AIM :-

To Verify the truth table of half Subtractor by using the ICs of XOR, NOT and AND gates and of full Subtractor by using the ICs of XOR, AND NOT and OR gates respectively and analyses the Working of half Subtractor and full Subtractor circuit with the help of LED's in Simulator 1 and verify the truth table only of half Subtractor and full Subtractor in Simulator 2.

Theory :-

Introduction :-

Subtractor circuits take two binary numbers as input and subtract one binary number input. Similar to adders. it gives out two outputs. difference and borrow (carry in the case of Adder). there are two types of Subtractor.

1) Half Subtractor.

2) full Subtractor.

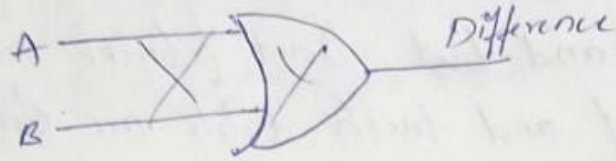
1) Half Subtractor :-

The half subtractor is a Combinational Circuit which is used to perform subtraction of two bit. it has two inputs. A [minuend) and B [subtrahend] and two outputs difference and Borrow. the logic symbol and truth table are shown below.

figure :1: logic symbol of Half subtractor.

Inputs		Outputs	
A	B	Difference	Borrow
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

Fig2: Truth table of Half subtractor.



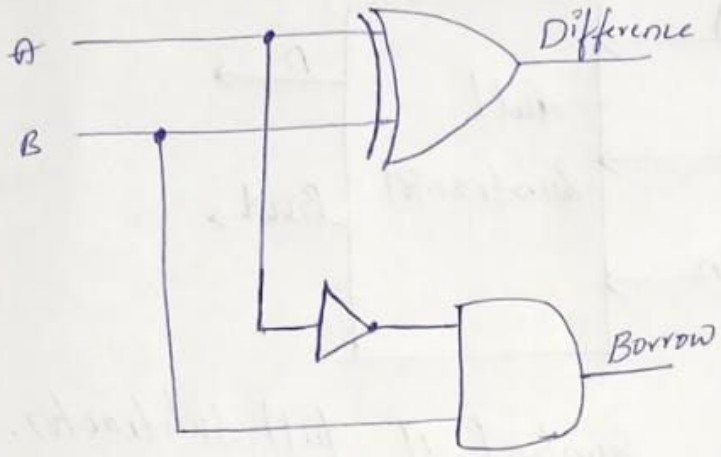


fig-3:- circuit diagram of Half Subtractor.

From the above truth table we can find the boolean expression

Difference - $A \oplus B$

Borrow - $A'B$.

from the equation we can draw the half-subtractor circuit as show in the figure 3.

2] Full Subtractor :-

A full subtractor is a combinational circuit that performs subtraction involving three bits. namely A [minuend] B [subtrahend], and Bin [borrow-in] it accepts three inputs A [minuend], B [subtrahend]

and Bin [borrow bit] and it produces two outputs D (difference) and but Bout [borrow out]. The logic symbol and truth table are shown bela

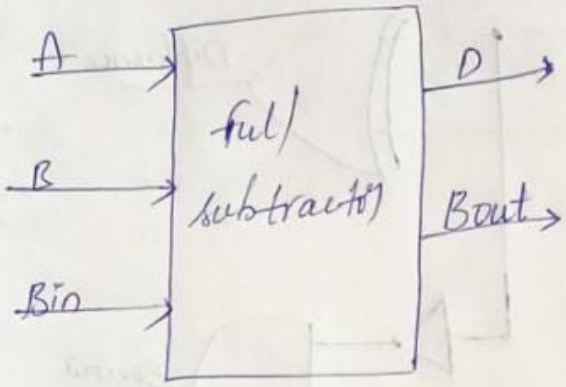


Fig 4:- logic symbol of full subtractor.

A	B	Bin	D	Bout
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

Fig 5:- Truth table of full subtractor

from the above truth table we can find the boole Expression

$D - A \oplus B \oplus Bin$

$Bout - A'Bin + A'B + B Bin$.

from the equation we can draw the full - Subtractor circuit as shown in the fig 6

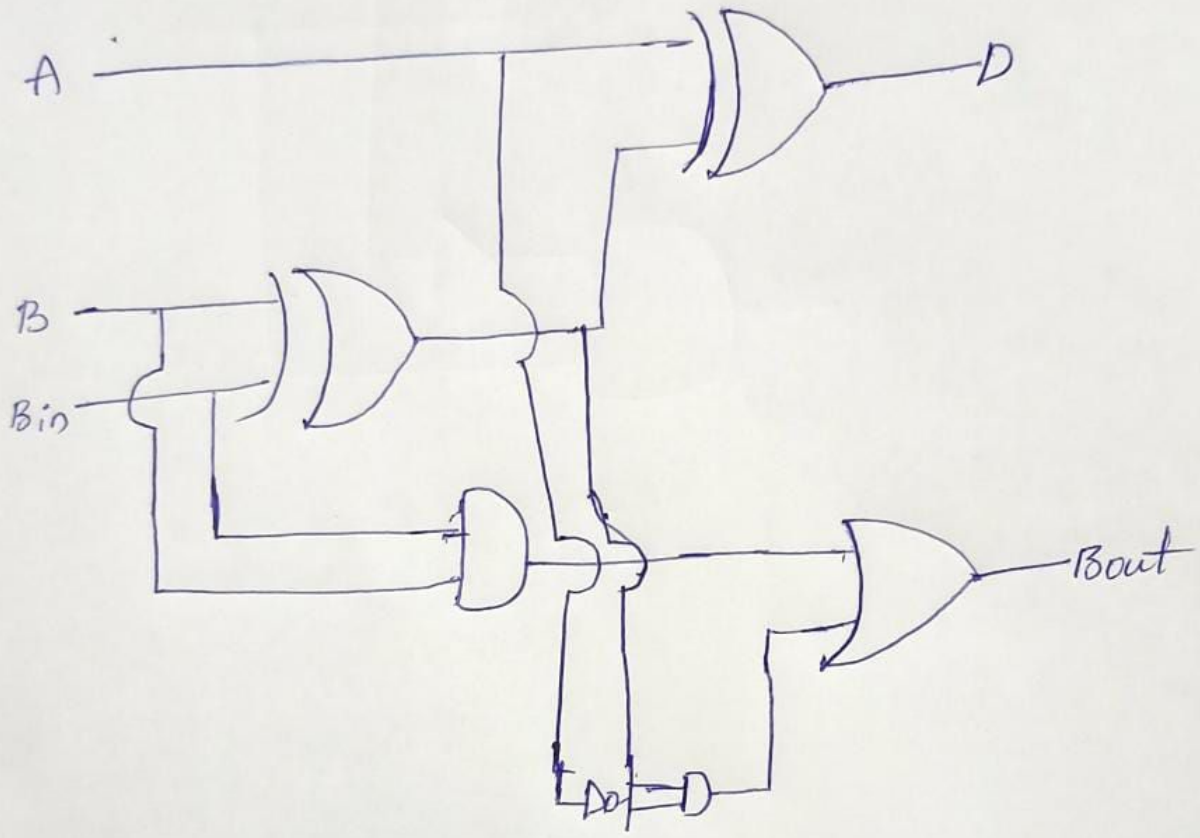
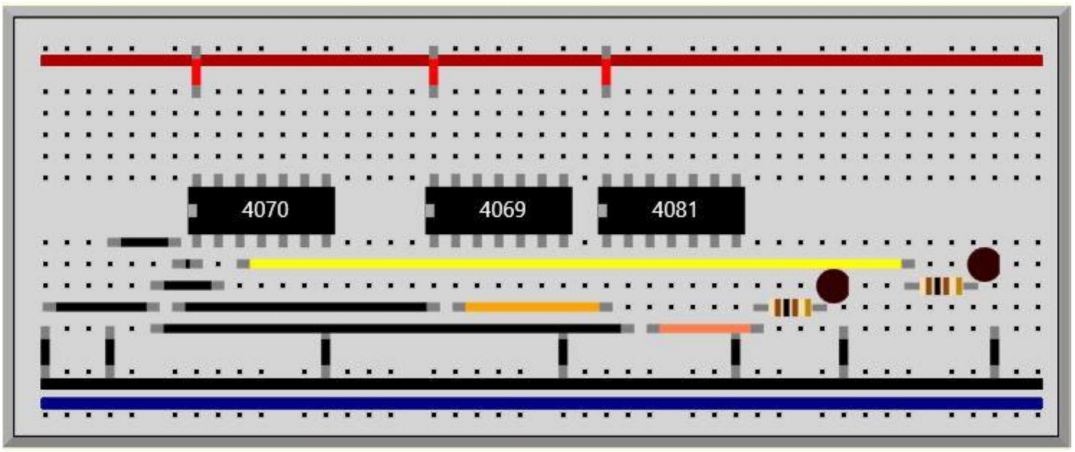


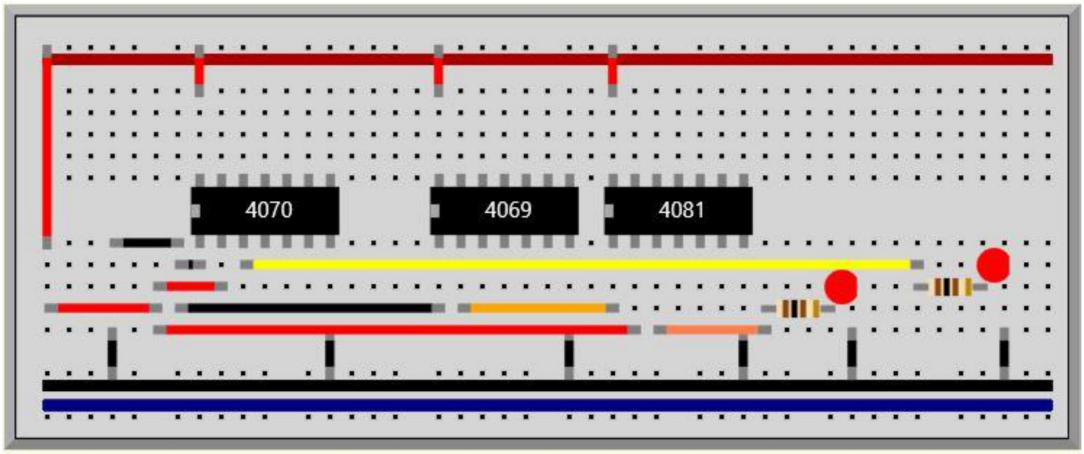
Fig 6: Circuit diagram of full Subtractor.

HALF SUBTRACTOR

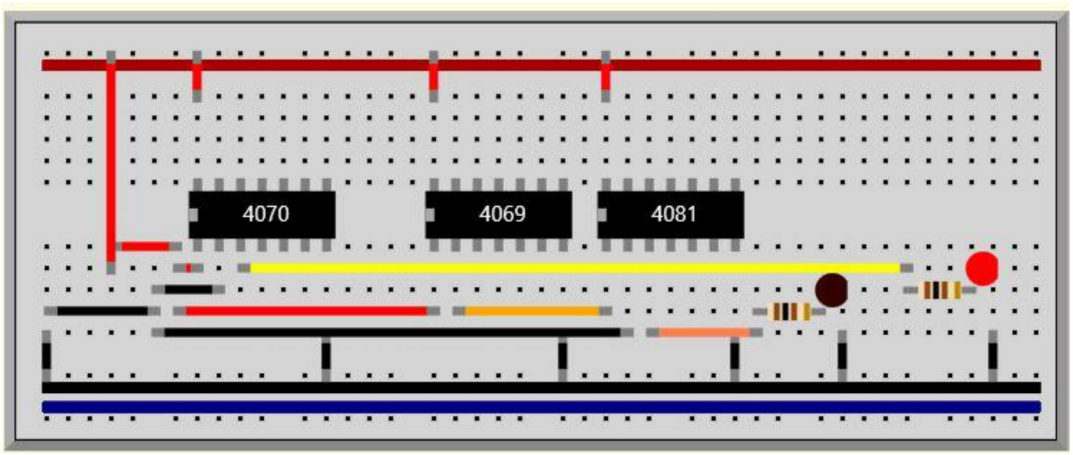
Input: A0 B0 Output:B0 D0



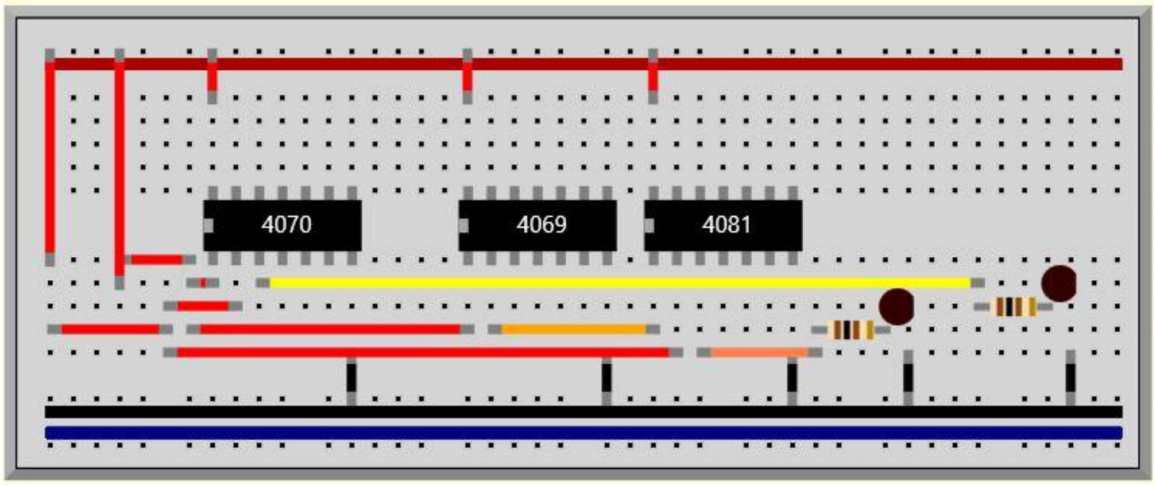
Input: A0 B1 Output:B1 D1



Input: A1 B0 Output:B0 D1

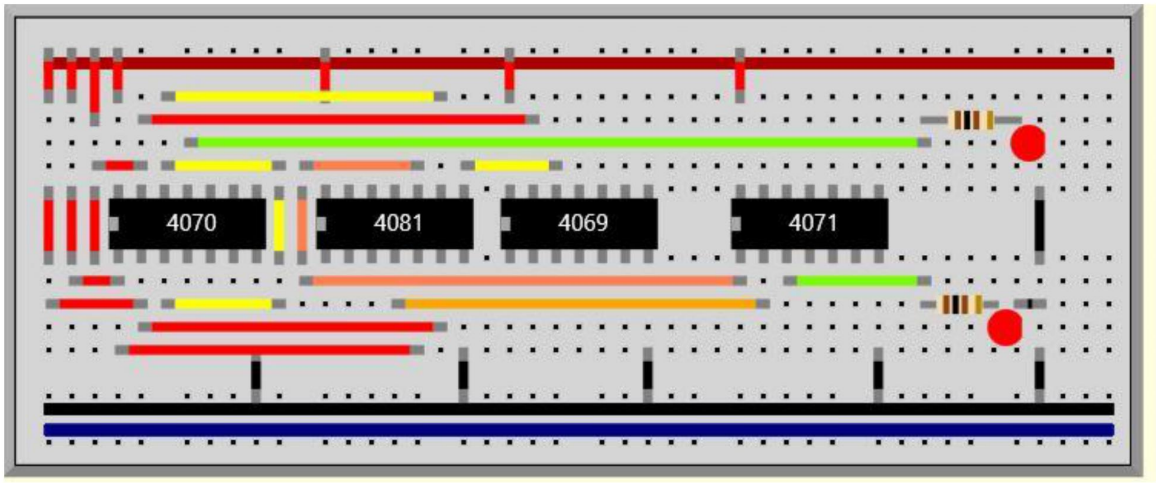


Input: A1 B1 Output:B0 D0

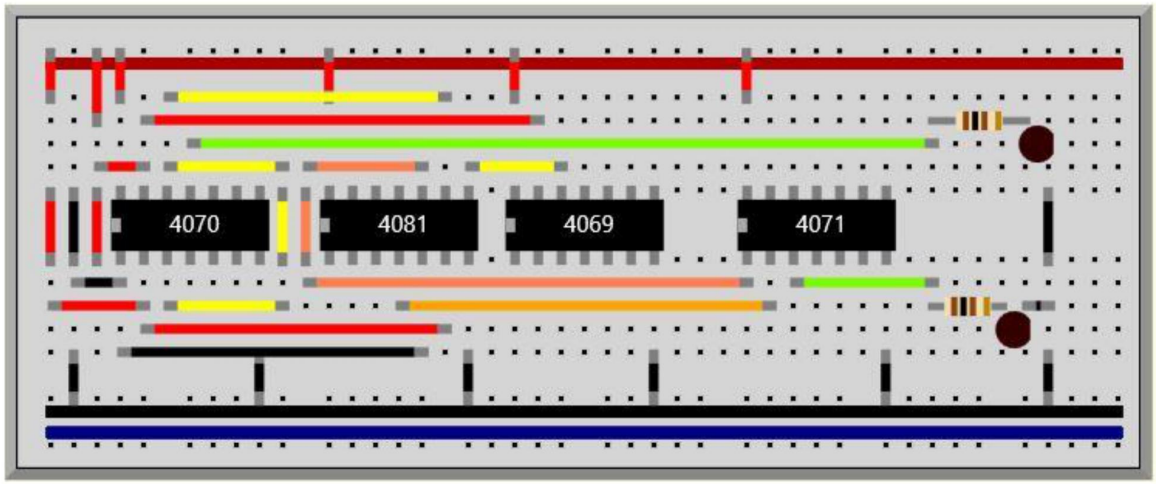


FULL SUBTRACTOR

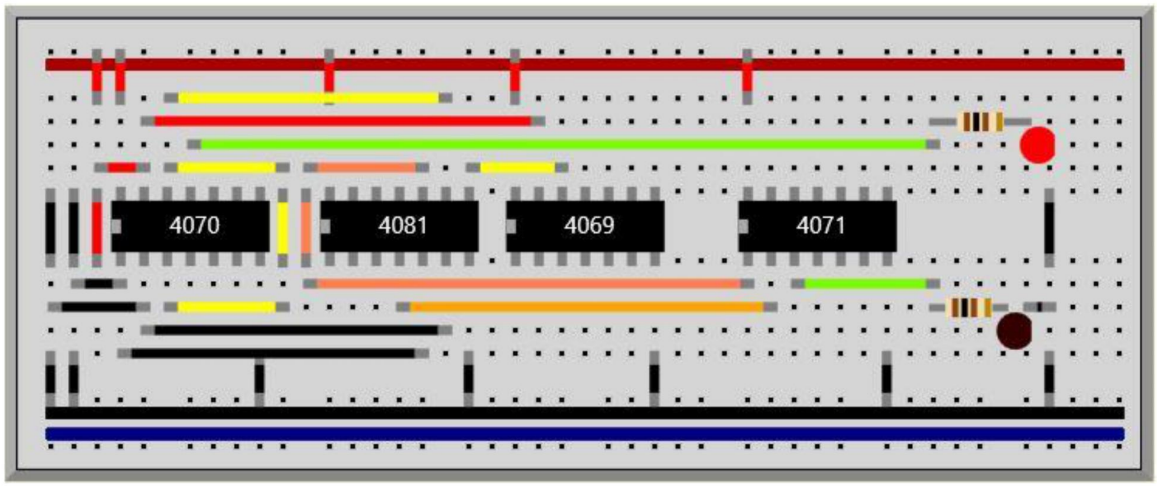
Input: A1 B1 Bin1 Output:Bout1 D1



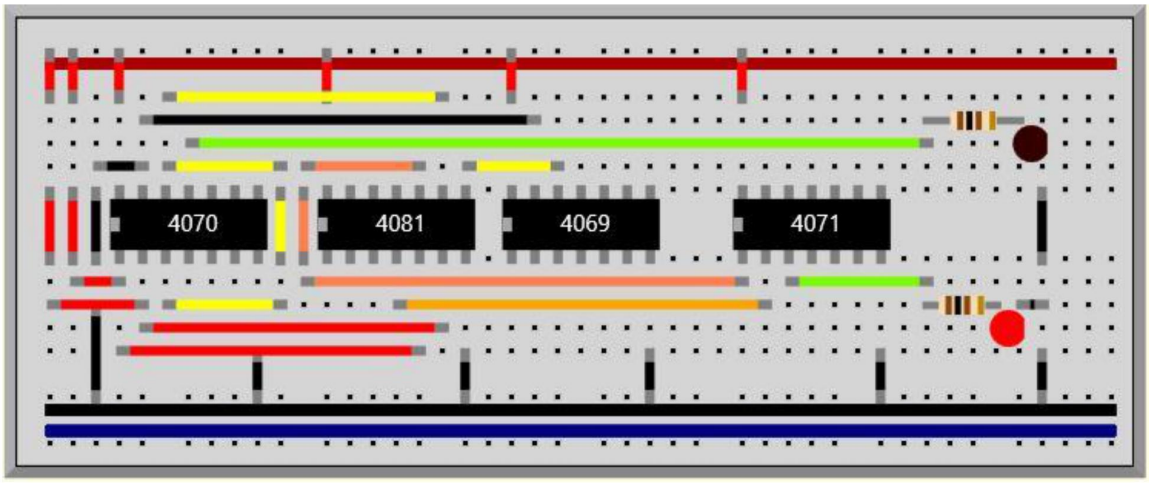
Input: A1 B0 Bin1 Output:Bout0 D0



Input: A1 B0 Bin0 Output:Bout0 D1



Input: A0 B1 Bin1 Output:Bout1 D0



Input: A0 B1 Bin0 Output:Bout1 D1