Lab 6

To Demonstrate the Working of Binary Subtractor

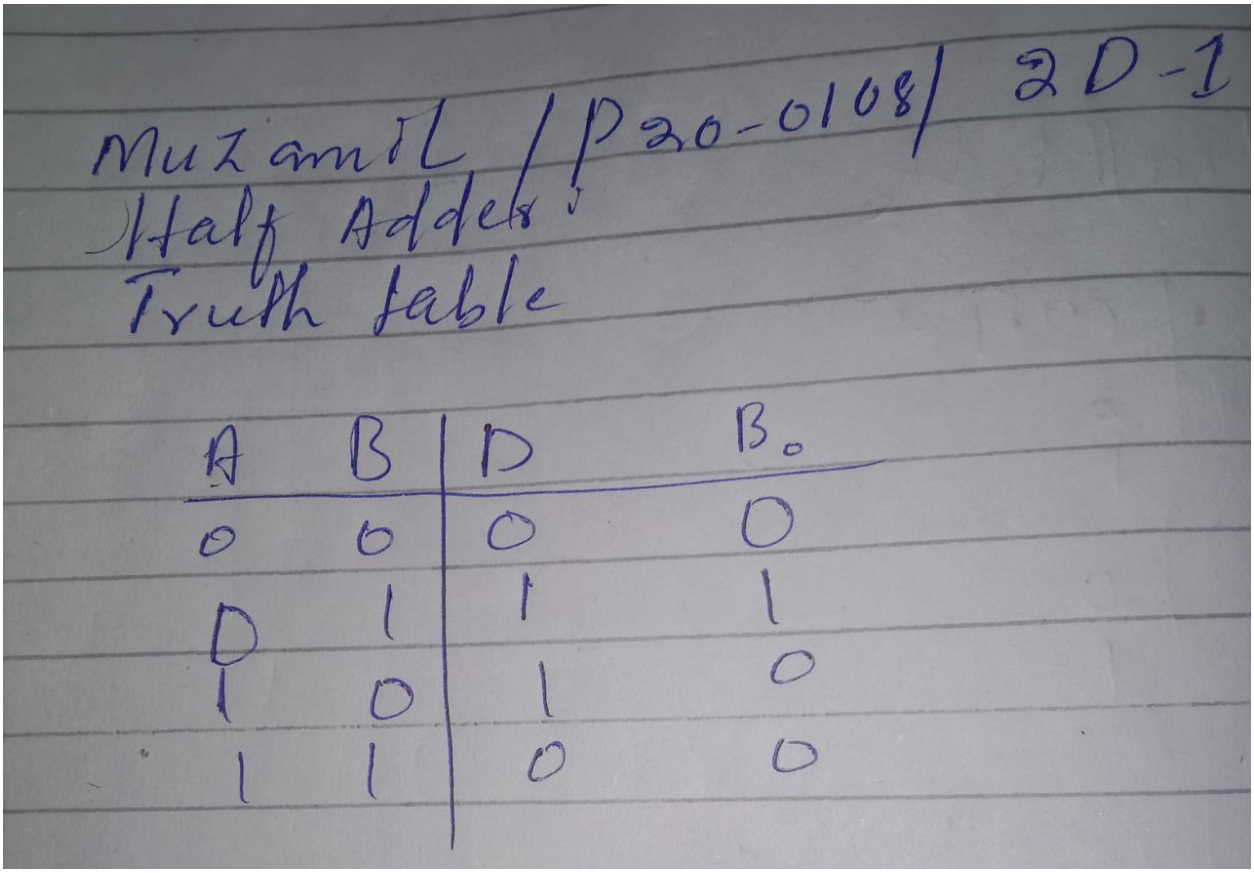
Note: You may draw all the logic diagrams with hand and paste the pictures here or on logicly software with your name, roll number & section mentioned in your workspace. Make sure that all of your connections are clearly visible and distinguishable.

Tasks

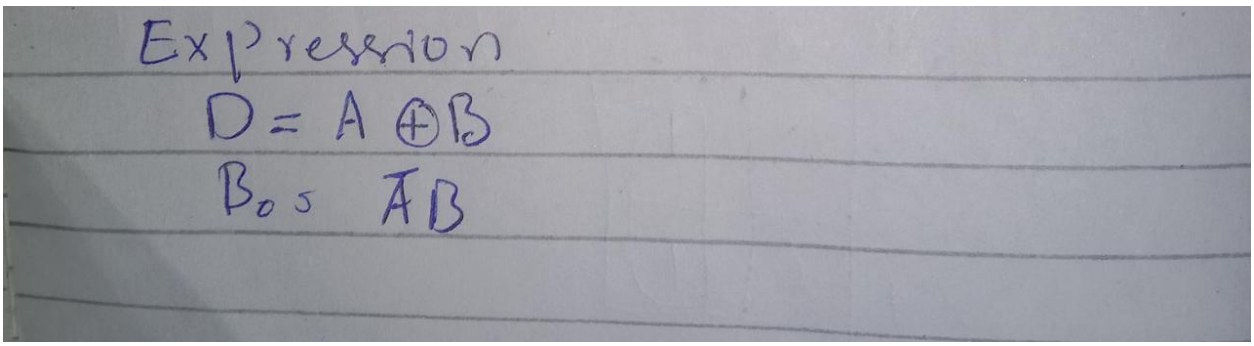
1. **Construct a logic circuit for half and full subtractor with the help of truth table/Boolean expression. Also write the Boolean expression for output(s).**

Half Subtractor

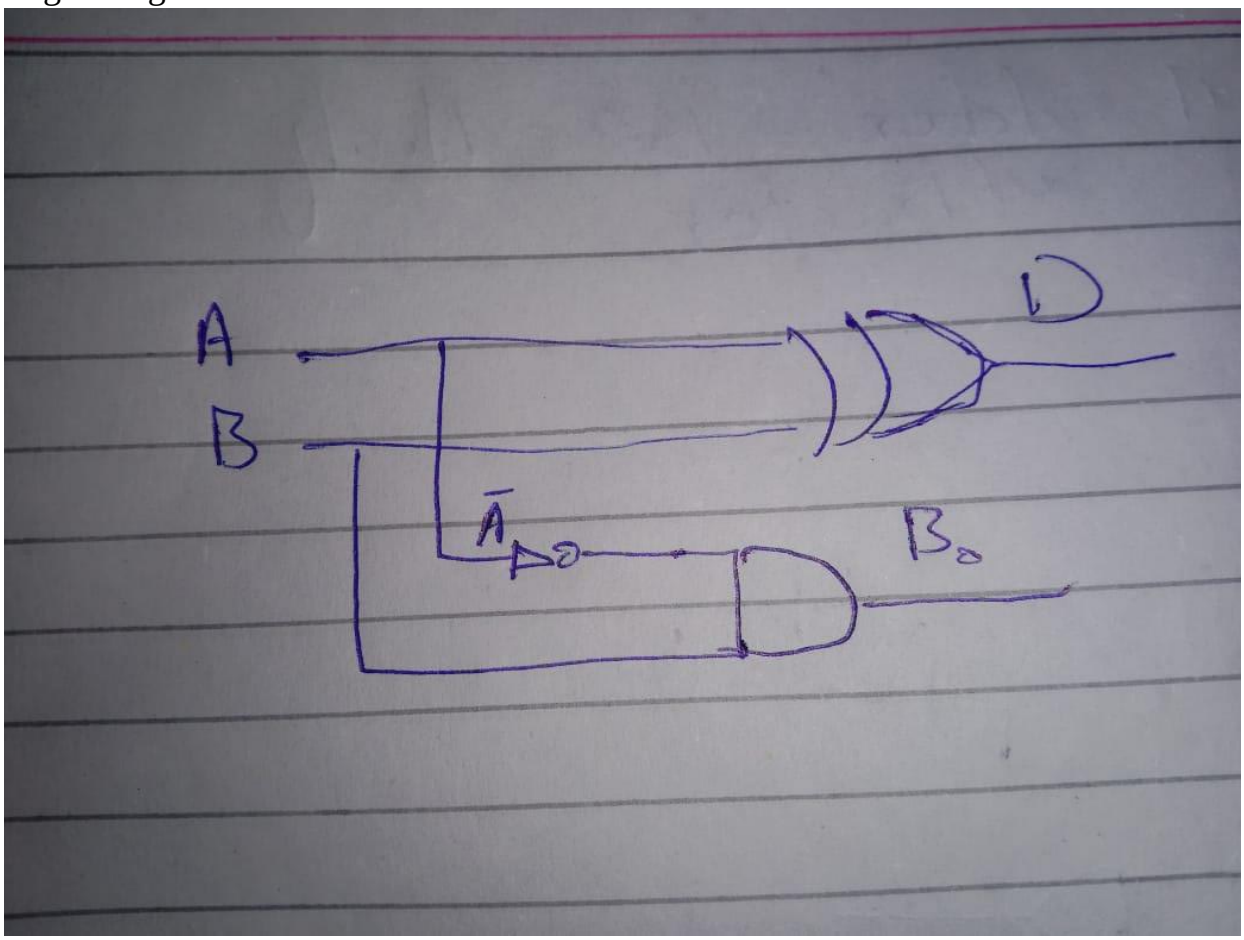
a) Truth Table



b) Boolean Expression (Simplified)

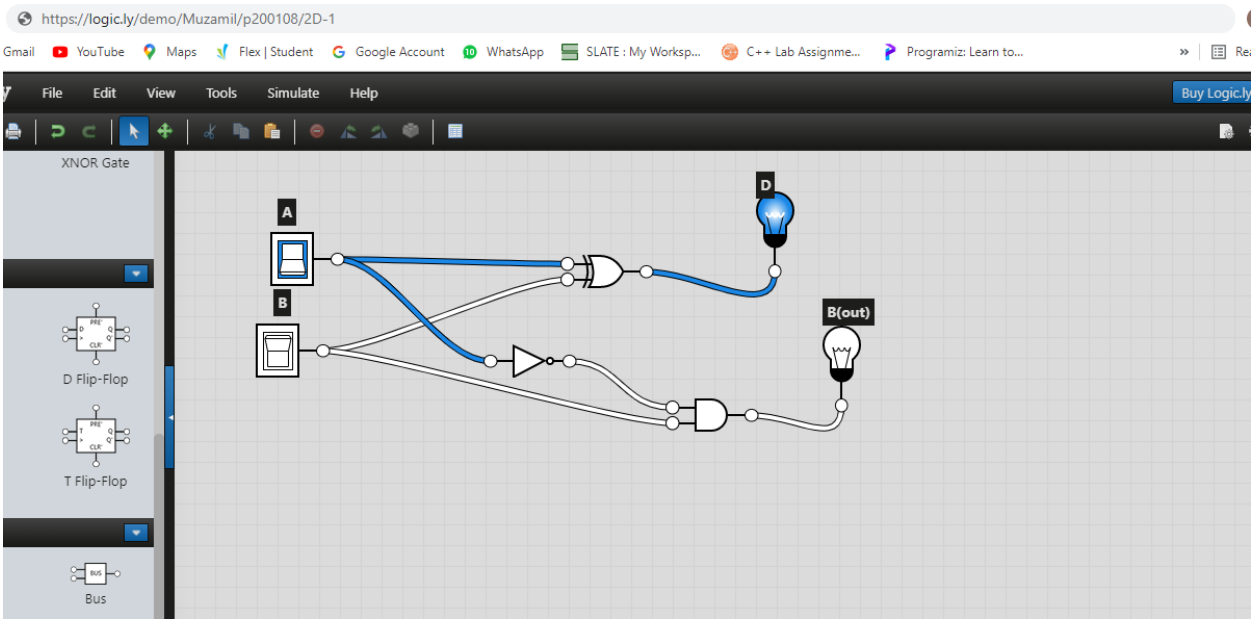


c) Logic Diagram

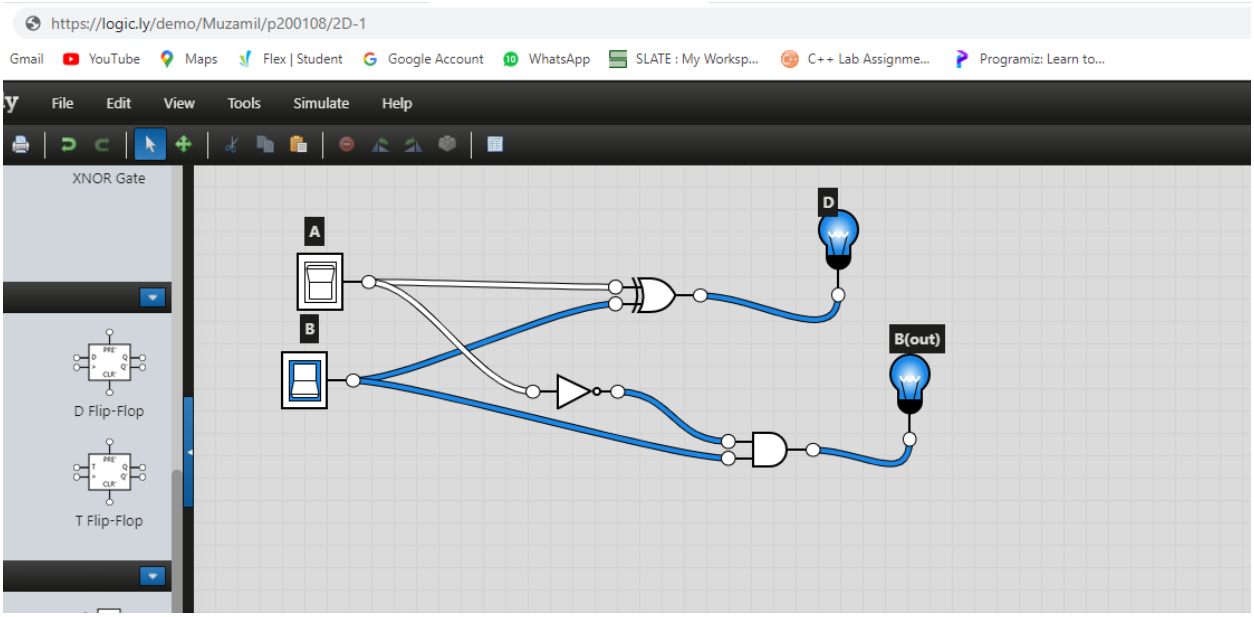


d) Software Simulation (Show here your results for each combination that gives a high output)

Inputs are 1 and 0

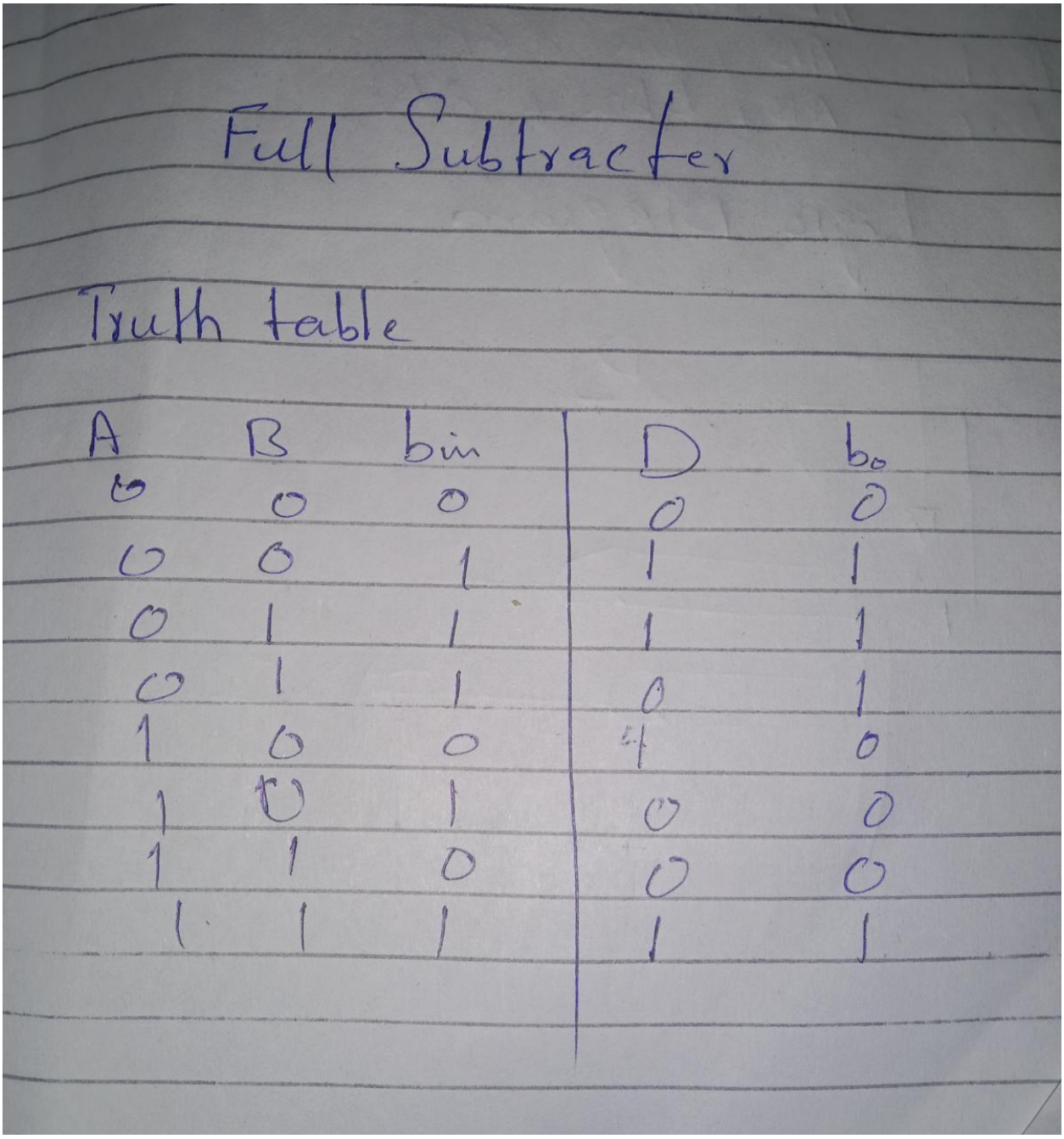


InPUTS ARE 0 AND 1



Full Subtractor

a) Truth Table



b) Boolean Expression (Simplified)

Boolean expression

$D = \bar{A}\bar{B}b_{in} + \bar{A}B\bar{b_{in}} + A\bar{B}\bar{b_{in}} + ABb_{in}$

$= \bar{A}(\bar{B}b_{in} + Bb_{in}) + A(\bar{B}\bar{b_{in}} + Bb_{in})$

$D = \bar{A} \oplus B \oplus b_{in}$

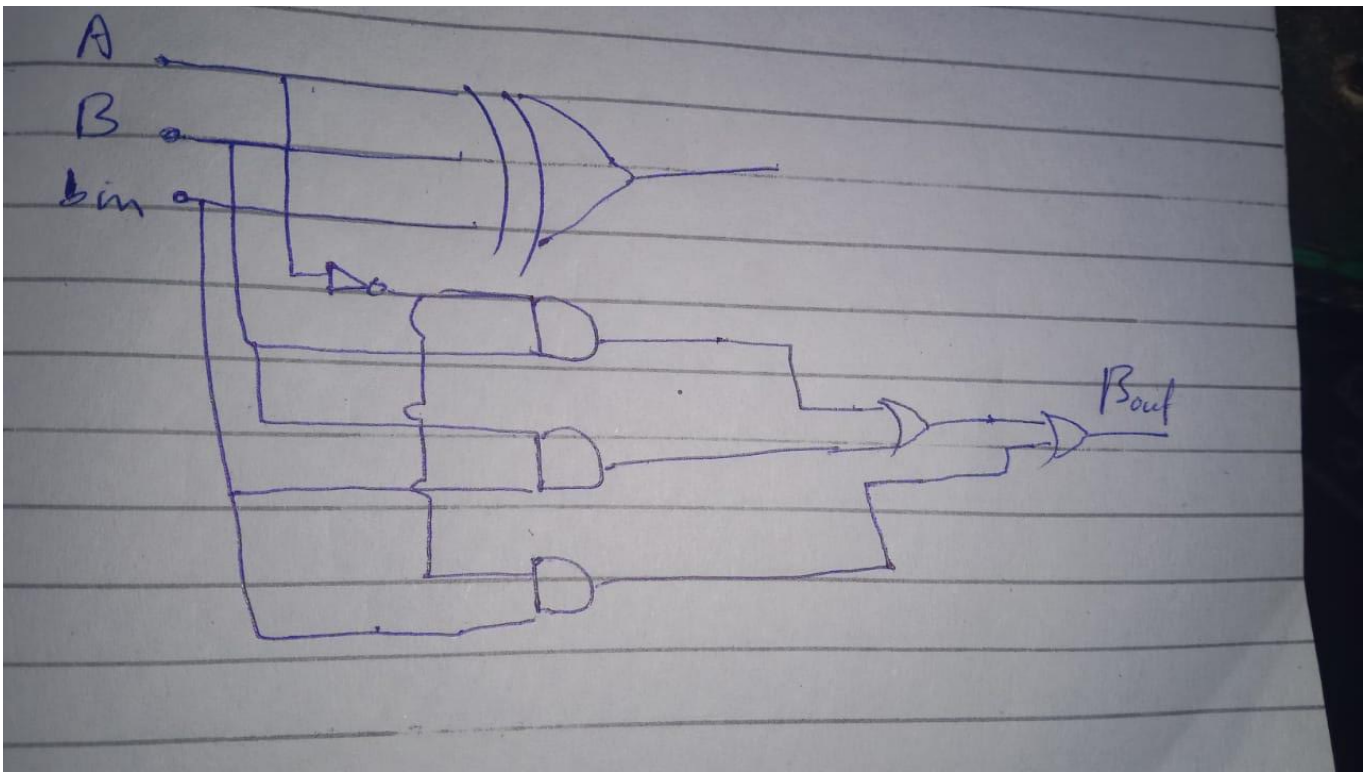
$B_{out} = \bar{A}\bar{B}b_{in} + \bar{A}B\bar{b_{in}} + \bar{A}\bar{B}b_{in} + ABb_{in}$

$= \bar{A}B(\bar{b_{in}} + b_{in}) + b_{in}(\bar{A}\bar{B} + AB)$

$B_{out} = \bar{A}B + b_{in}(A \odot B)$

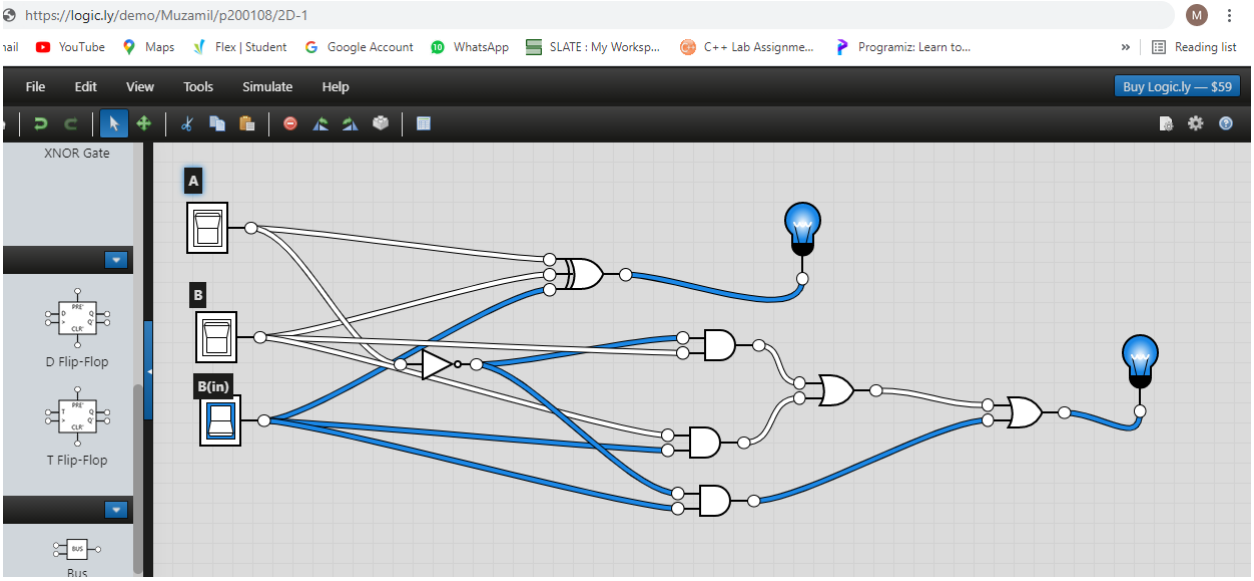
$B_{out} = A'B + Bb_{in} + A'Bi$

c) Logic Diagram

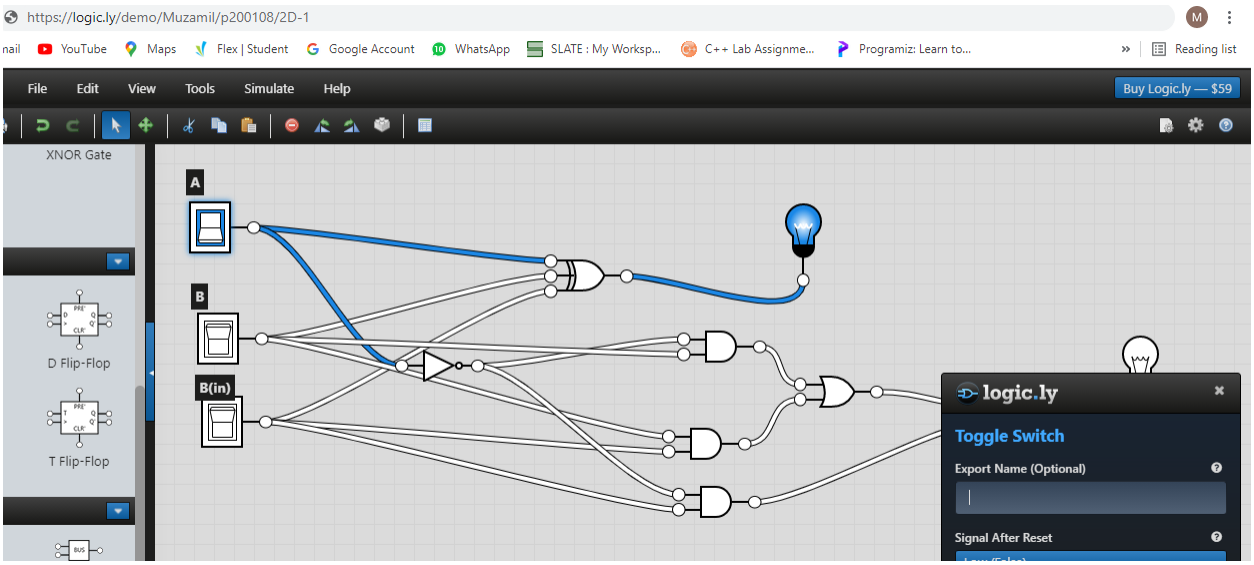


d) Software Simulation (Show here your results for each combination that gives a high output)

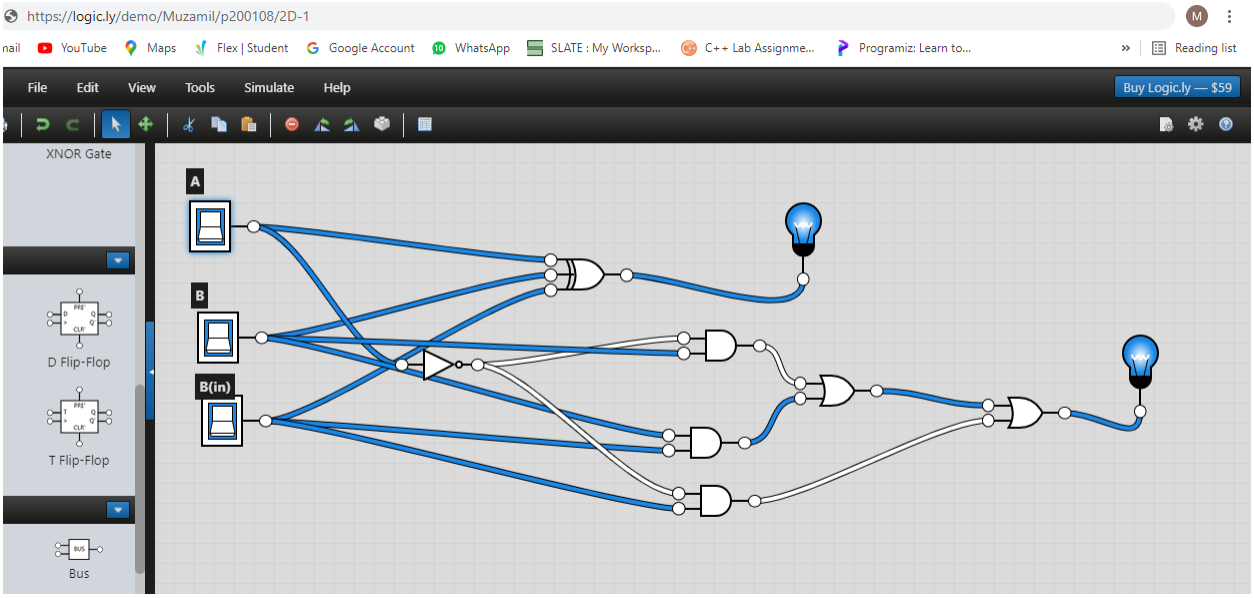
Inputs are 001 and output is 1 and Bout is also 1



Inputs are 100 and output is 1 and Bout is 0

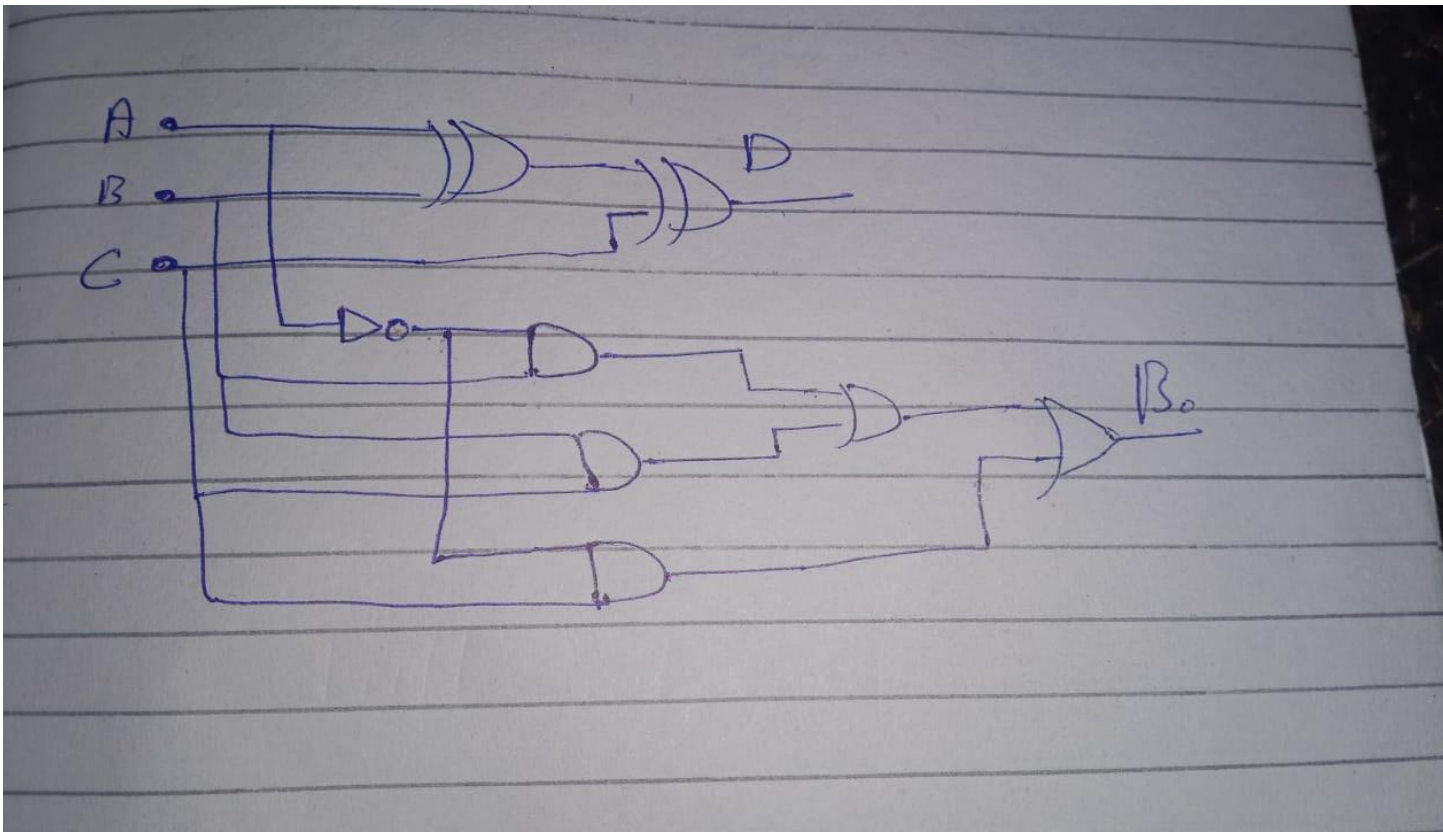


Inputs are 111 and output is 1 and Bout is also 1



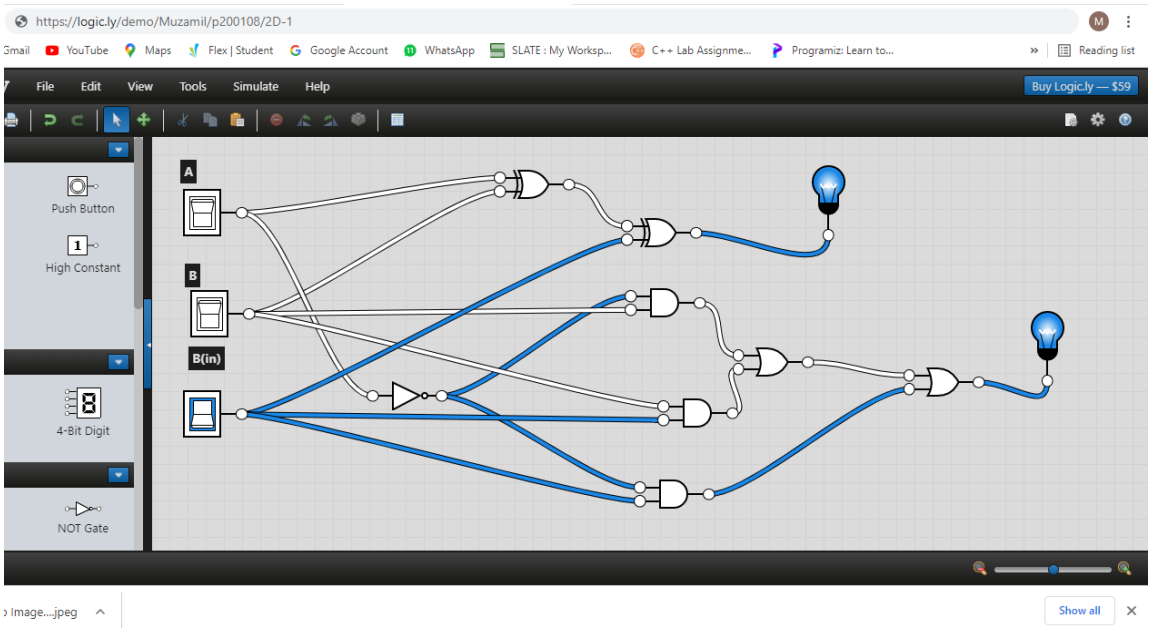
2. **A full subtractor can be implemented using 2-half subtractors. Demonstrate the logic diagram for the said circuit. Simulate your circuit for the verification of results.**

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

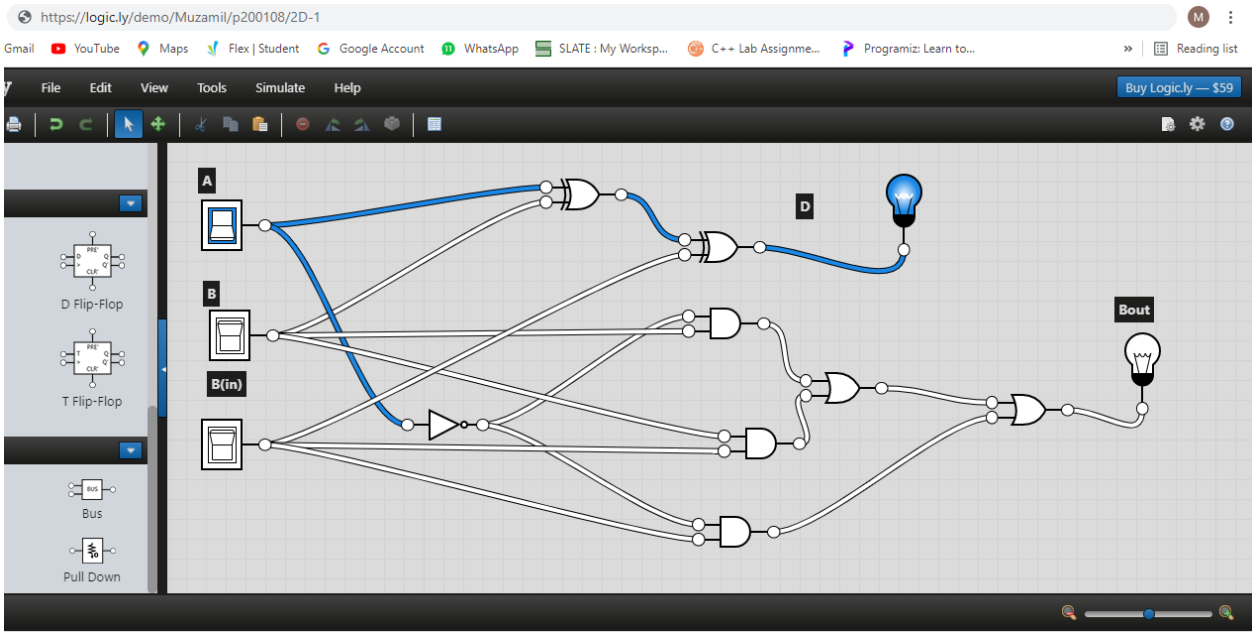


b) Software Simulation (Show here your results for each combination that gives a high output)

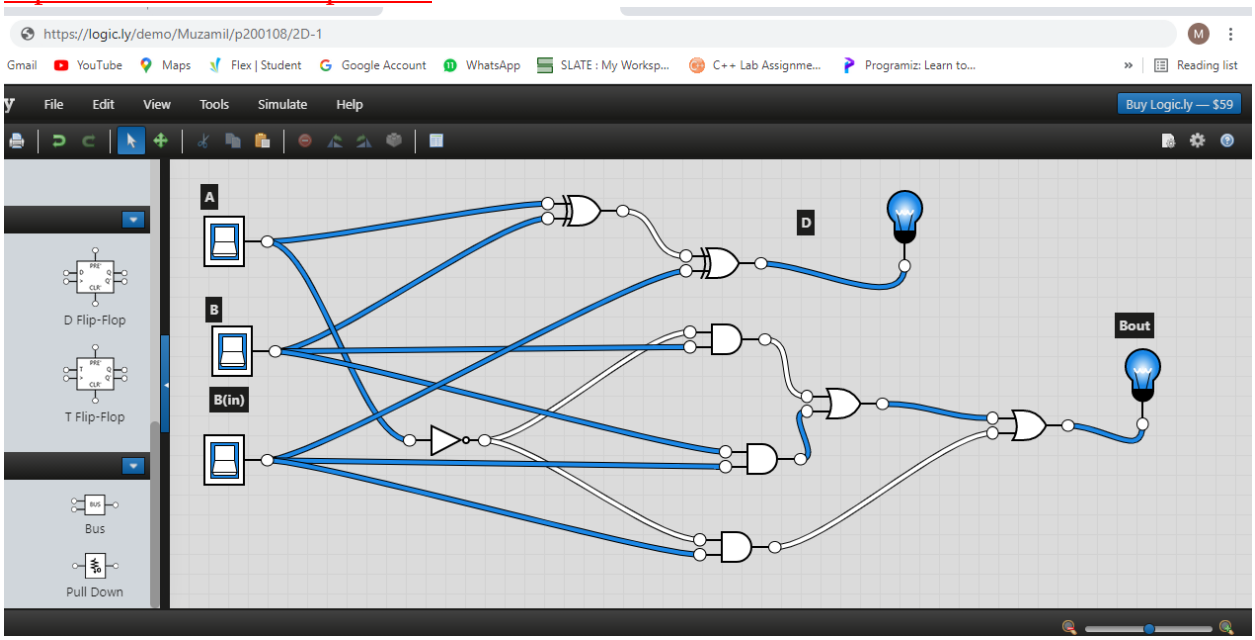
Inputs are 001 and output is 1 and Bout is 1



Inputs are 100 and output is 1



Inputs are 111 and output is 1



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Lab Task # 6
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