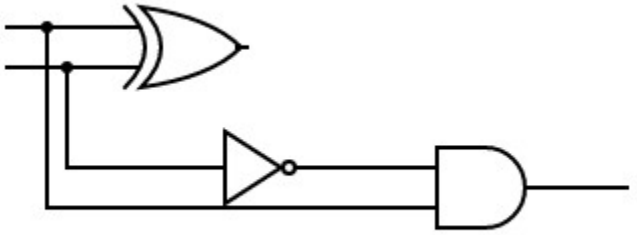
Objective:

Making a BINARY HALF SUBTRACTOR.

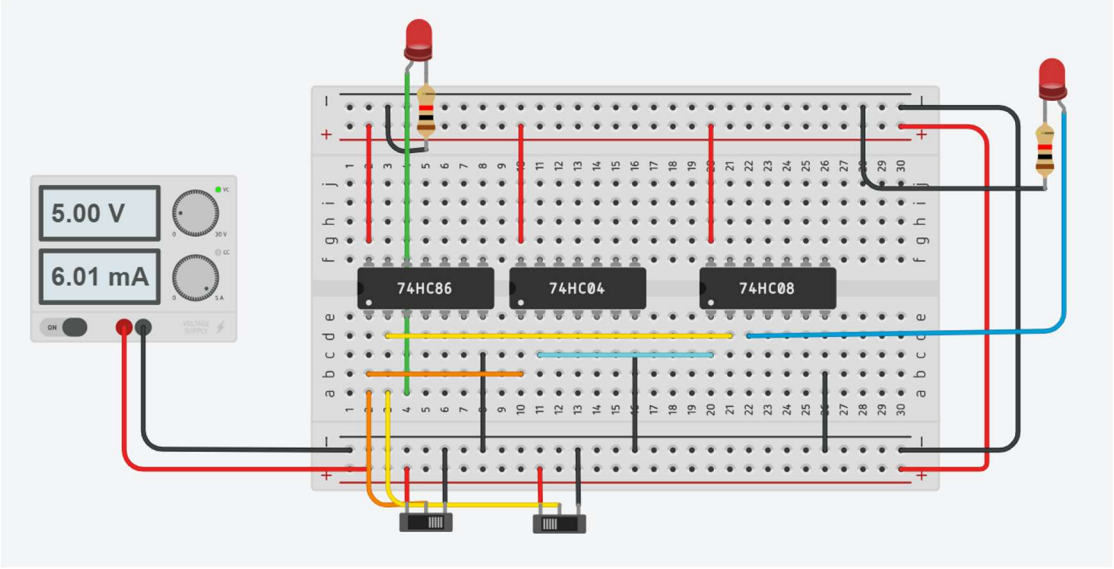
Electronic components used:

5. Digital Test Kit
6. Connecting Wires
7. ICs: XOR: 7486, AND: 7408, NOT: 7404

Reference circuit:



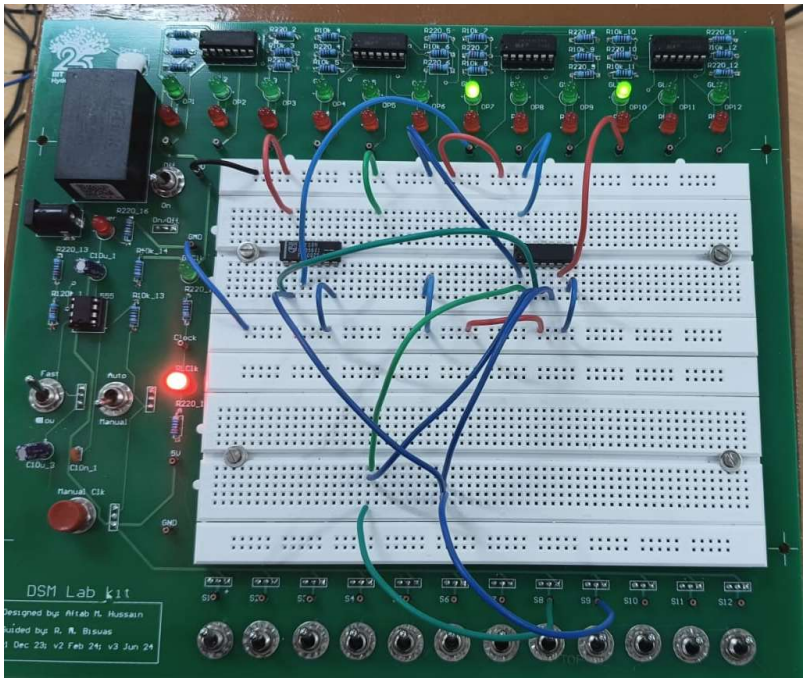
Tinkercad Reference circuit:



Procedure:

3. Connect the VCC (14) and GND (7) pins of the ICs to the VCC and GND lines of the Digital Test Kit respectively.
4. Use the XOR Gate to get the DIFFERENCE of the two inputs
5. NOT the value of the minuend and then use the AND Gate on A' and B to get the BORROW.

Observation:



Here, we've used the XOR Gate to get A' since A XOR 1 = A'

Conclusion:

A	B	DIFFERENCE	BORROW
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

Therefore, the A XOR B is the DIFFERENCE and A'.B is the BORROW

Link to TinkerCAD simulation:
https://www.tinkercad.com/things/bK3npOhdiRZ-lab3exp3?sharecode=fU_kSEnOLbVqPQwcM6eeisk4f2ZU305We768ypwi6VU

****The TinkerCAD link does not work properly sometimes. If there's an issue with the same, please tell me and I can send you the login details of my Tinkercad Account.

Experiment 4

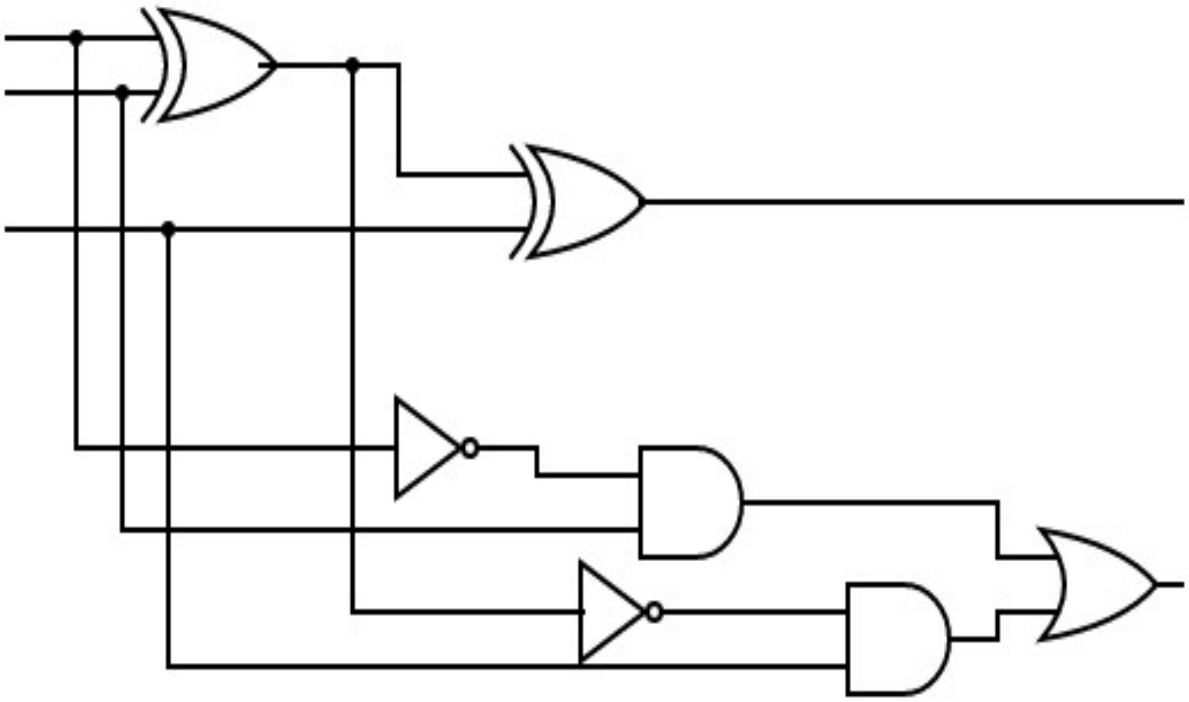
Objective:

To make a BINARY FULL SUBTRACTOR.

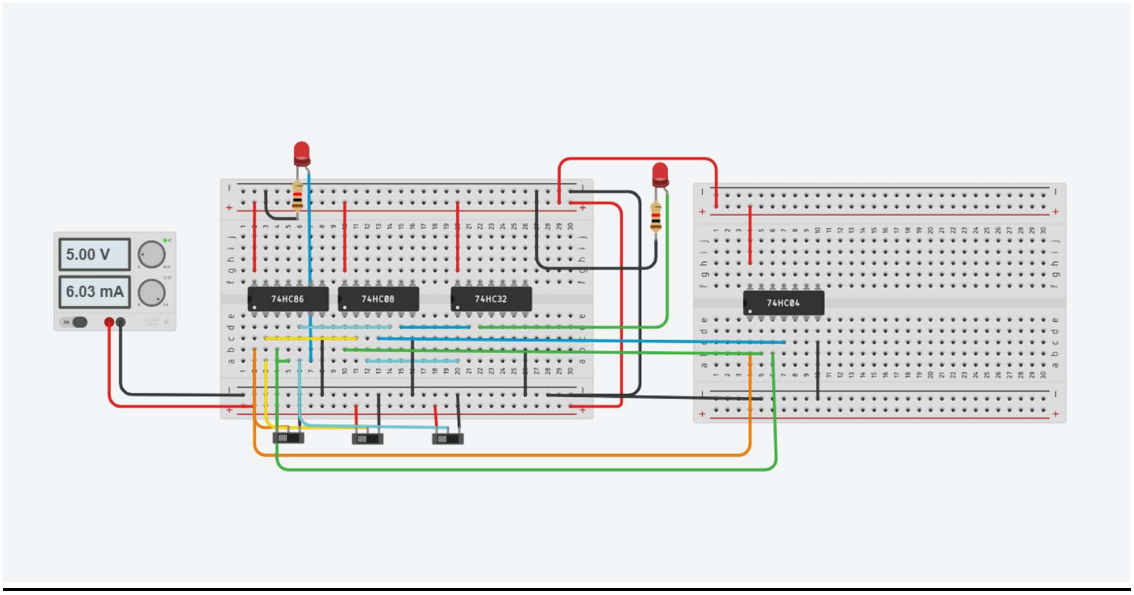
Electronic components used:

1. Digital Test Kit
2. Connecting Wires
3. ICs: XOR: 7486, AND: 7408, OR: 7432, NOT: 7404

Reference circuit:



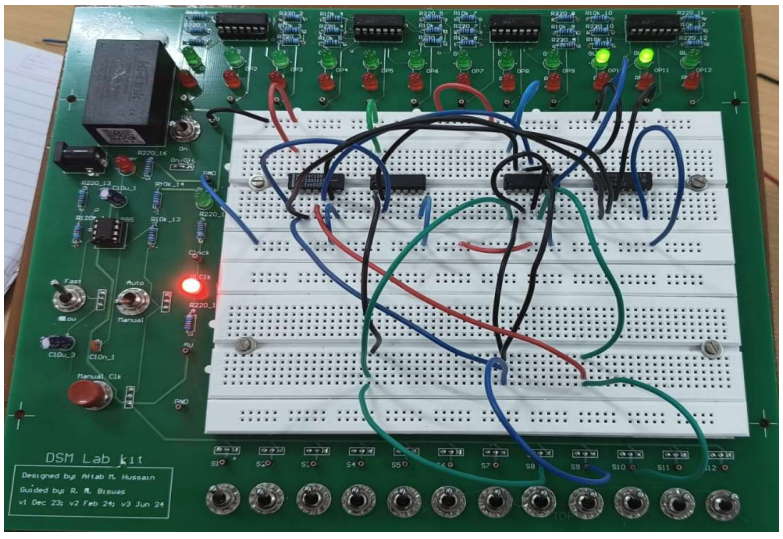
Tinkercad Reference circuit:



Procedure:

1. Connect the VCC (14) and GND (7) pins of the ICs to the VCC and GND lines of the Digital Test Kit respectively.
2. Use the XOR Gate on all 3 of the inputs to get the final DIFFERENCE.
3. NOT the value of the minuend (A) and on A XOR B.
4. Then use the AND Gate on A' and B.
5. AND the values of Bin and (A XOR B)'.
6. Finally, OR the two outputs of the AND Gate to get the BORROW.

Observation:



Conclusion:

A	B	Bin	DIFFERENCE	BORROW (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

Therefore, the DIFFERENCE is A XOR B XOR Bin, while the

BORROW is A'.B + (A XOR B)'.Bin

Link to TinkerCAD simulation:
https://www.tinkercad.com/things/iMTiMujPGwg-lab3exp4?sharecode=huAwC6L72Elo0398_1Gh-k0UZdSYZfcaYbl6Io-Bchw

**Site used to make circuit reference diagrams: https://www.circuit-diagram.org/editor/
****The TinkerCAD link does not work properly sometimes. If there's an issue with the same, please tell me and I can send you the login details of my Tinkercad Account.