LAB # 5

CSE-202L Digital Logic Design Lab

Fall 2022

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SUBMITTED TO:

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ADDERS AND SUBTRACTORS

OBJECTIVES:

- To Design and construct half adder, full adder, half subtractor and full subtractor circuits
- Verify their truth tables using logic gates

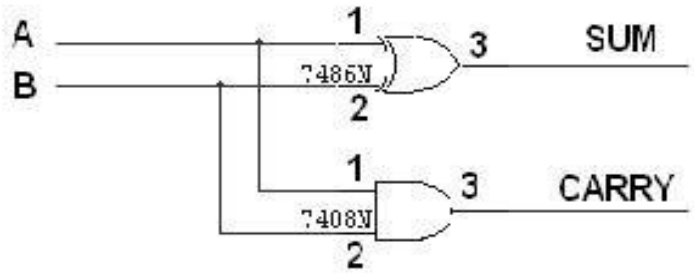
COMPONENTS:

- IC's
  - 7408 Quad-2-Input AND Gate
  - 7432 Quad-2-Input OR Gate
  - 7486 Quad-2-Input XOR Gate
  - 7404 Hex Inverters
- LED's
- Dip Switch
- 520/1KΩ Resistors

THEORY:

A digital adder circuit adds binary signals & a subtractor subtracts binary signals. Half Adder/Subtractor is a basic circuit that adds / subtracts 2 bits and generates Sum or Difference along with Carry / Borrow. Unlike Half Adder or Subtractor a Full Adder / Subtractor has the provision to take consideration of previous Carry / Borrow also.

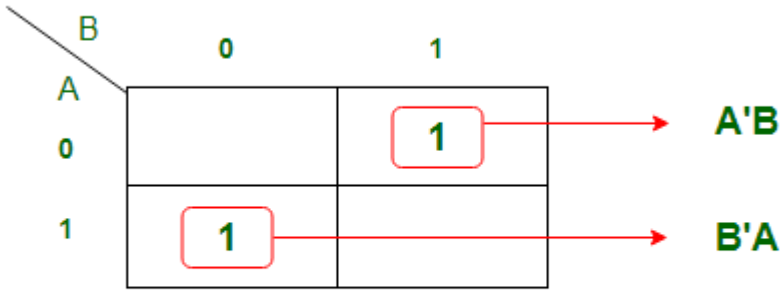
LOGIC DIAGRAM HALF ADDER



TRUTH TABLE

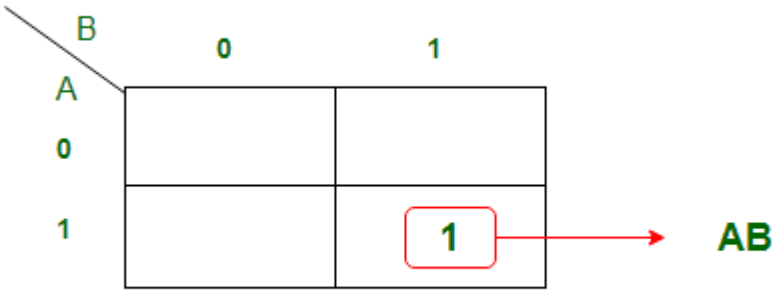
A	B	CARRY	SUM
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

SUM = A’B + AB’



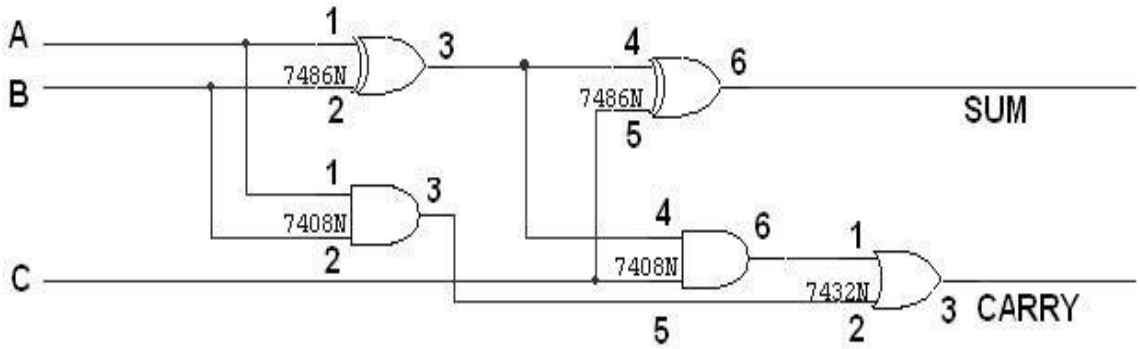
A'B+B'A=A xor B

CARRY = AB



LOGIC DIAGRAM FULL ADDER:

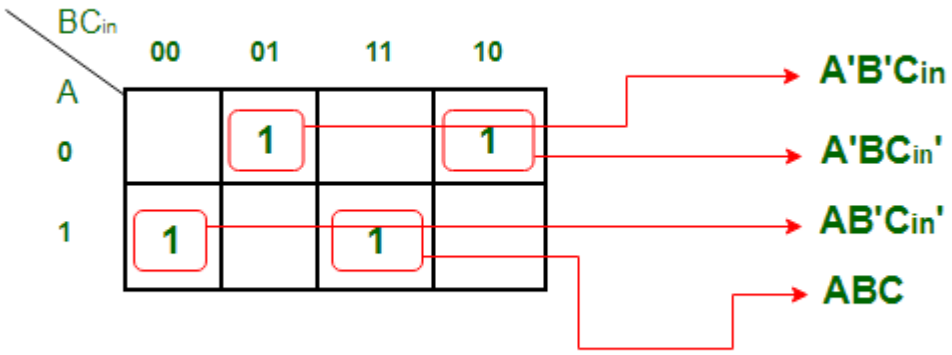
FULL ADDER USING TWO HALF ADDER



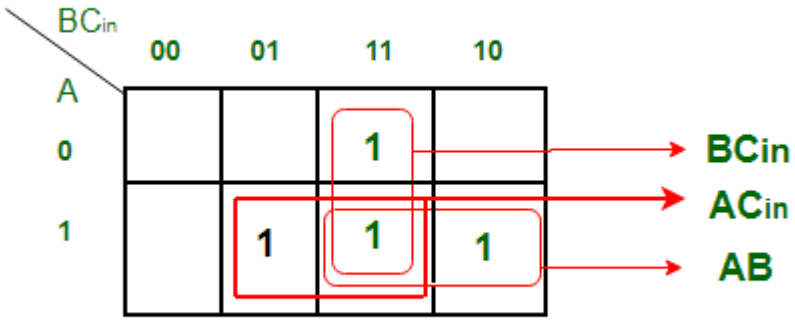
TRUTH TABLE

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

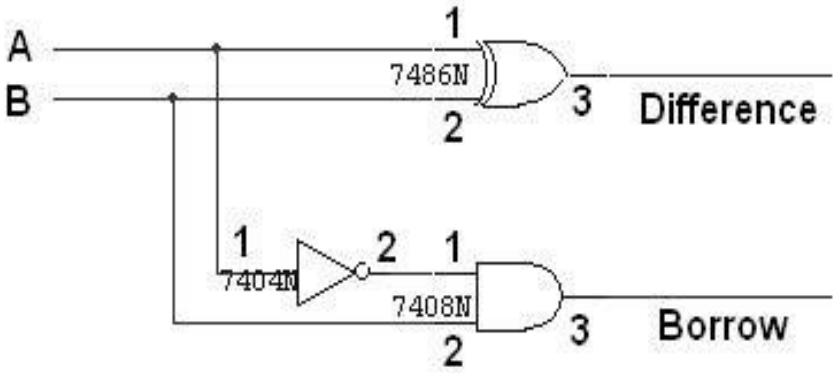
SUM = A’B’Y + A’BY’ + ABY + AB’Y’ = Y(A’B’+AB) + Y'(A’B+AB’) = YX’+Y’X



CARRY = AB + BY + AY = Y(A+B) + AB



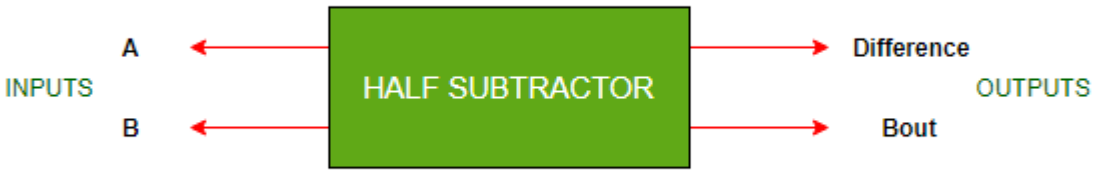
LOGIC DIAGRAM HALF SUBTRACTOR



TRUTH TABLE

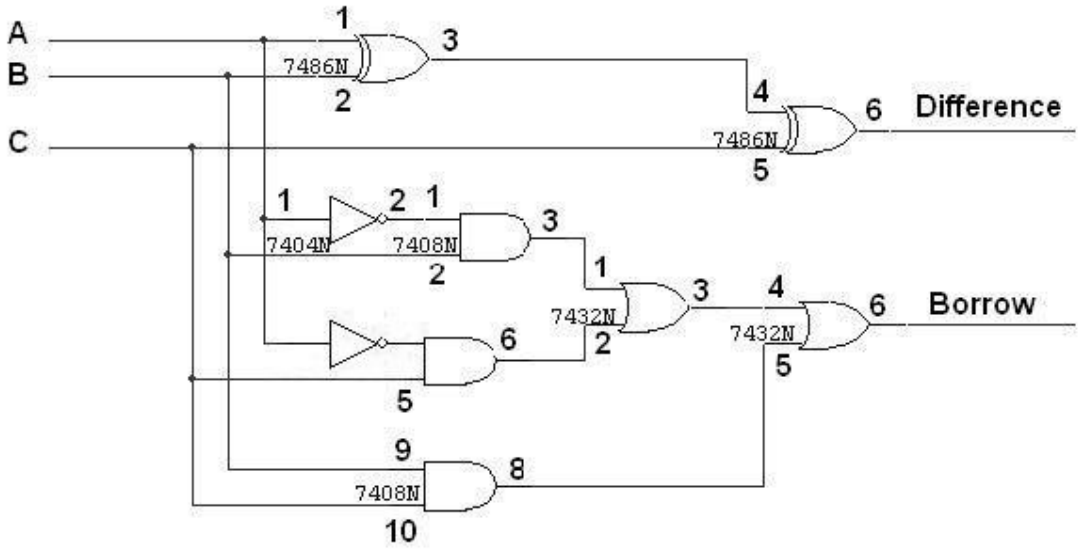
A	B	BORROW	DIFFERENCE
0	0	0	0
0	1	1	1
1	0	0	1
1	1	0	0

0 – 0 = 0
0 – 1 = 1, borrow 1
1 – 0 = 1
1 – 1 = 0

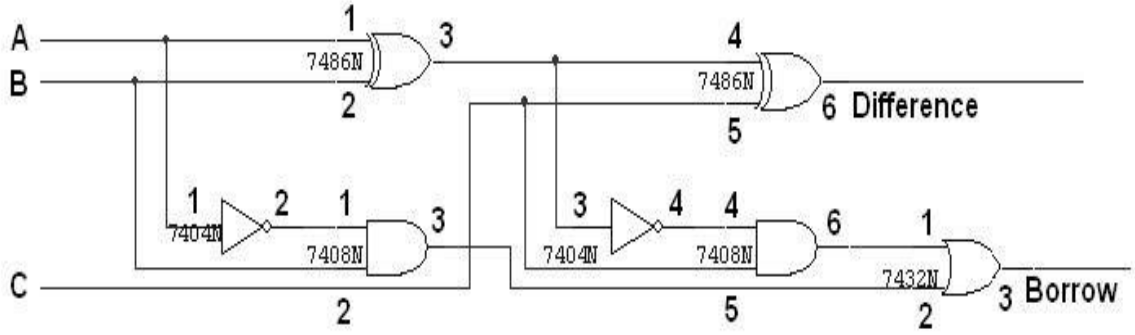


DIFFERENCE= A'B + AB'
BORROW = A'B

LOGIC DIAGRAM FULL SUBTRACTOR

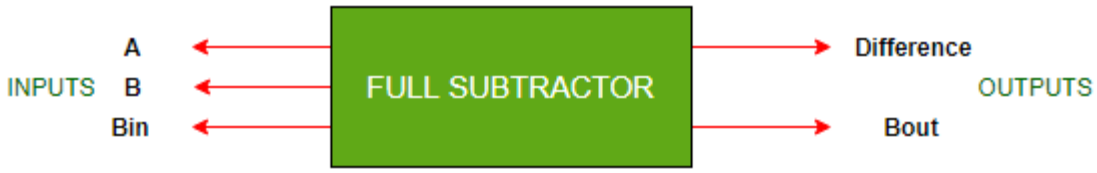


FULL SUBTRACTOR USING TWO HALF SUBTRACTOR



TRUTH TABLE

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



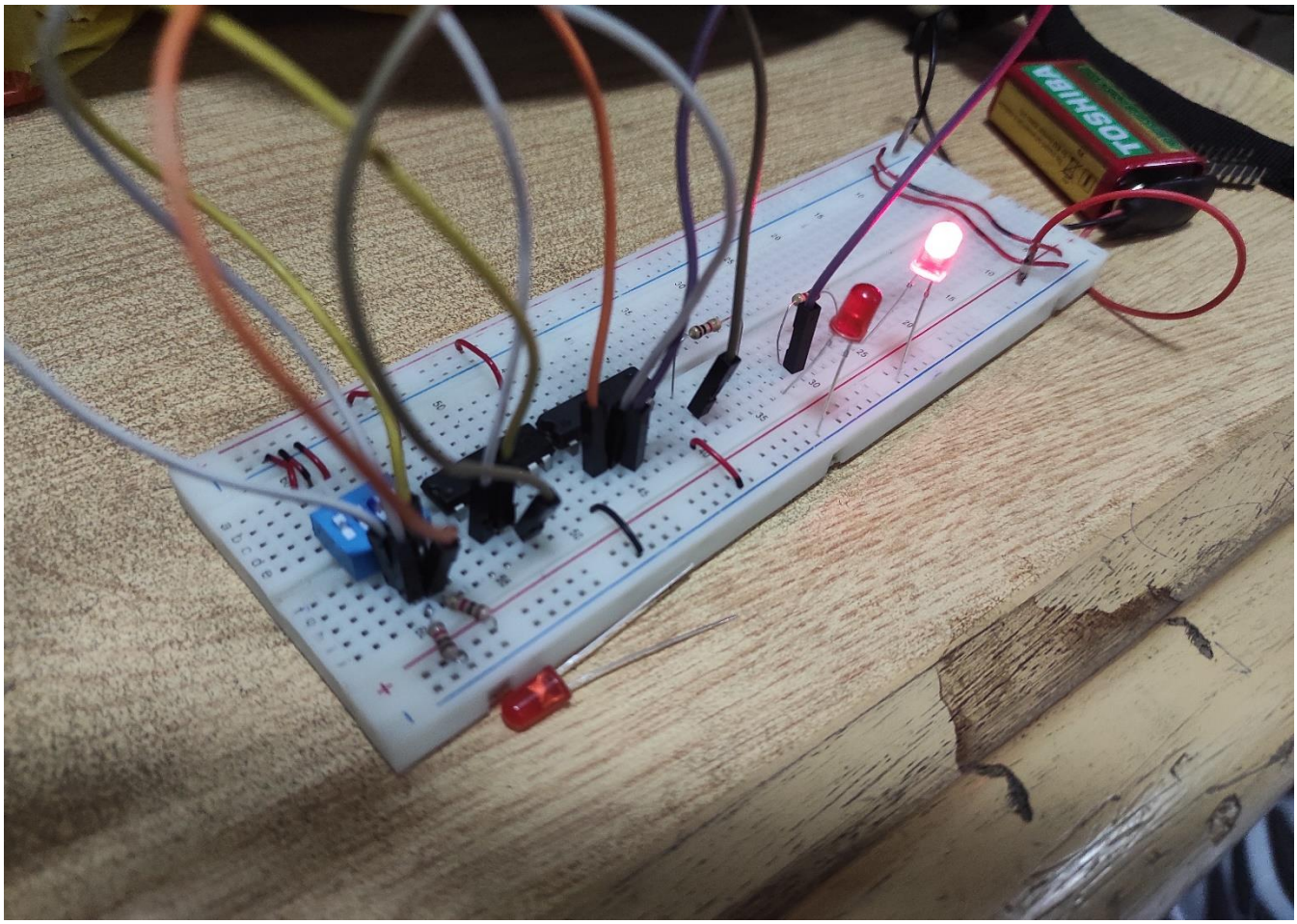
BORROW = A’D + BD + A’B = A'(B+D) + BD

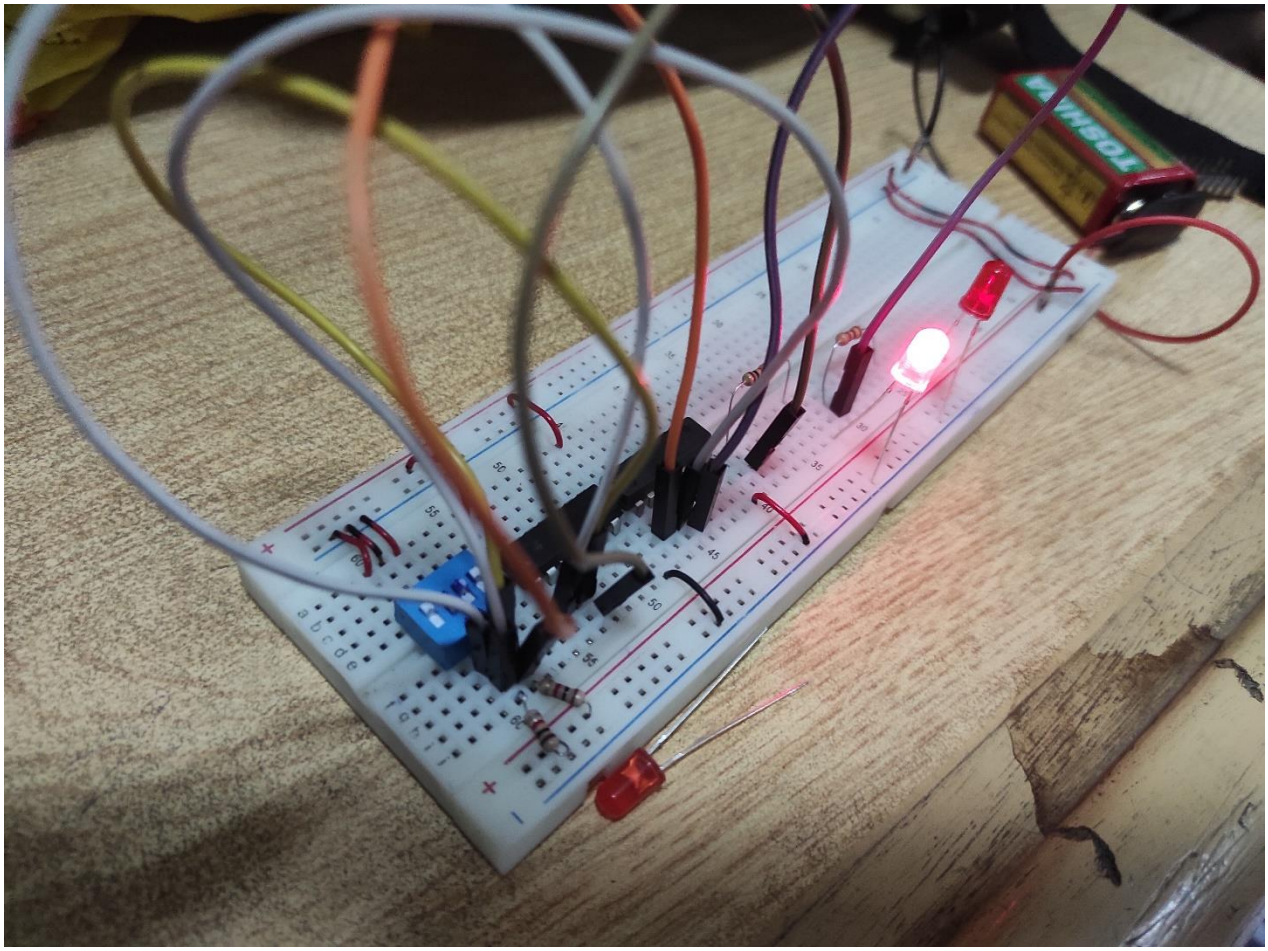
PROCEEDURE

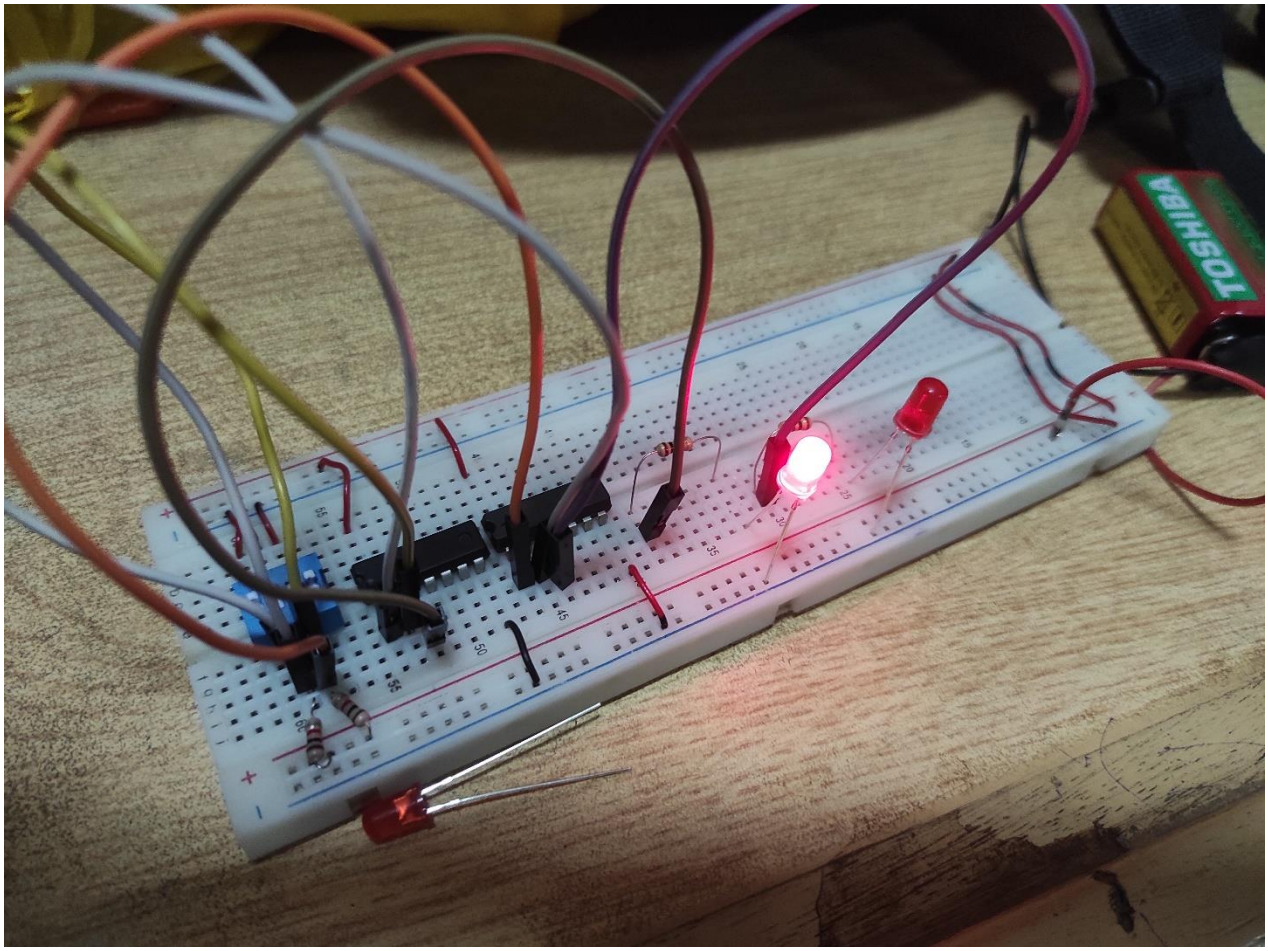
1. Connections are given as per circuit diagram.
2. Logical inputs are given as per circuit diagram.
3. Observe the output and verify the truth table.

LAB WORK:

HALF ADDER



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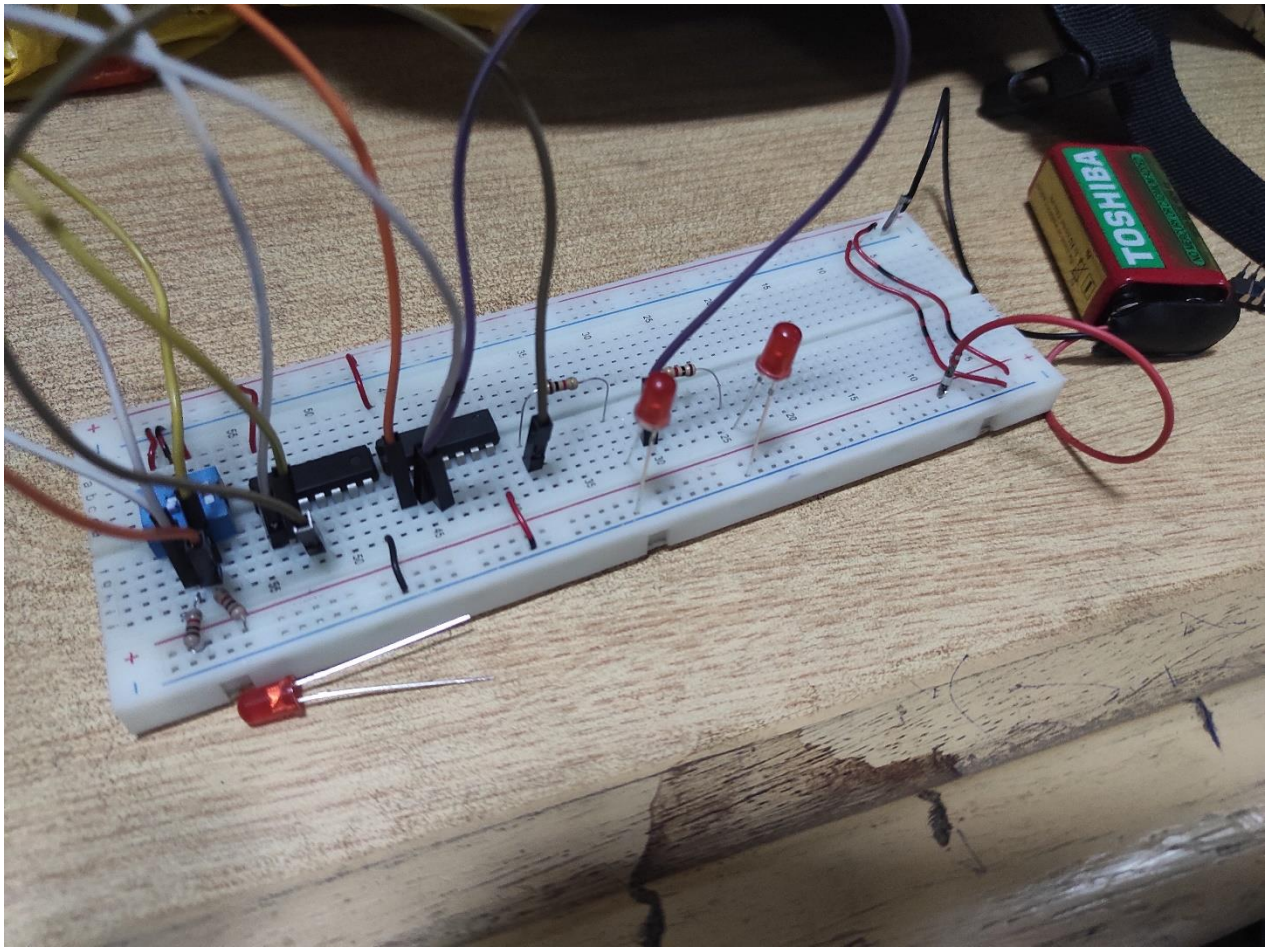
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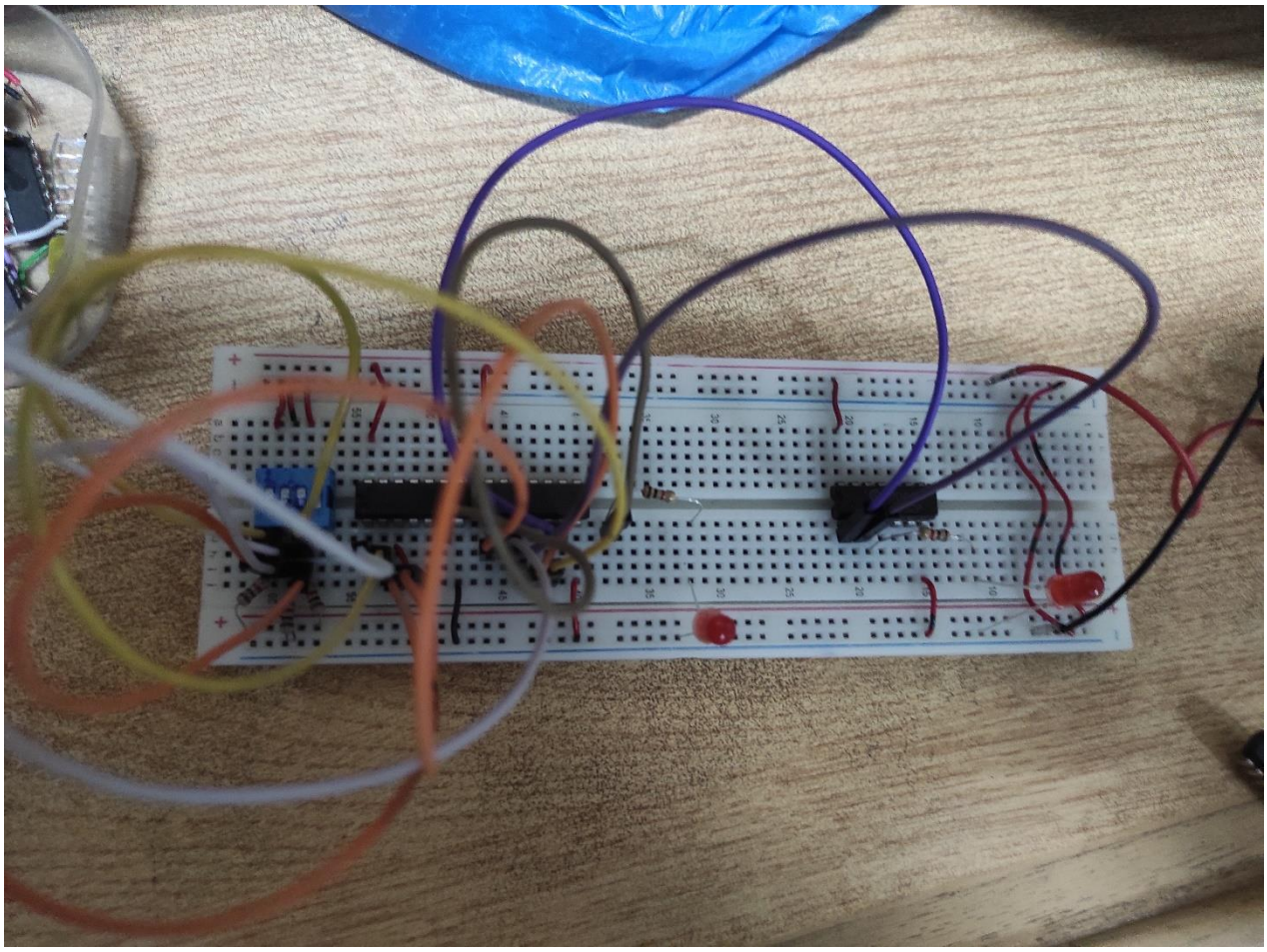
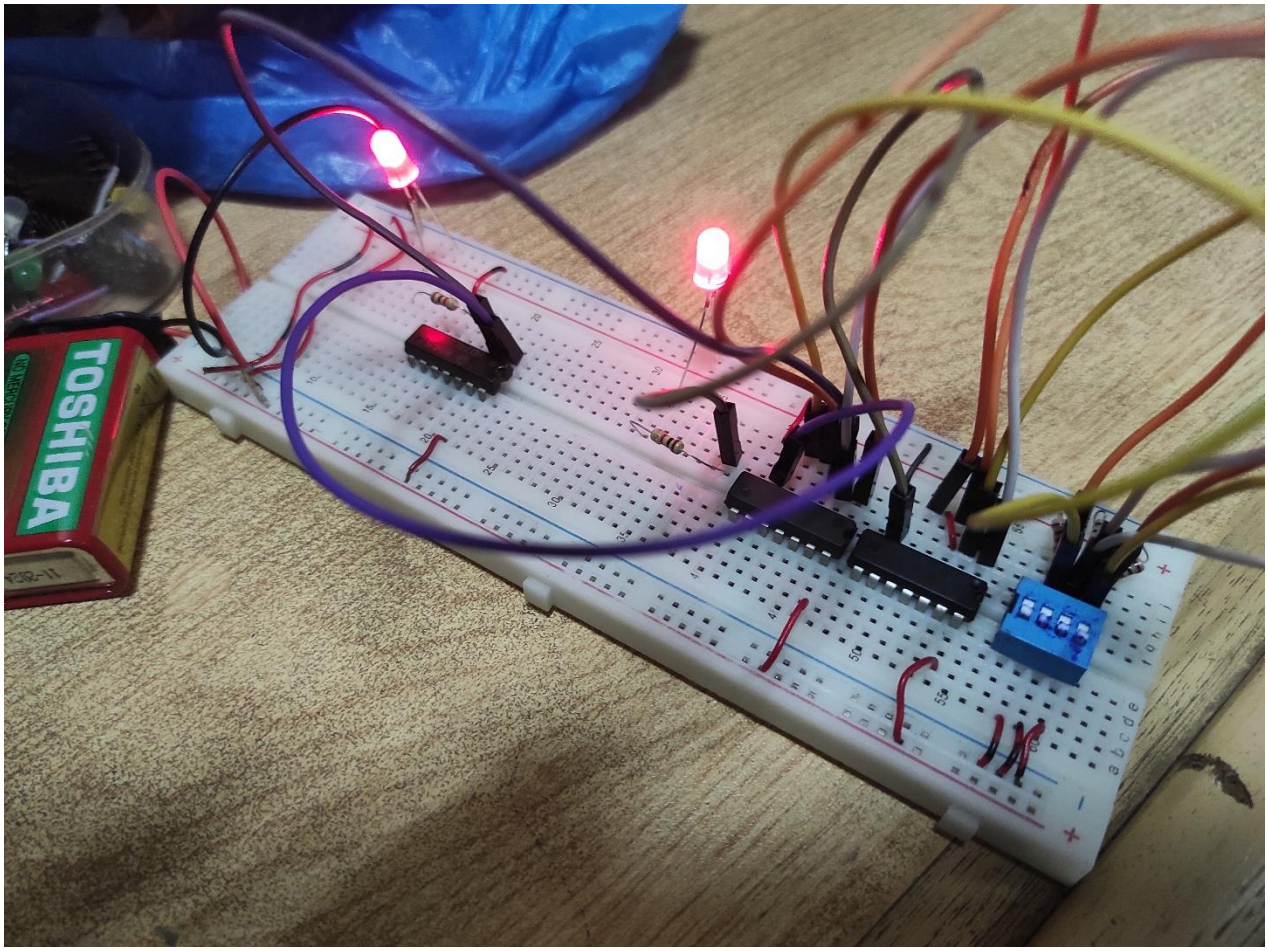
FULL ADDER

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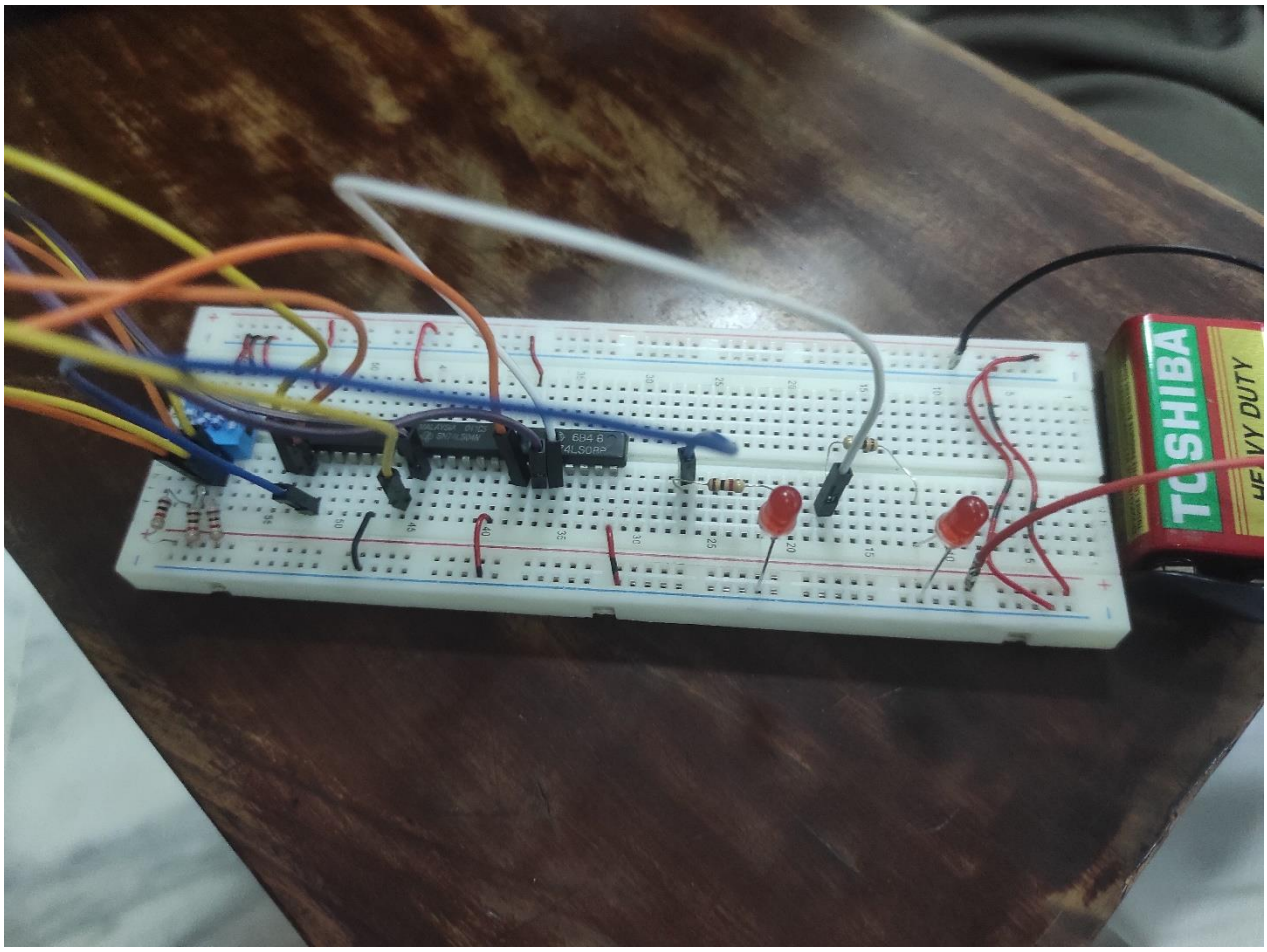
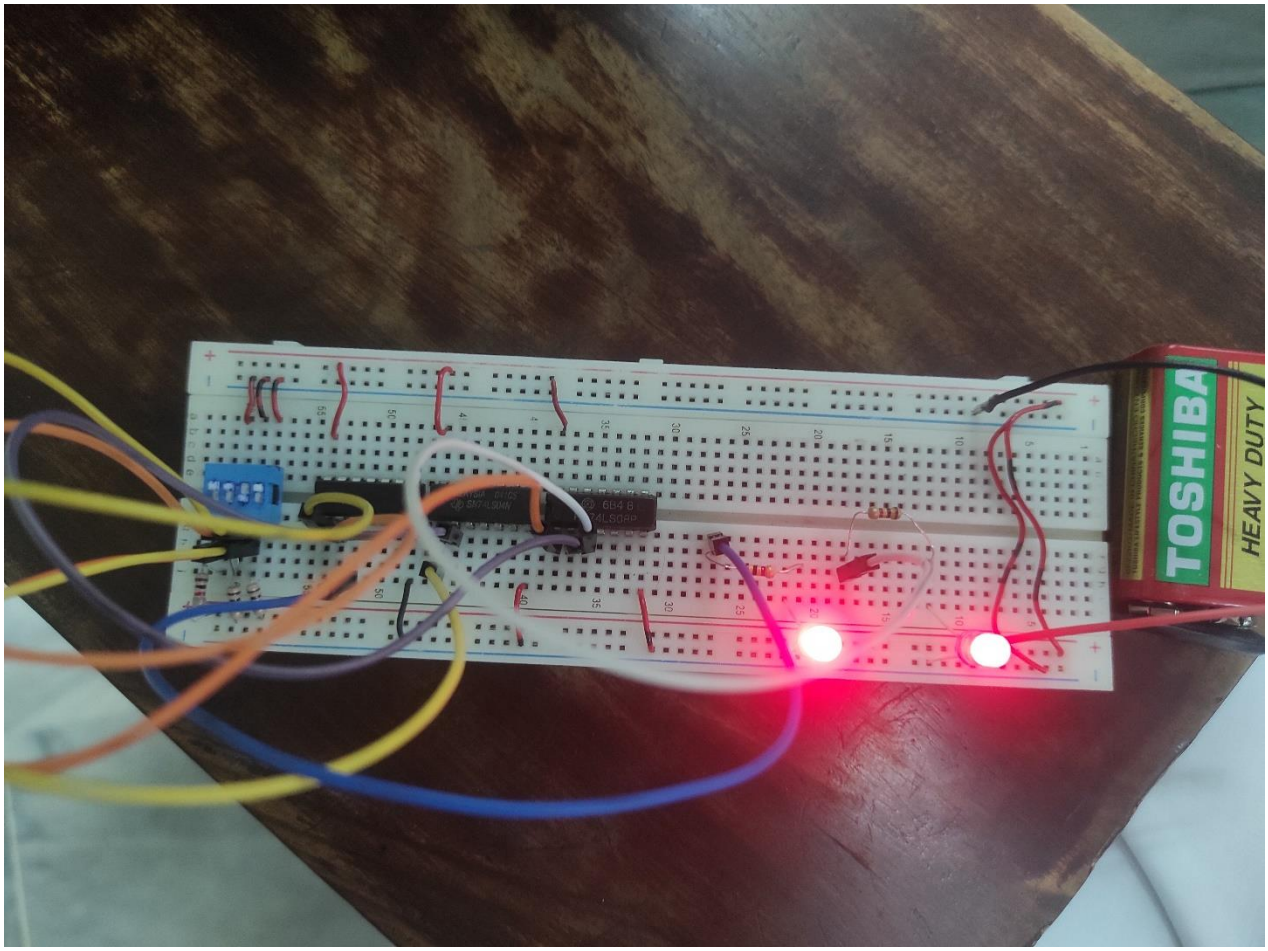
HALF SUBTRACTOR

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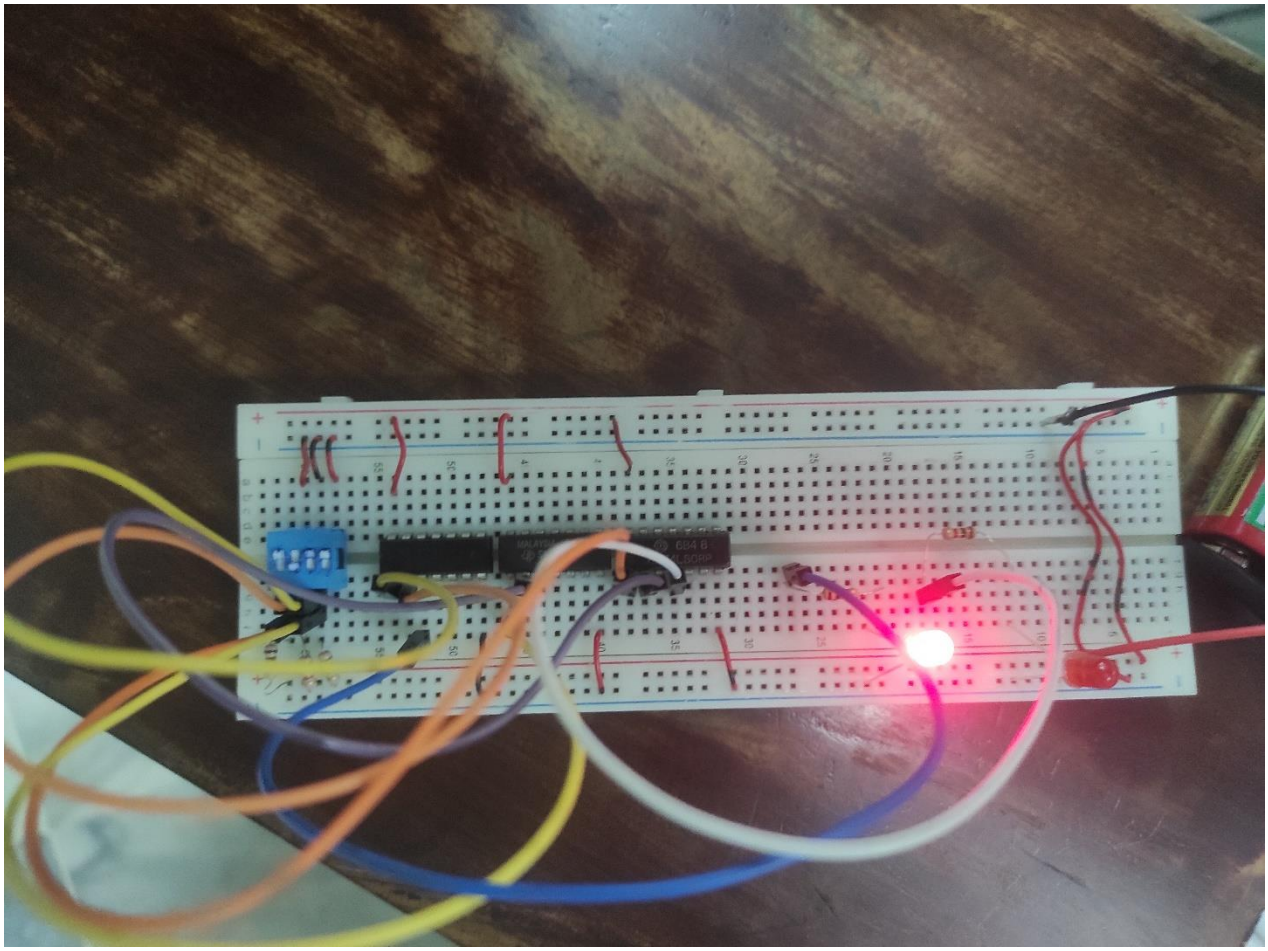
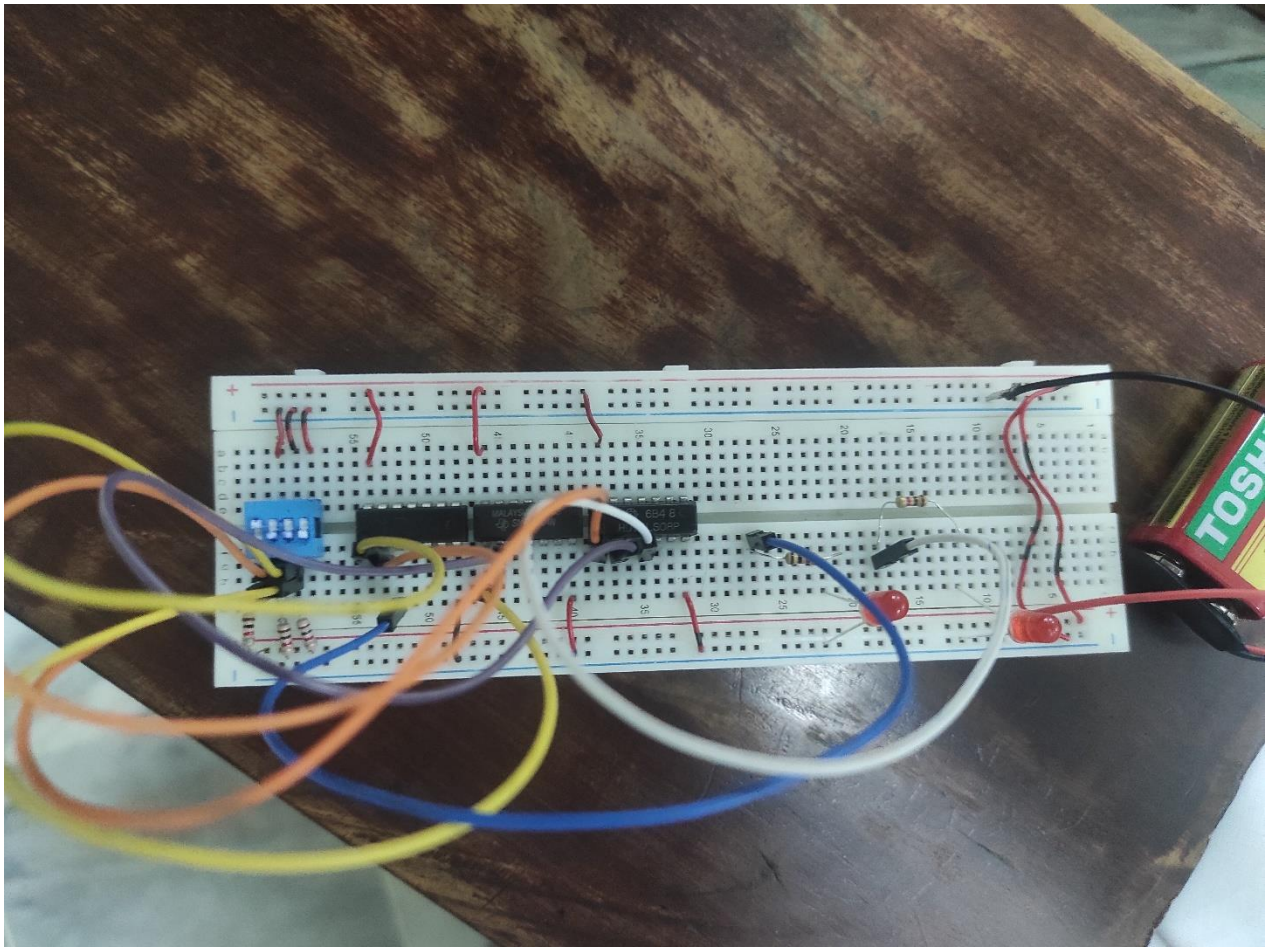
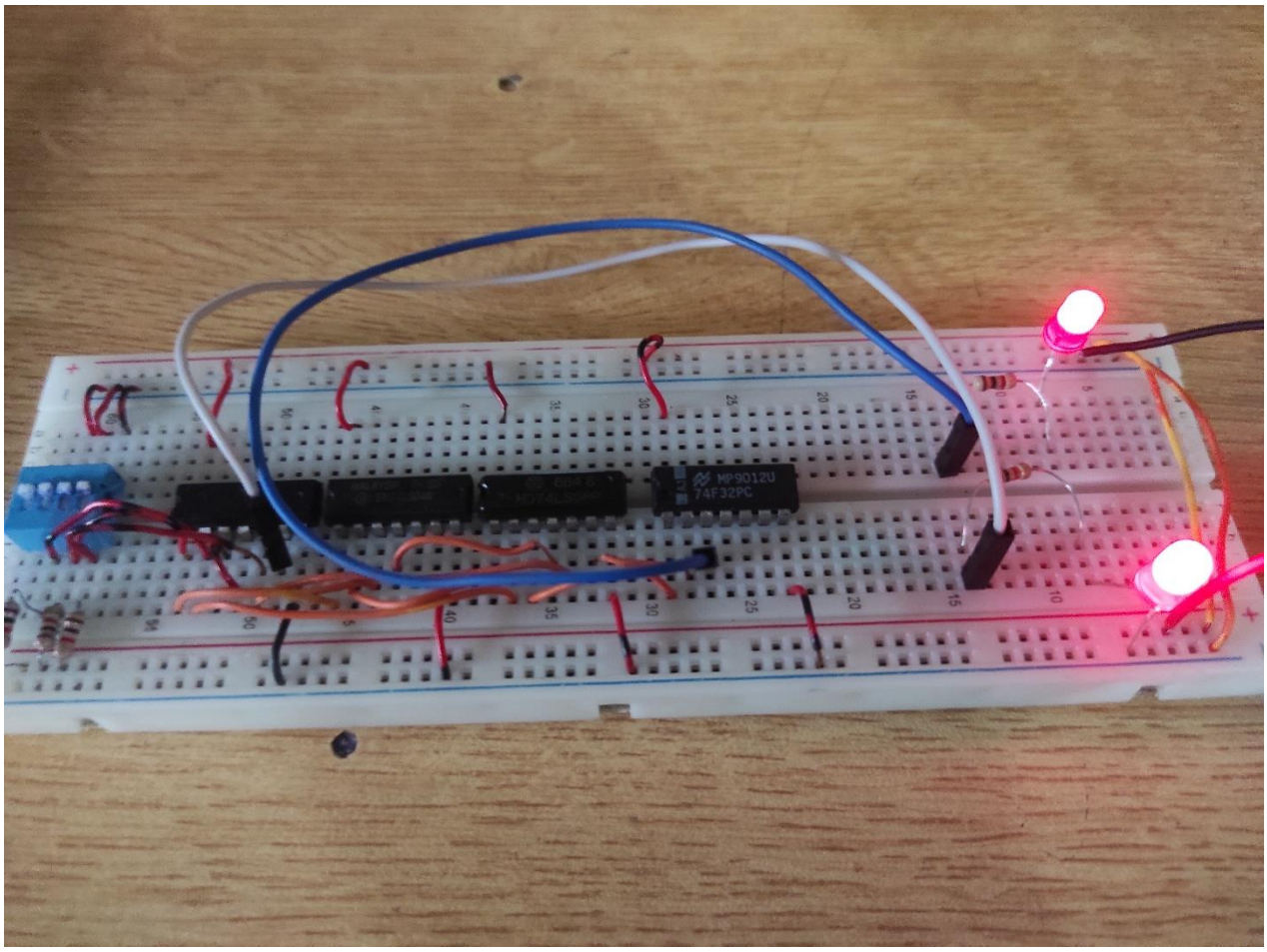
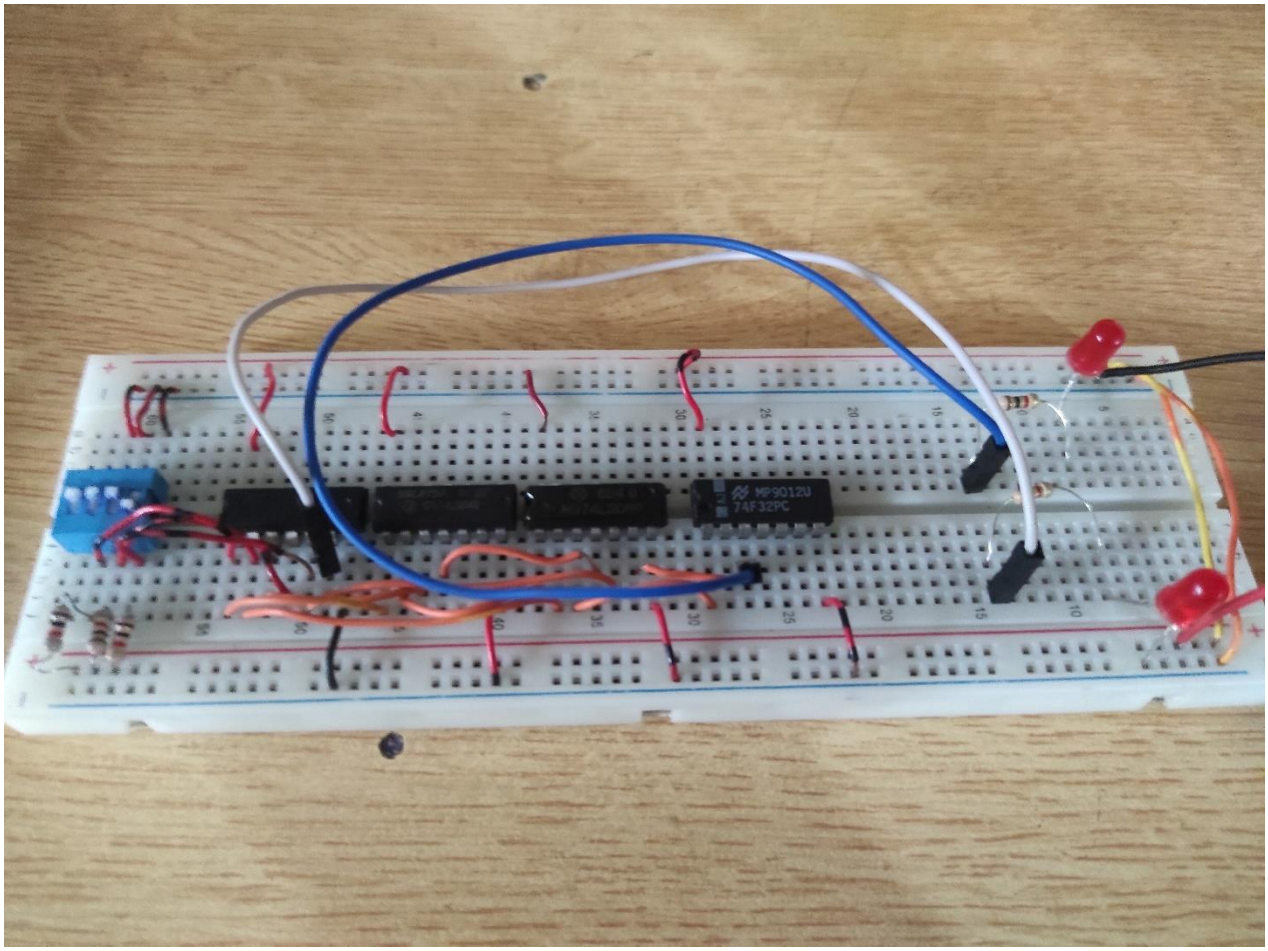
HEAVY DUTY





FULL SUBTRACTOR

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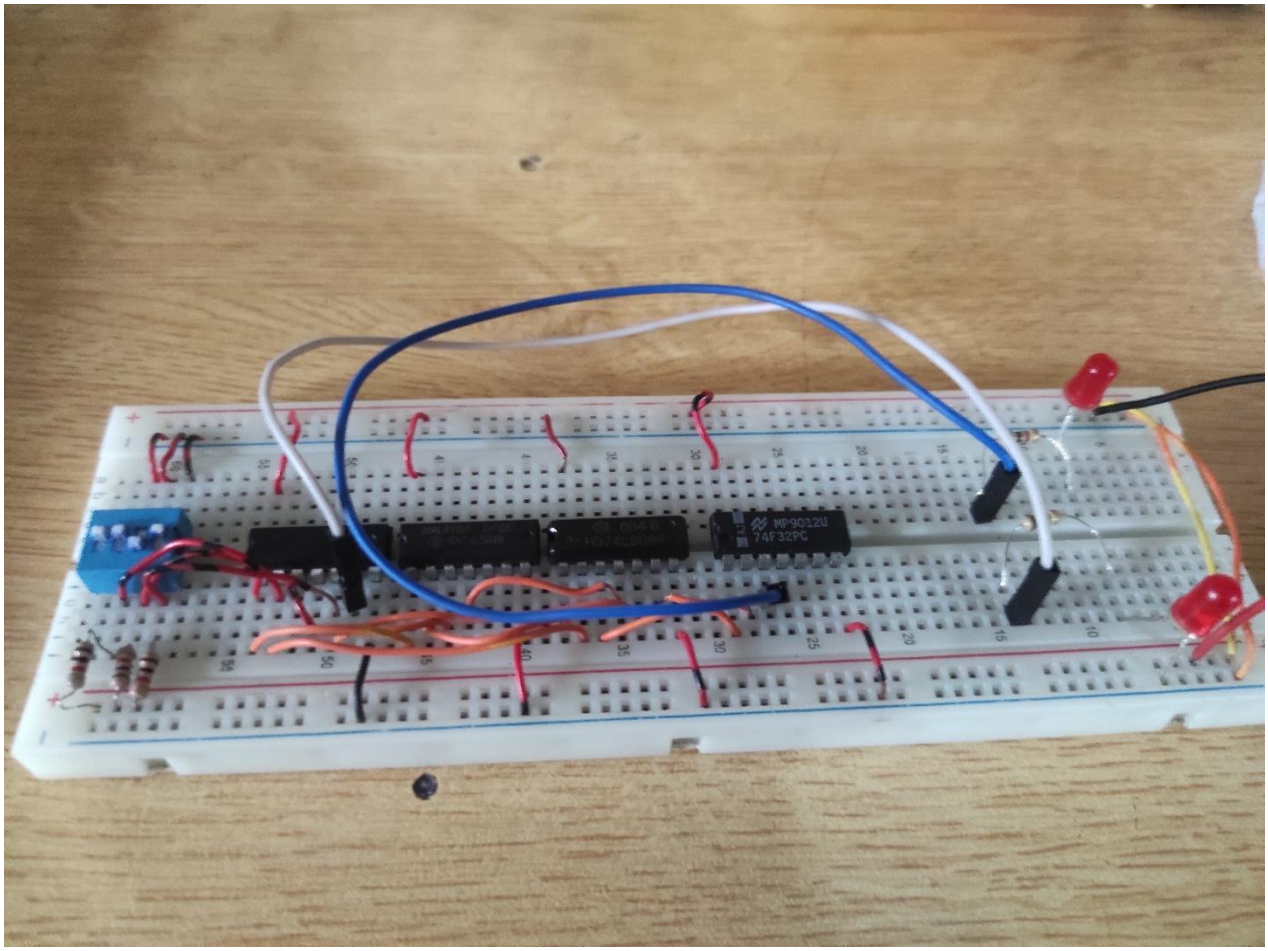
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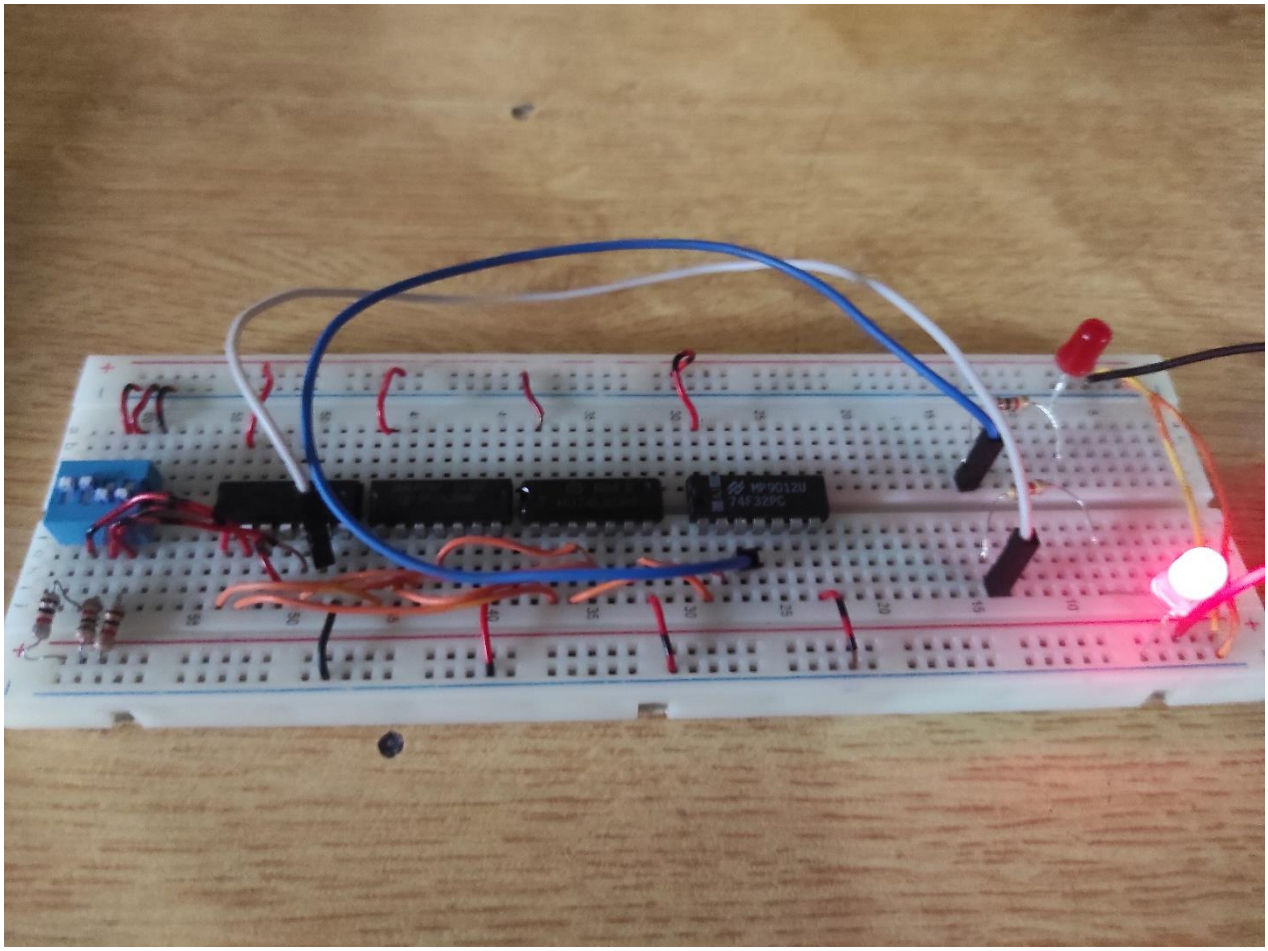
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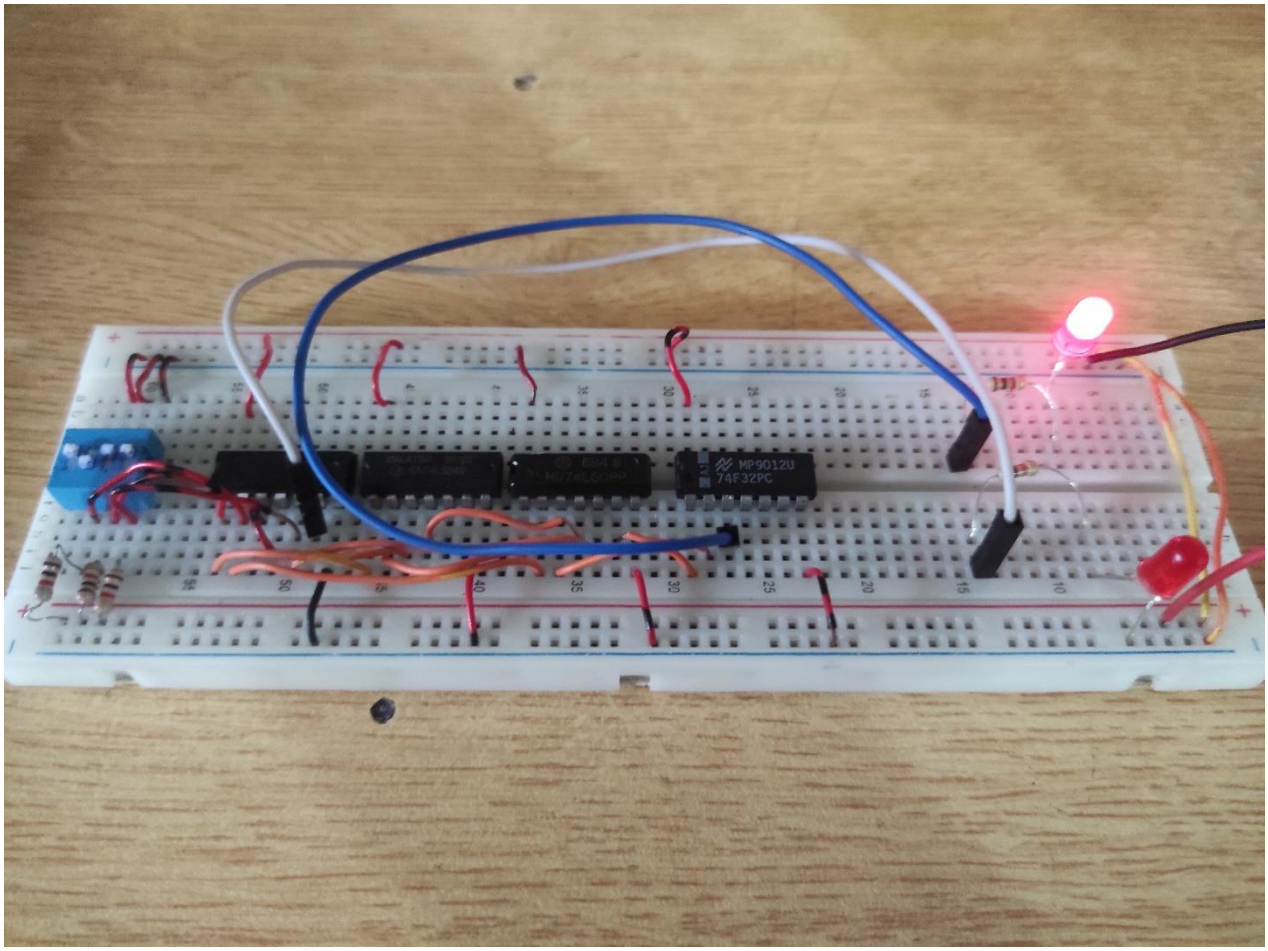
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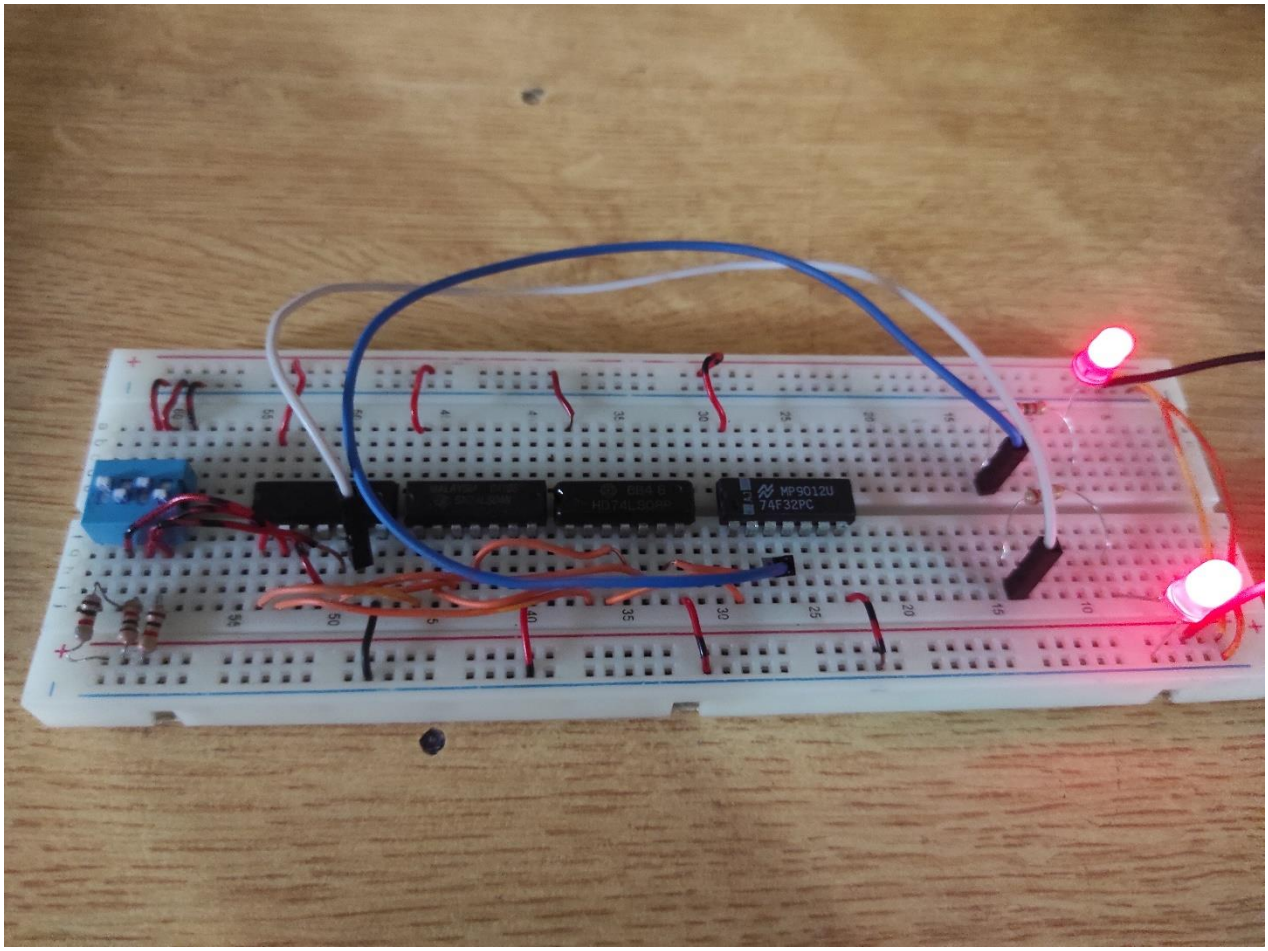
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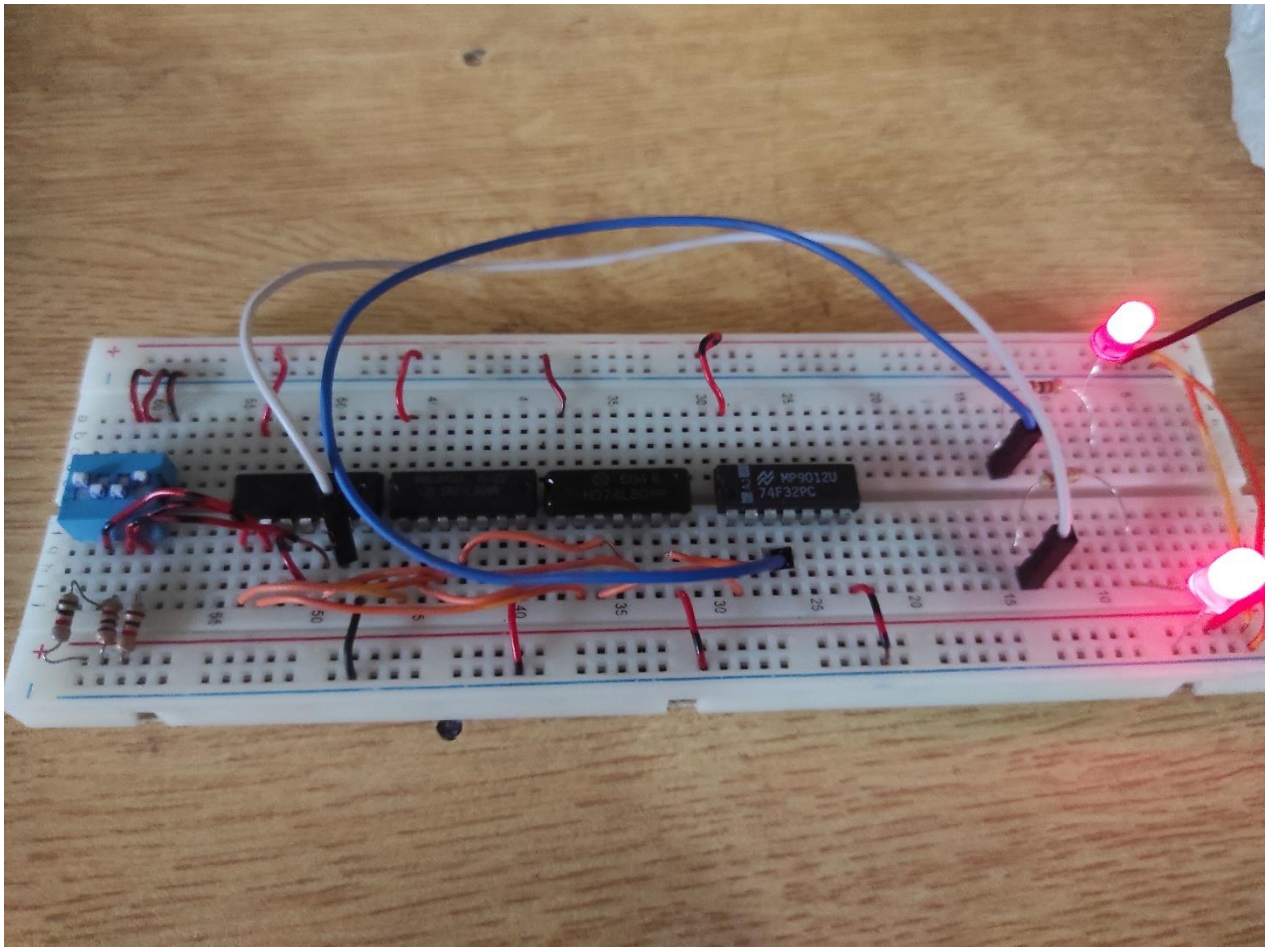
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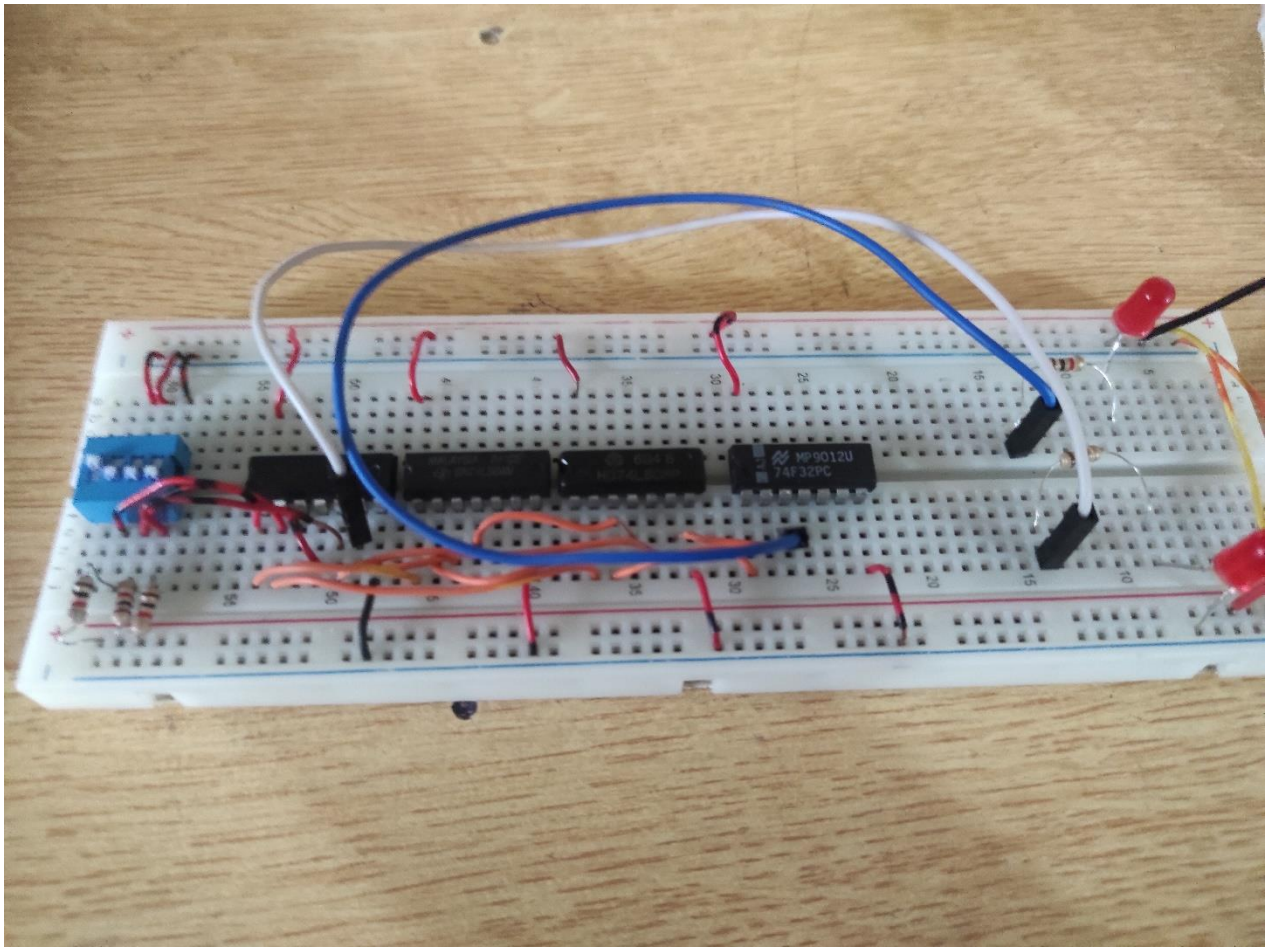
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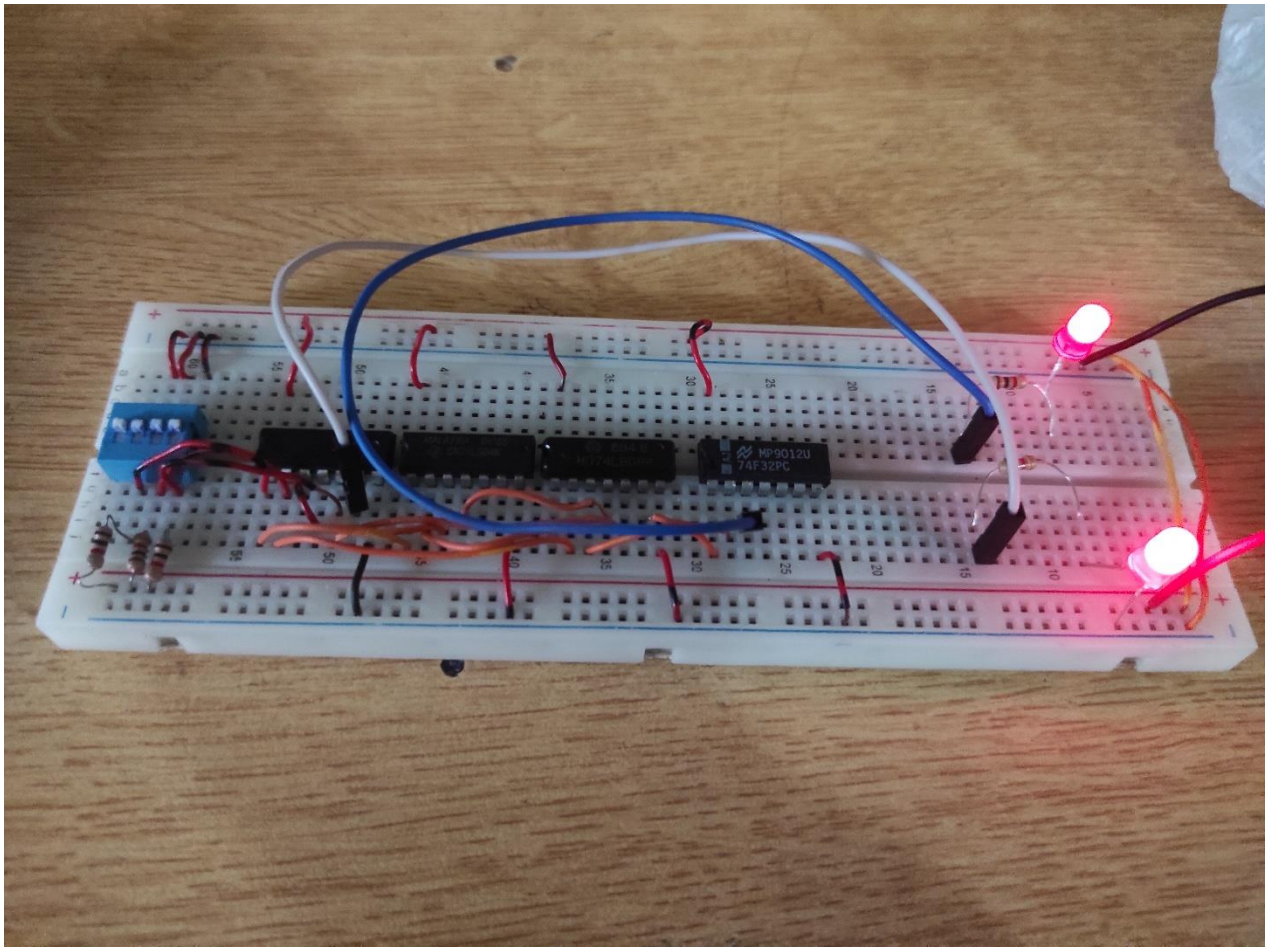
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