Lab 6

To Demonstrate the Working of Binary Subtractor

Note: You may draw all the logic diagrams with hand and paste the pictures here or on logicly software with your name, roll number & section mentioned in your workspace. Make sure that all of your connections are clearly visible and distinguishable.

Tasks

1. **Construct a logic circuit for half and full subtractor with the help of truth table/Boolean expression. Also write the Boolean expression for output(s).**

Half Subtractor

a) Truth Table

X	Y	Difference	Borrow-out
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

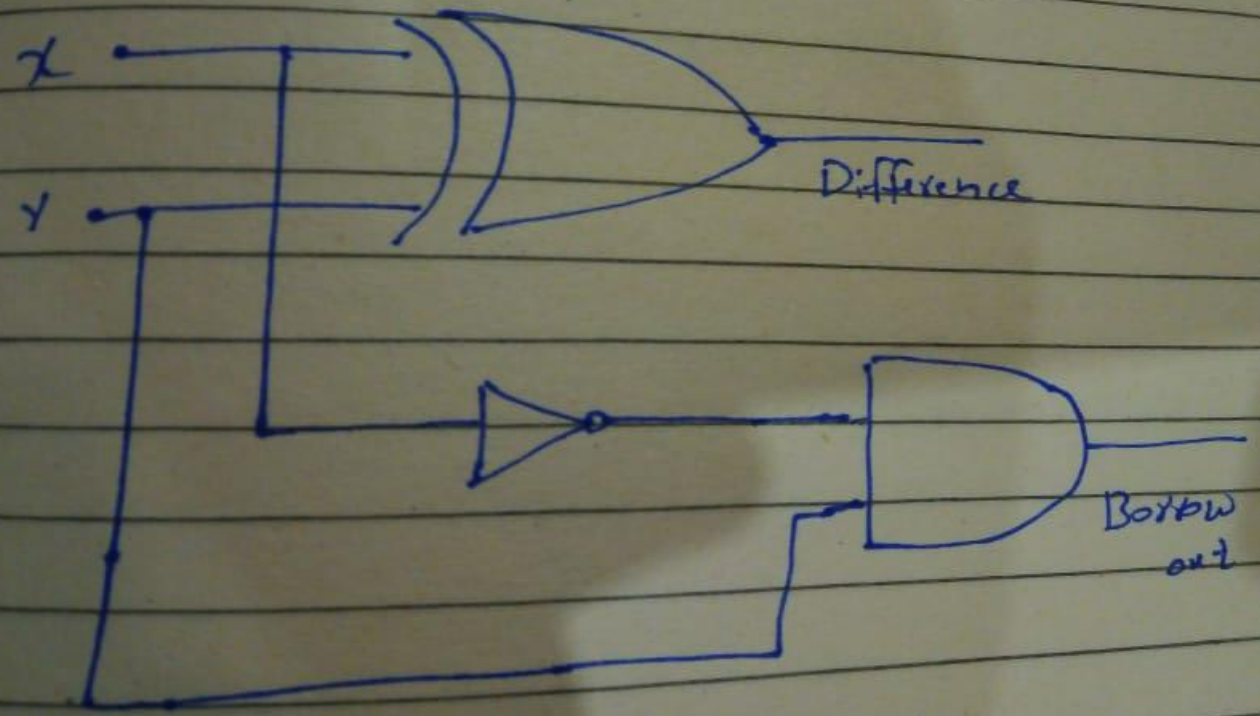
b) Boolean Expression (Simplified)
Difference: $X \oplus Y = X \text{ XOR } Y$
Borrow Out: X'. Y = Not-X AND Y

c) Logic Diagram

M T W T F S

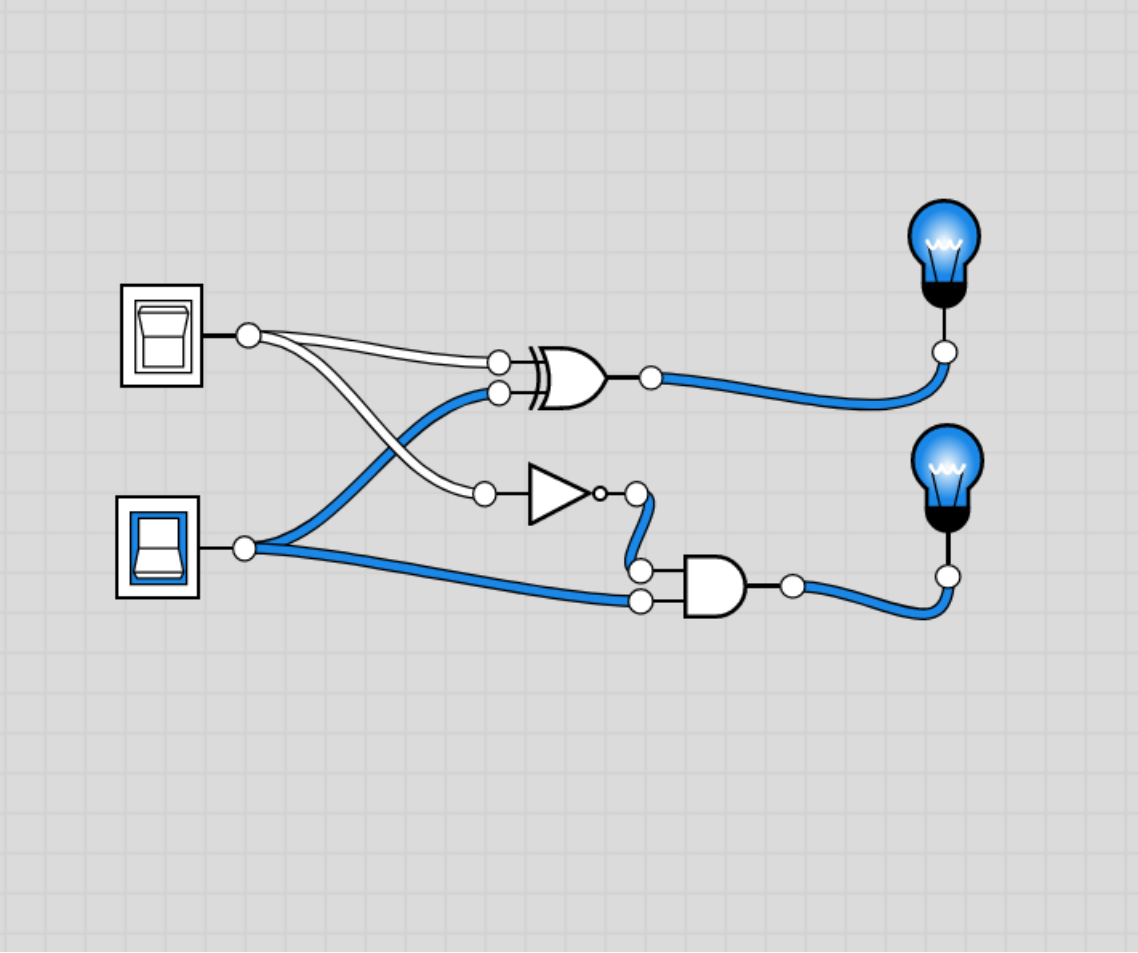
Date: __/__/20__

→ Logic Diagram Of Half Subtractor:

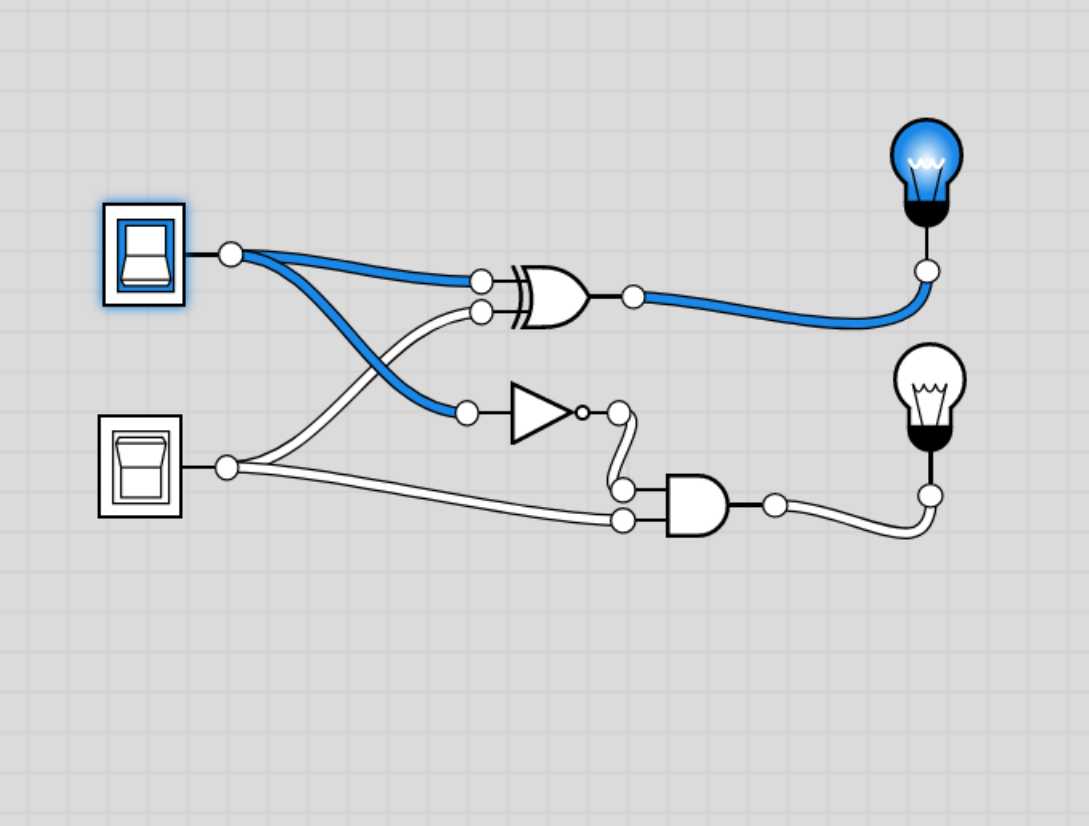


d) Software Simulation (Show here your results for each combination that gives a high output)

1st High Output Simulation:



2nd High Output Simulation:



Full Subtractor

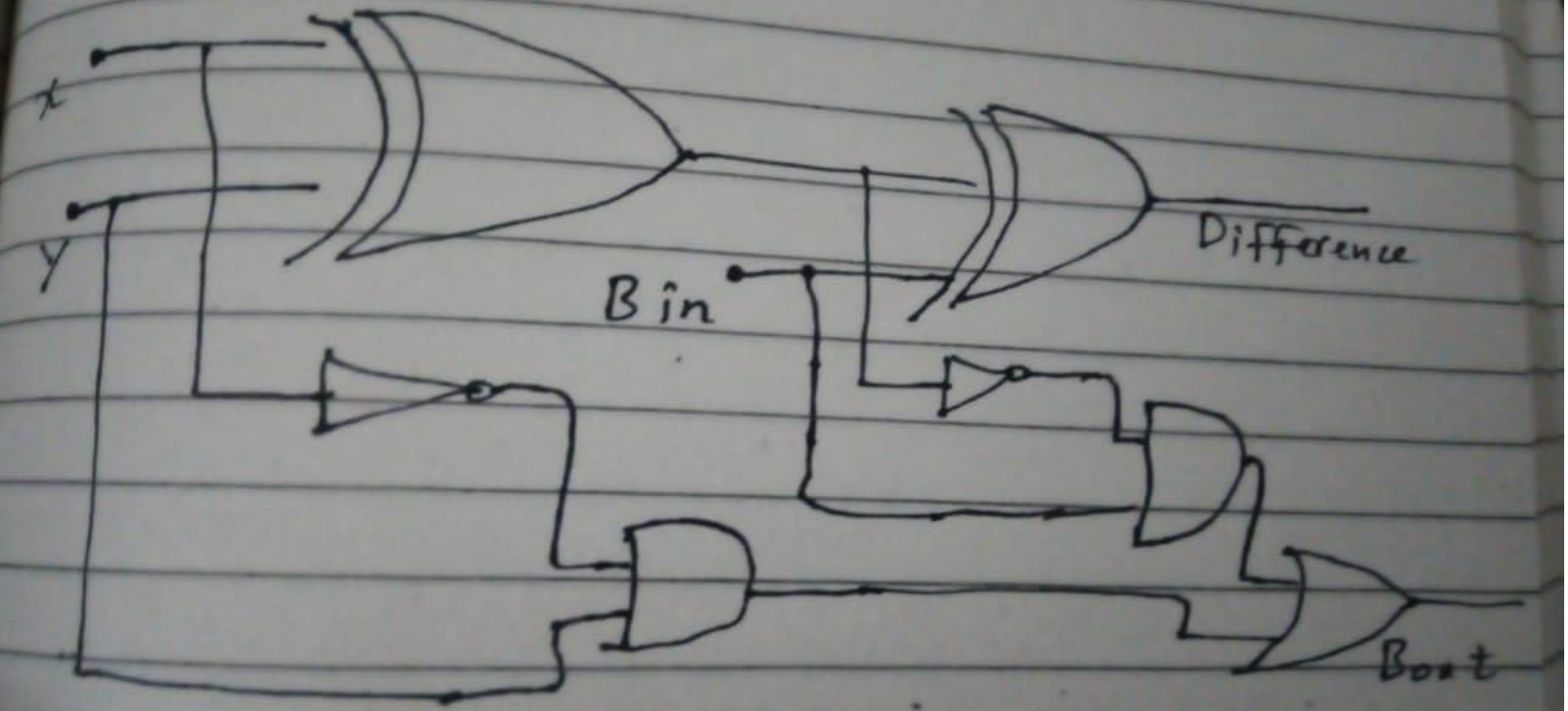
a) Truth Table

Bin	Y	X	Diff	Bout
0	0	0	0	0
0	0	1	1	0
0	1	0	1	1
0	1	1	0	0
1	0	0	1	1
1	0	1	0	0
1	1	0	0	1
1	1	1	1	1

b) Boolean Expression (Simplified)
Difference: (X XOR Y) XOR Bin = $(X \oplus Y) \oplus Bin$
Borrow Out: X' AND Y OR (X XOR Y)' Bin $= (X \oplus Y)'$ Bin

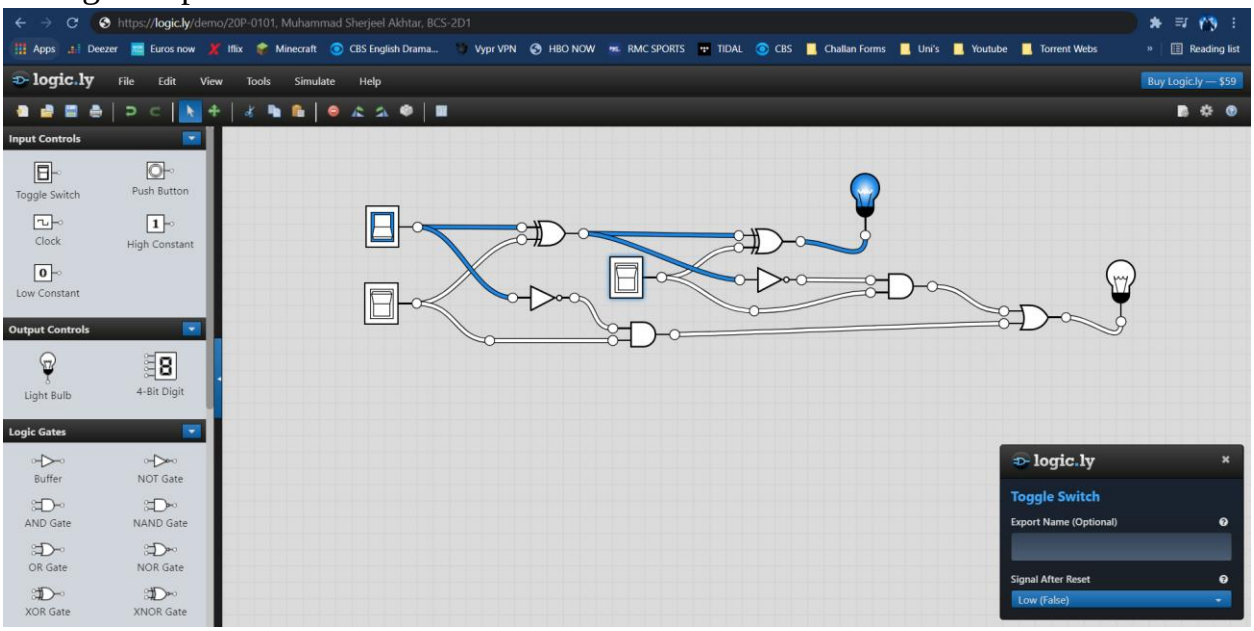
c) Logic Diagram

→ Logic Diagram Of Full Adder:

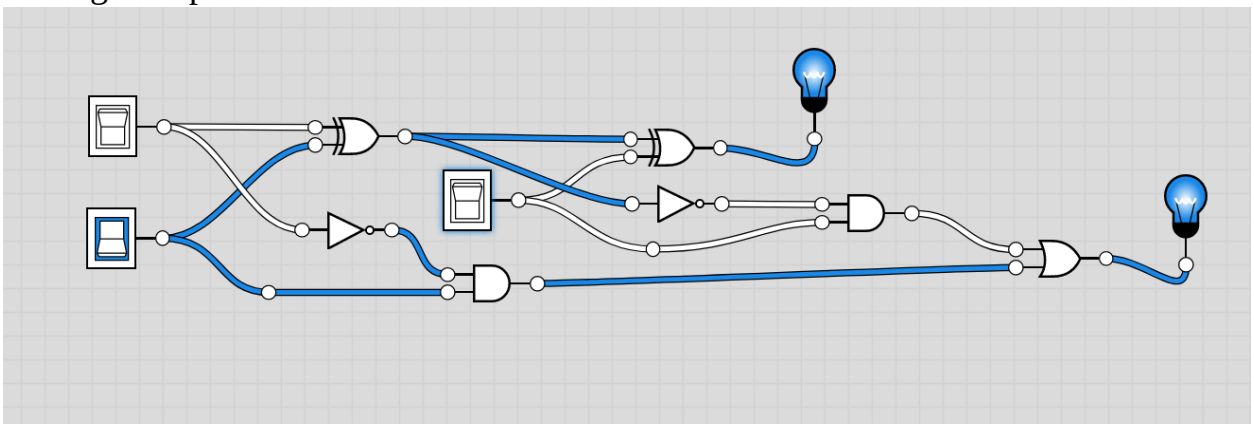


d) Software Simulation (Show here your results for each combination that gives a high output)

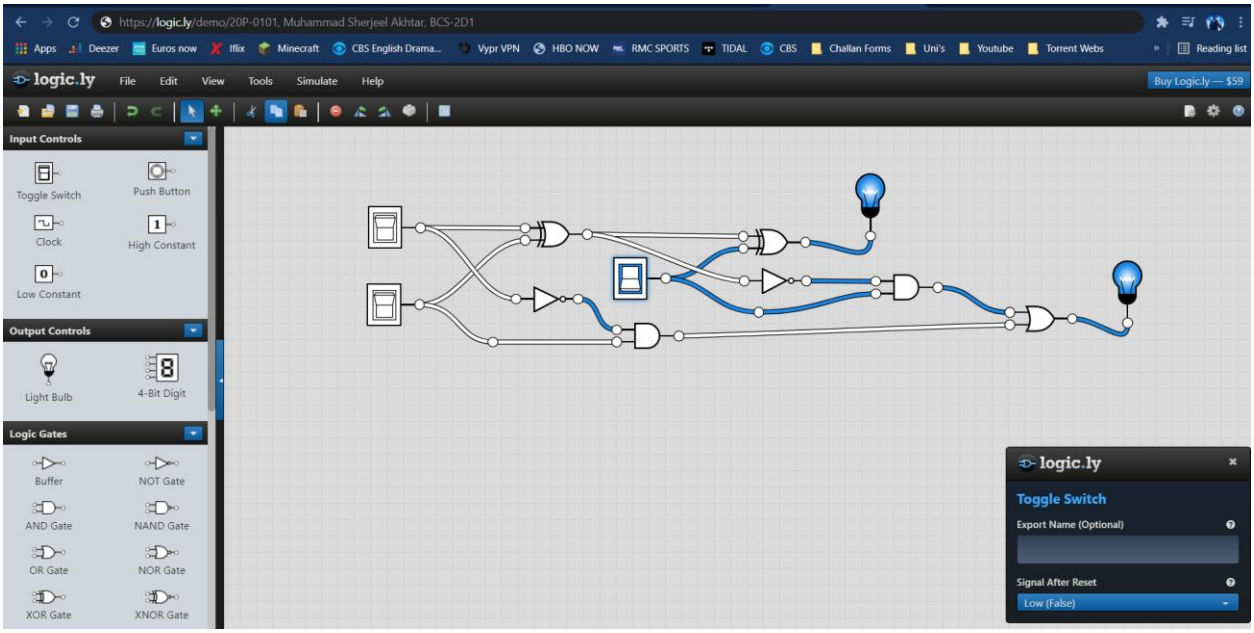
1st High Output:



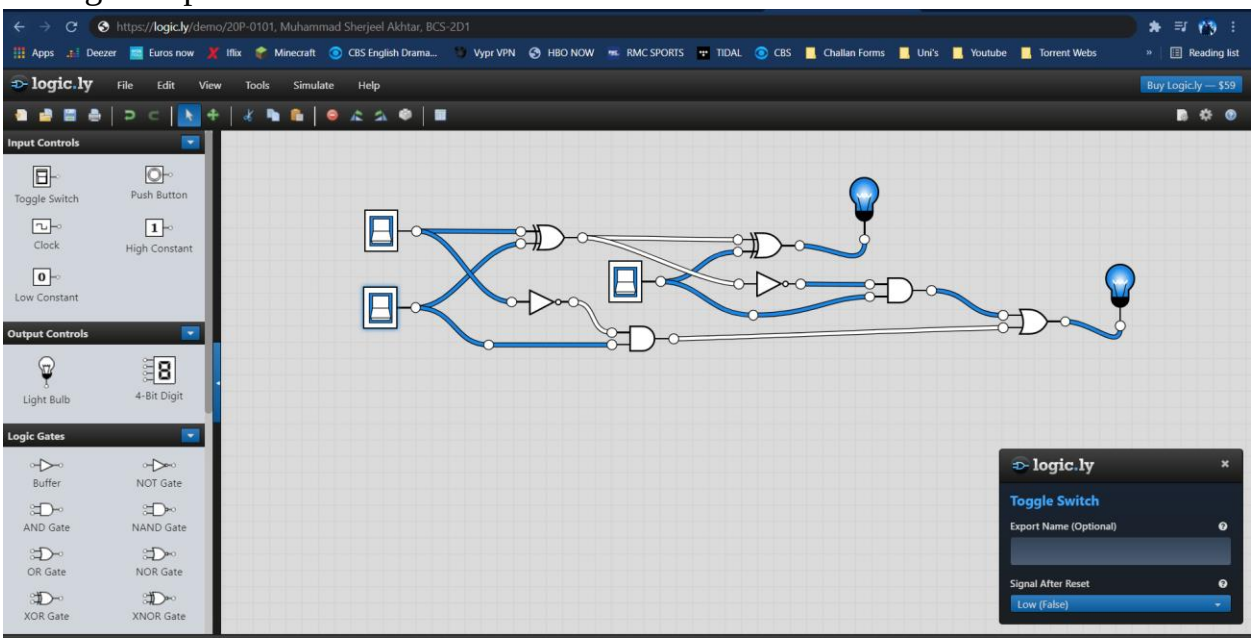
2nd High Output:



3rd High Output:

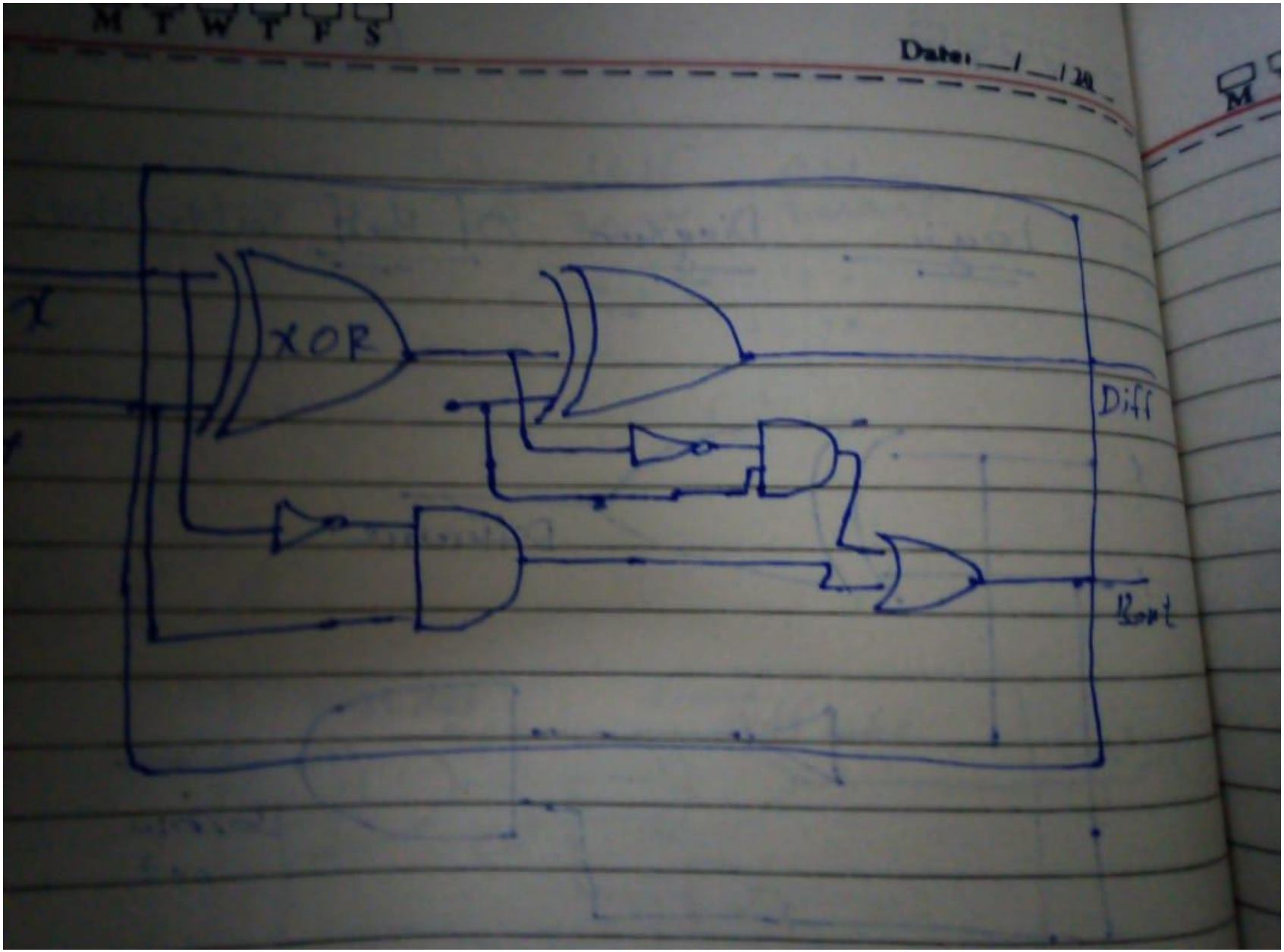


4th High Output:



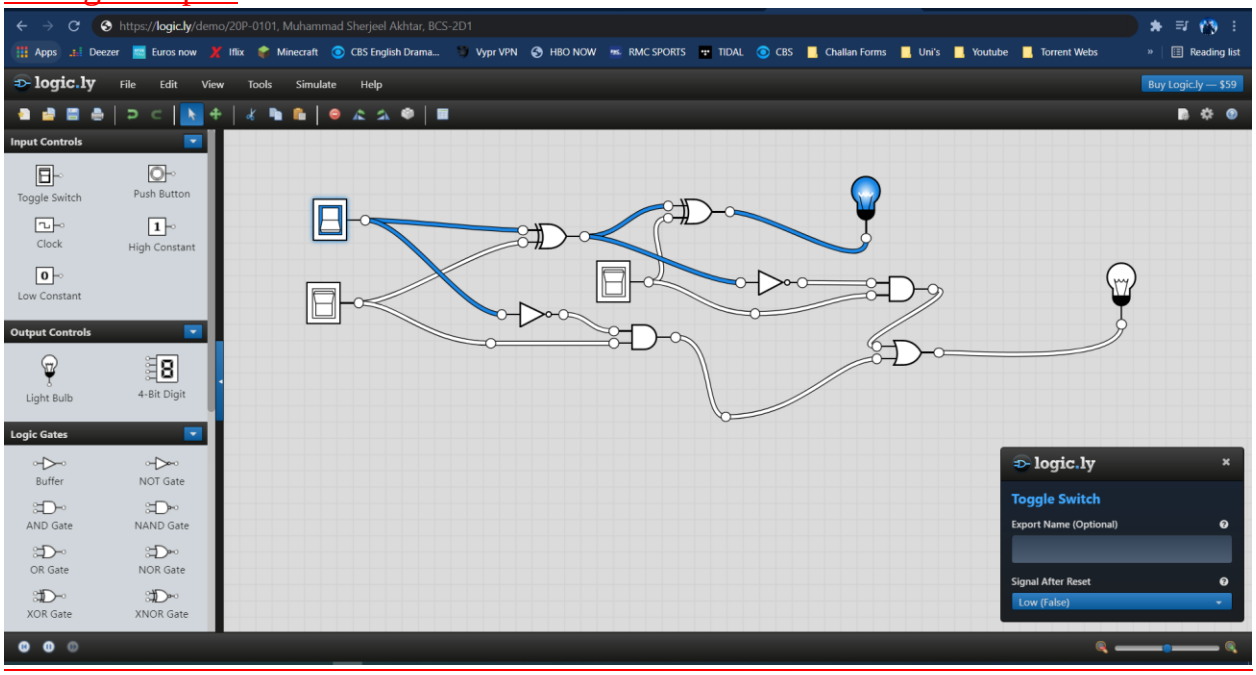
2. **A full subtractor can be implemented using 2-half subtractors. Demonstrate the logic diagram for the said circuit. Simulate your circuit for the verification of results.**

a) Logic Diagram of Full Subtractor using 2-Half Subtractor

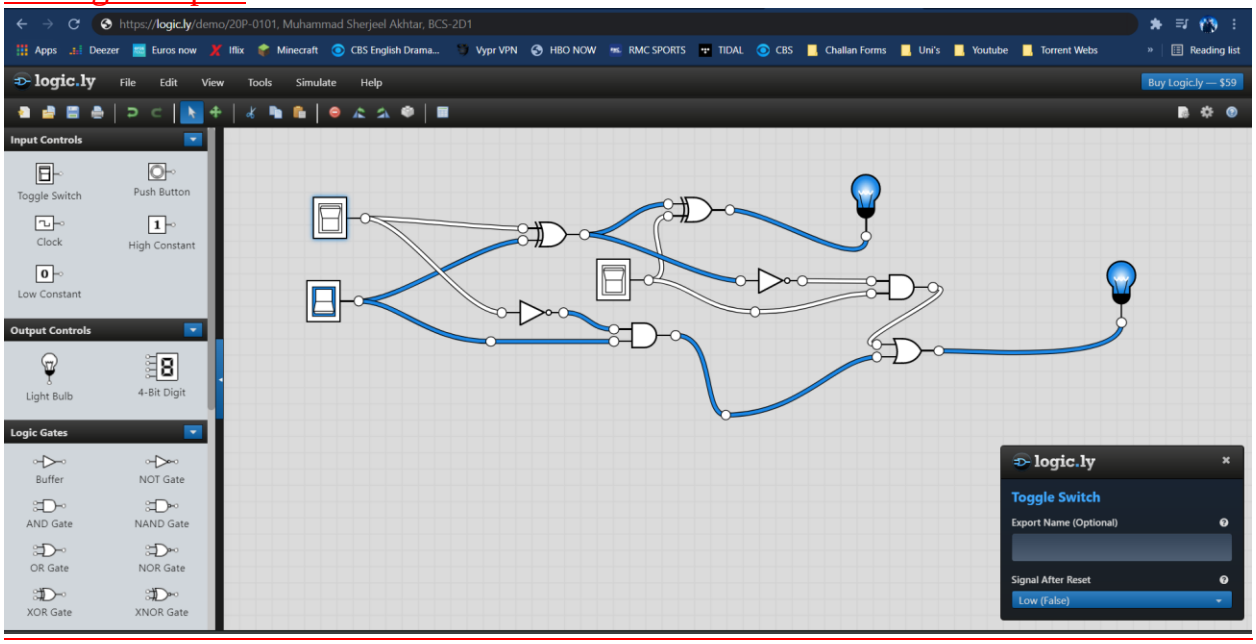

M T W T F S
Date: __/__/20
M
x
XOR
Diff
Bout

b) Software Simulation (Show here your results for each combination that gives a high output)

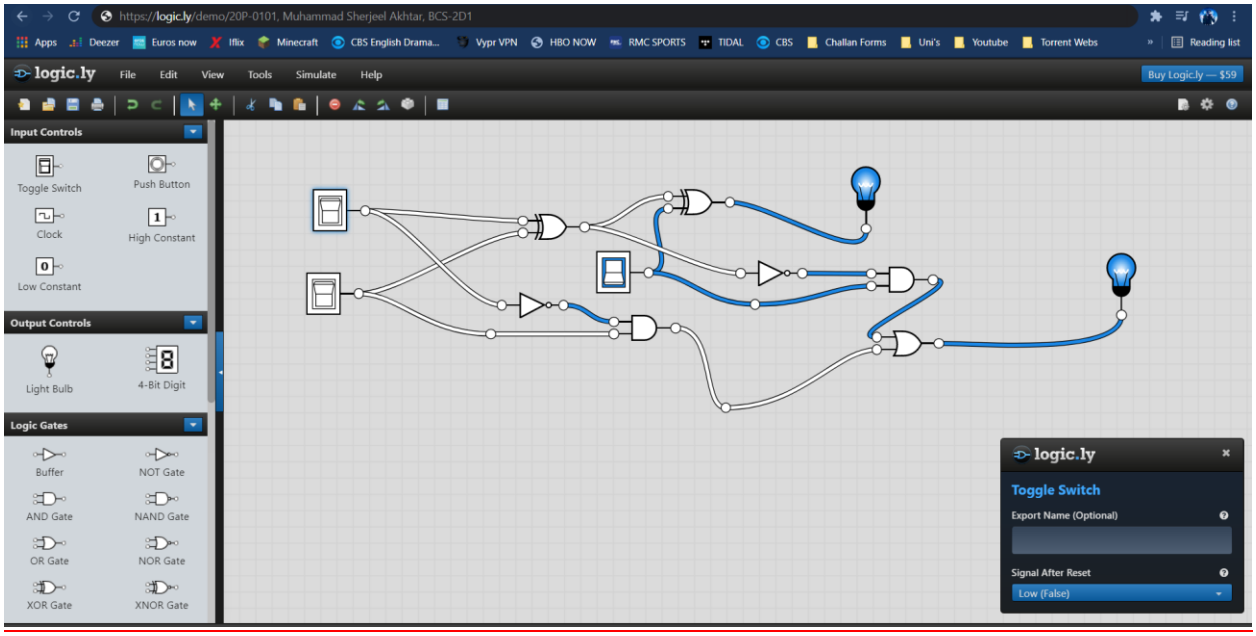
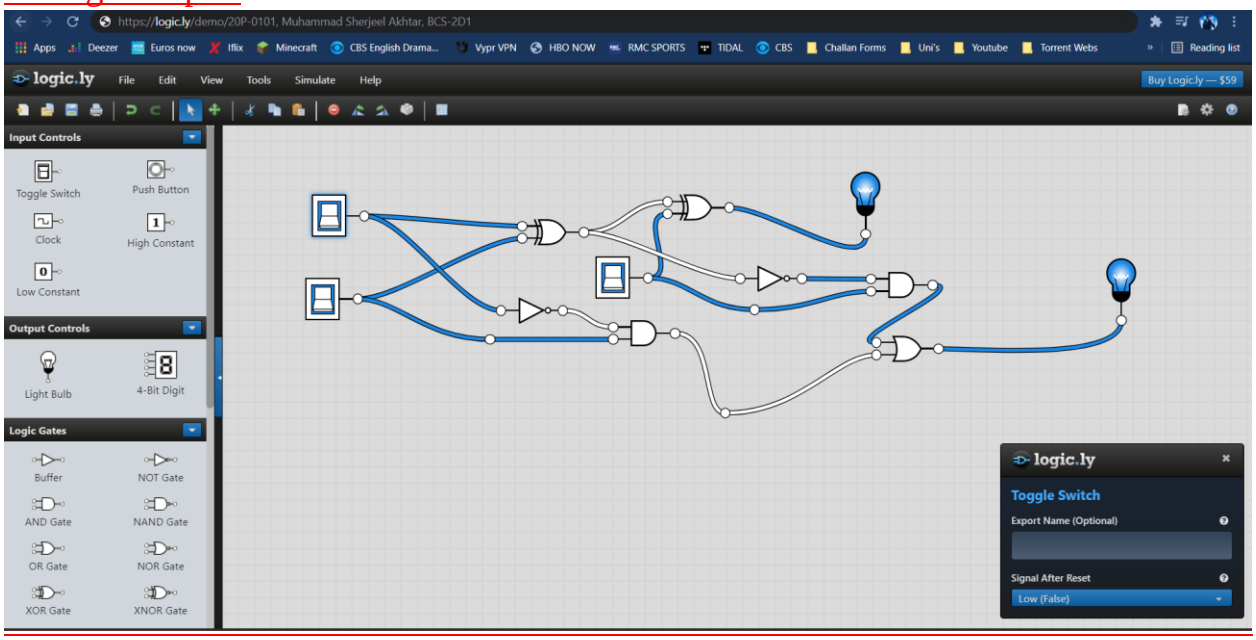
1st High Output:



2nd High Output:



3rd high Output:



4th High Output: