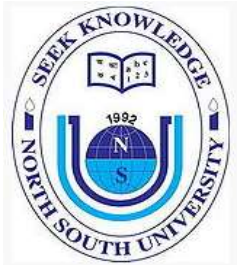


North South University

Department of Electrical & Computer Engineering

Lab Report

Experiment No:	03
Experiment Title:	Design of a 2-bit Arithmetic Unit.
Course Code:	**CSE332L**
Course Name:	**Computer Organization & Architecture Lab**
Name & ID:	Mosroor Mofiz Arman, 1921079642
Date of Experiment:	17.11.2021
Date of Submission:	17.11.2021

Objectives:

(i) We have to know about NOT gates.

(ii) We have to construct a 2-bit arithmetic unit.

(iii) We have to know about adder and how to add and subtract two 2-bit inputs using adder.

(iv) We have to know about MUX and implementing 4:1 MUX.

Equipment list:

(i) Trainer board

(ii) IC 7404, 7483, 74F153.

(iii) Wires for connection.

Block Diagram:

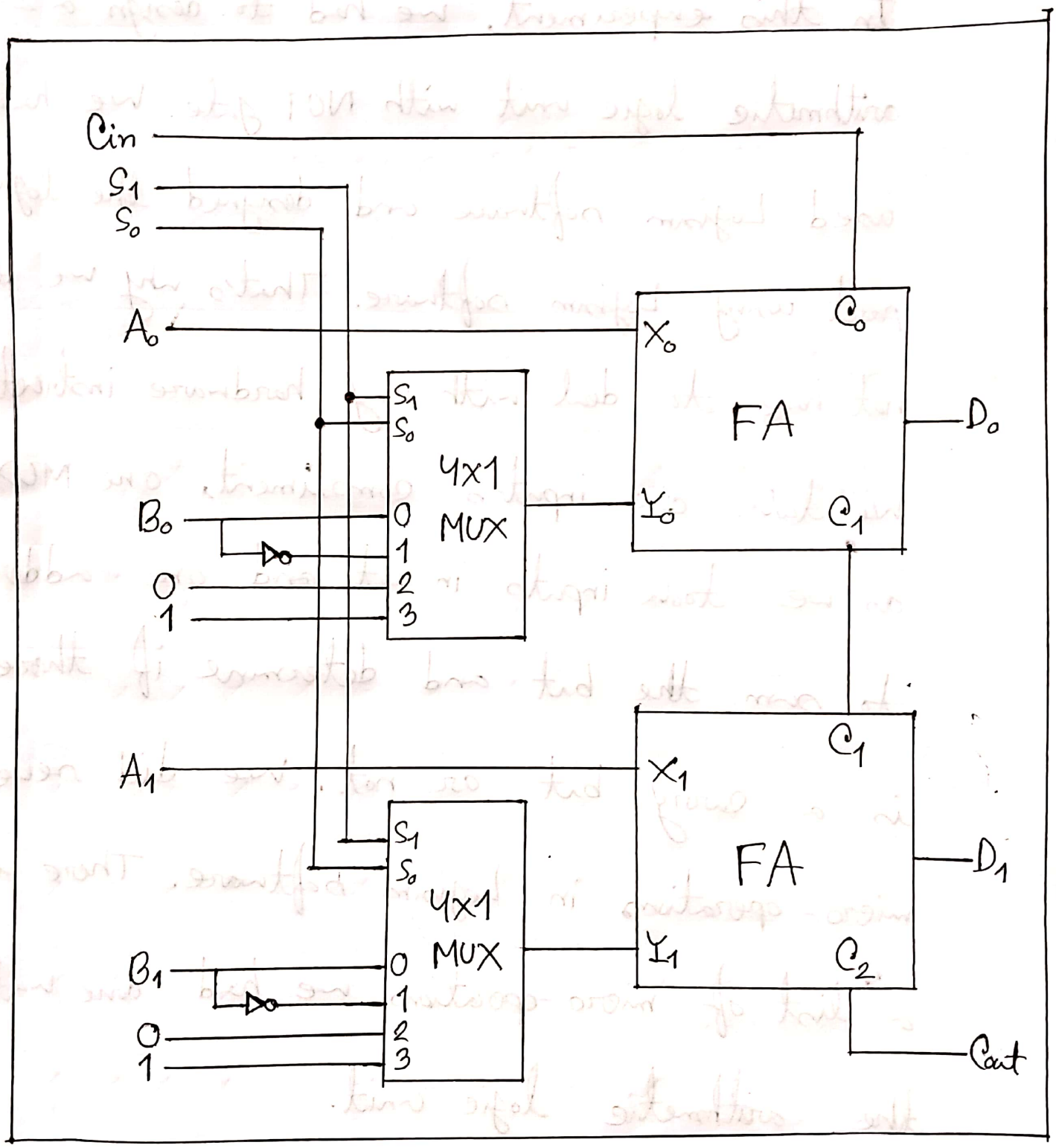
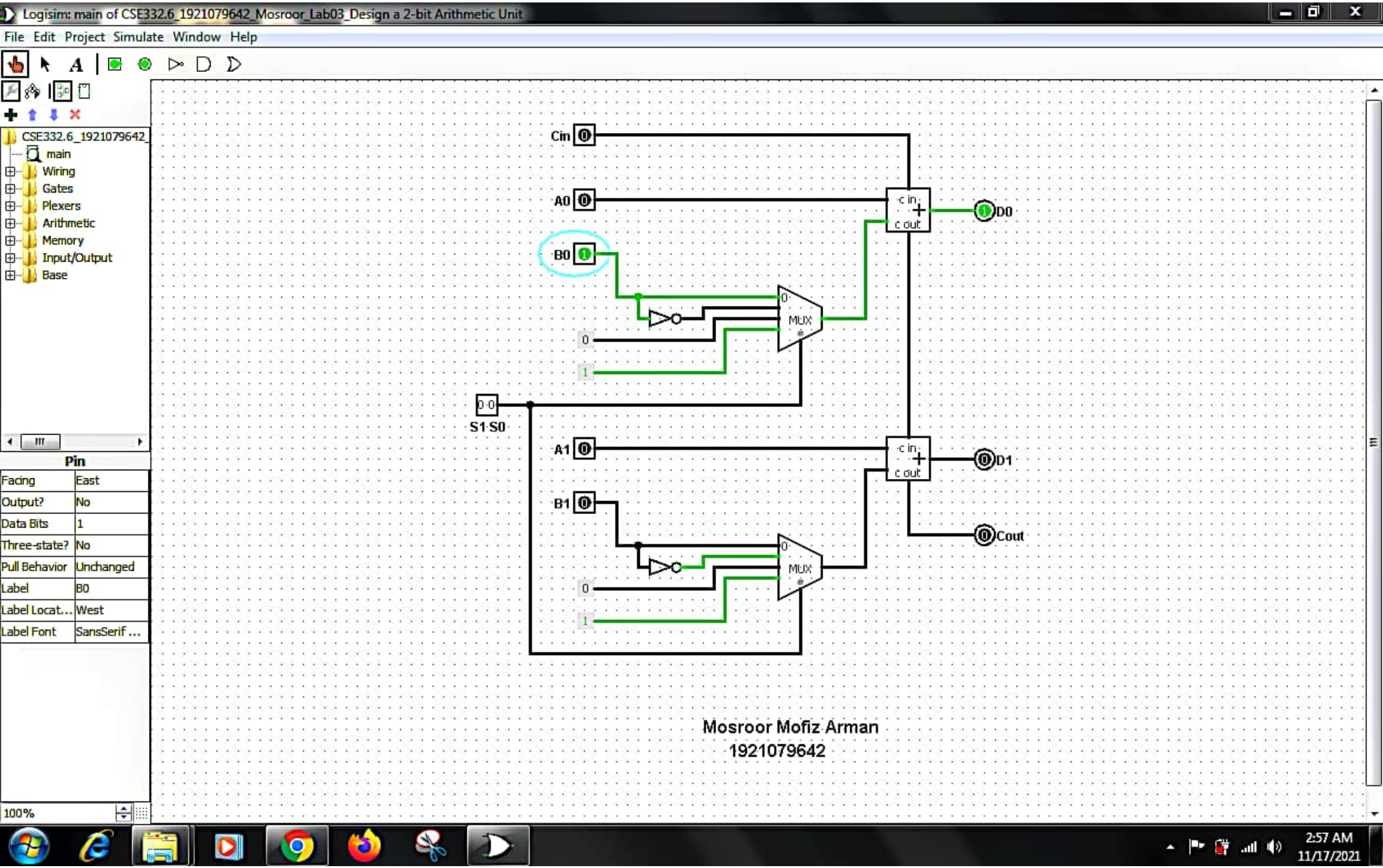


Figure: A 2-bit Arithmetic Unit (Block Diagram).

Truth table

S1	S0	Cin	A1	A0	B1	B0	D1	D0	Cout	Microoperation
0	0	0	0	0	0	1	0	1	0	Add
0	0	1	1	0	0	1	0	0	1	Add with carry
0	1	0	0	1	0	0	0	0	1	Subtract with Borrow
0	1	1	0	1	1	1	1	0	0	Subtract
1	0	0	1	1	0	1	1	1	0	Transfer A A1A0+00+0 = Transfer A
1	0	1	1	0	1	0	1	1	0	Increment A A1A0+00+1=Increment A
1	1	0	1	1	0	0	1	0	1	Decrement A A1A0+11+0=Decrement A
1	1	1	1	0	0	0	1	0	1	Transfer A A1A0+11+1=Transfer A

Table : 2-bit arithmetic unit truth table.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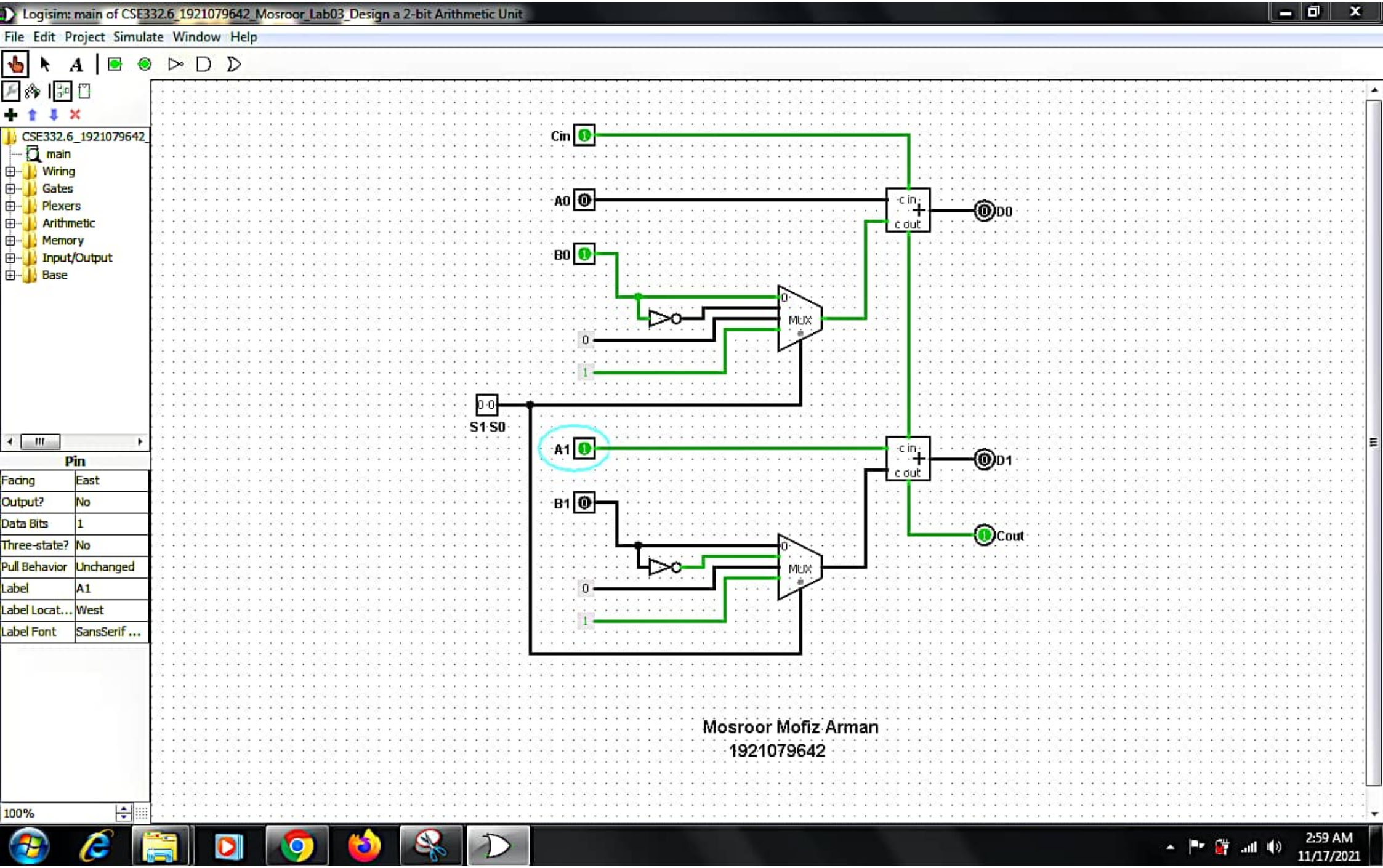
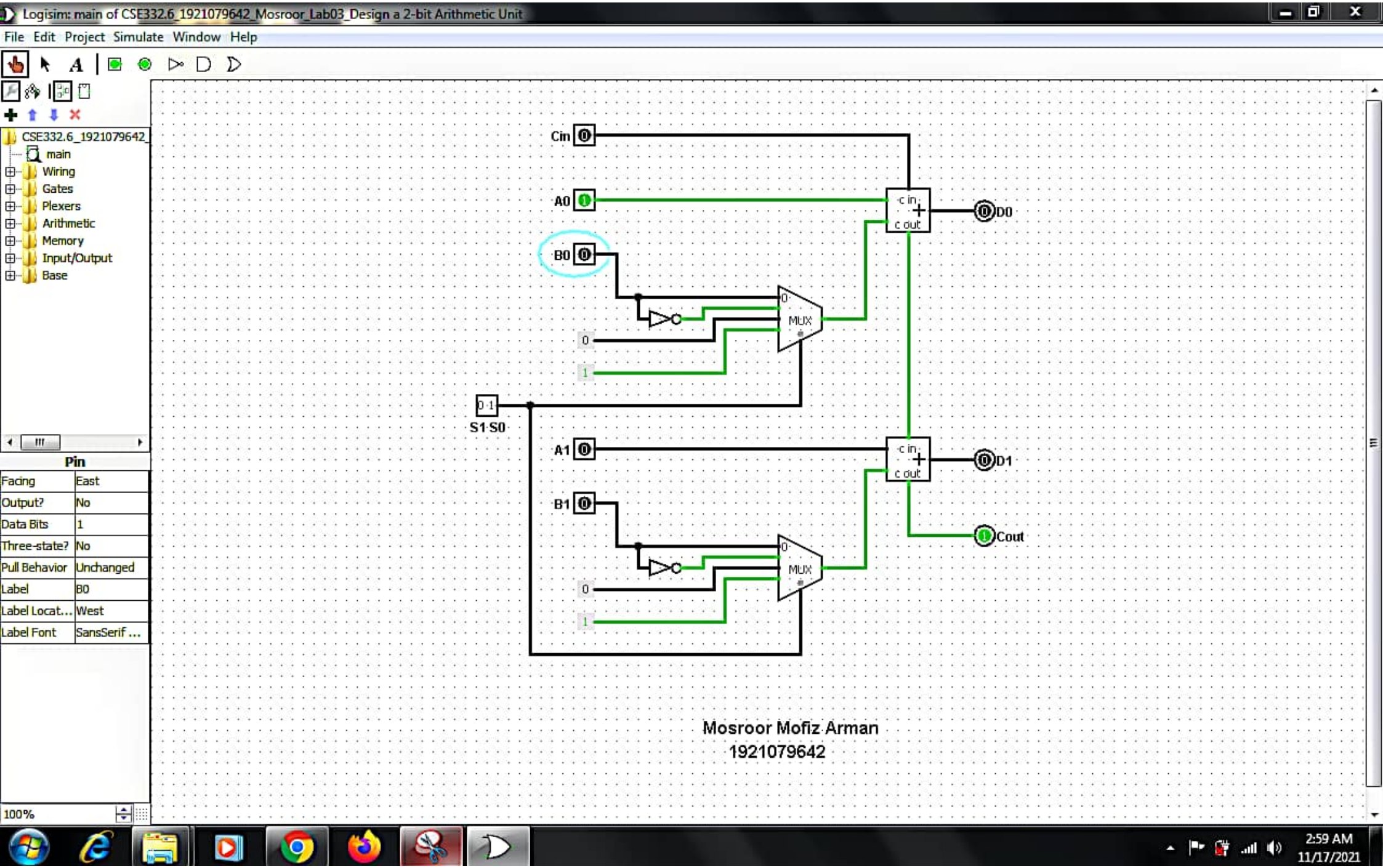
File Edit Project Simulate Window Help
CSE332.6_1921079642_
main
Wiring
Gates
Plexers
Arithmetic
Memory
Input/Output
Base
Pin
Facing East
Output? No
Data Bits 1
Three-state? No
Pull Behavior Unchanged
Label B0
Label Locat... West
Label Font SansSerif ...
100%
Cin
A0
B0
S1 S0
A1
B1
c in
c out
MUX
D0
D1
Cout
Mosroor Mofiz Arman
1921079642
2:57 AM
11/17/2021

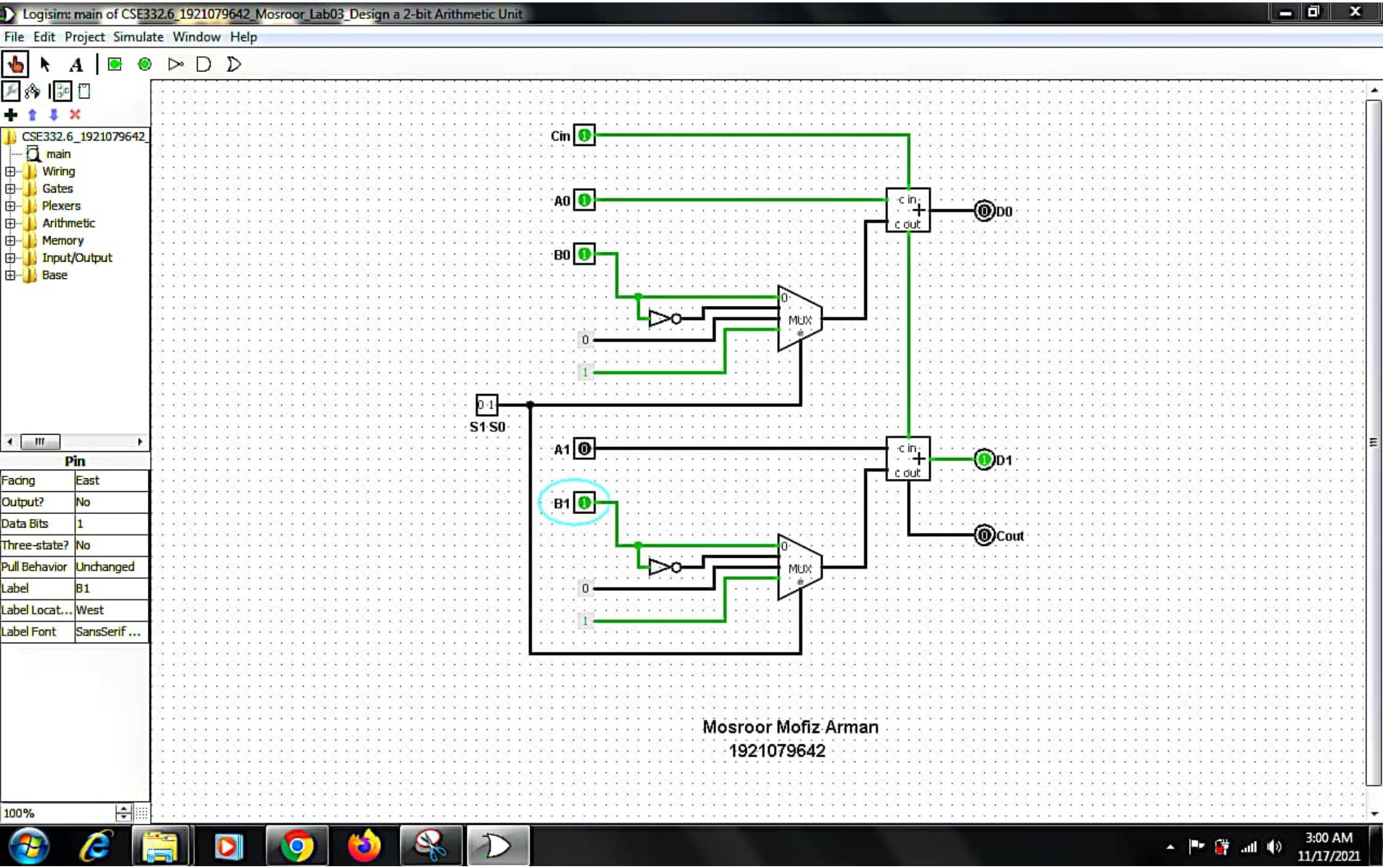
Add



Add with Carry



Subtract with Borrow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Base
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Facing East
Output? No
Data Bits 1
Three-state? No
Pull Behavior Unchanged
Label B1
Label Locat... West
Label Font SansSerif ...
100%
Cin
A0
B0
A1
B1
S1 S0
c in
c out
MUX
D0
D1
Cout
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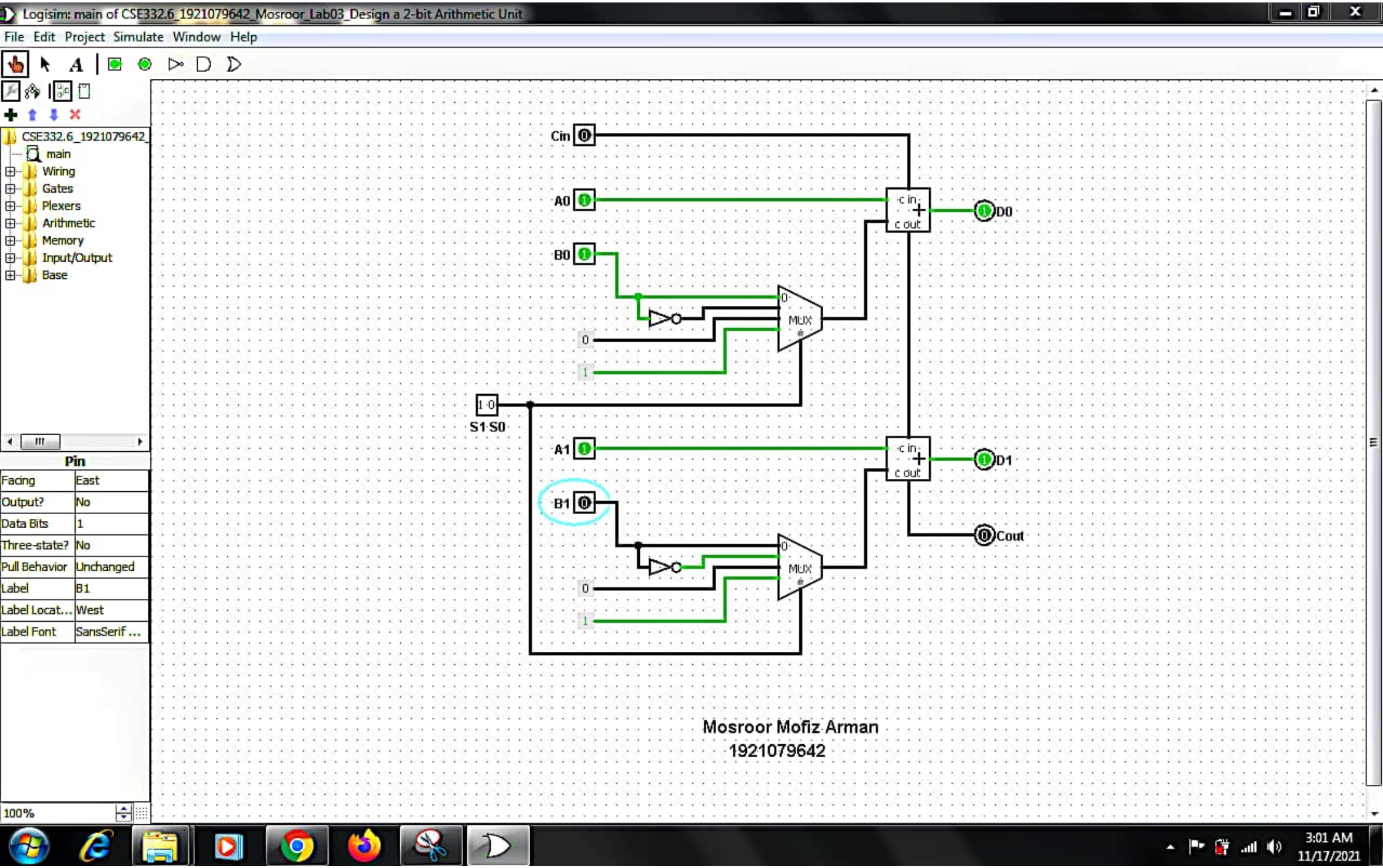
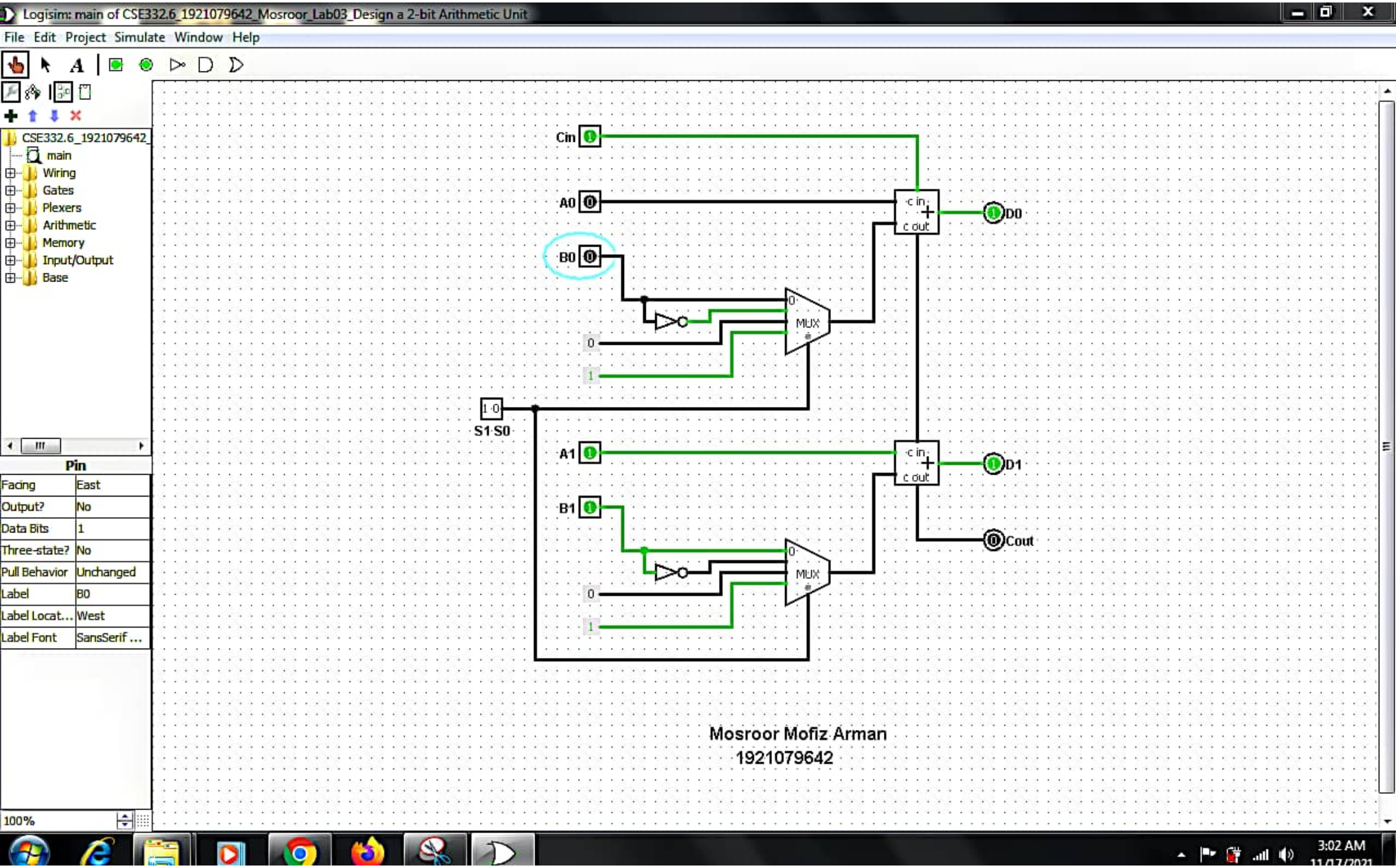
Subtract



Transfer A(A1 A0 + 0 0 + 0 = Transfer A)


Logisim: main of CSE332.6_1921079642_Mosroor_Lab03_Design a 2-bit Arithmetic Unit
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CSE332.6_1921079642_
main
Wiring
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Output? No
Data Bits 1
Three-state? No
Pull Behavior Unchanged
Label B0
Label Locat... West
Label Font SansSerif ...
100%
Cin
A0
B0
A1
B1
S1 S0
c in
c out
MUX
D0
D1
Cout
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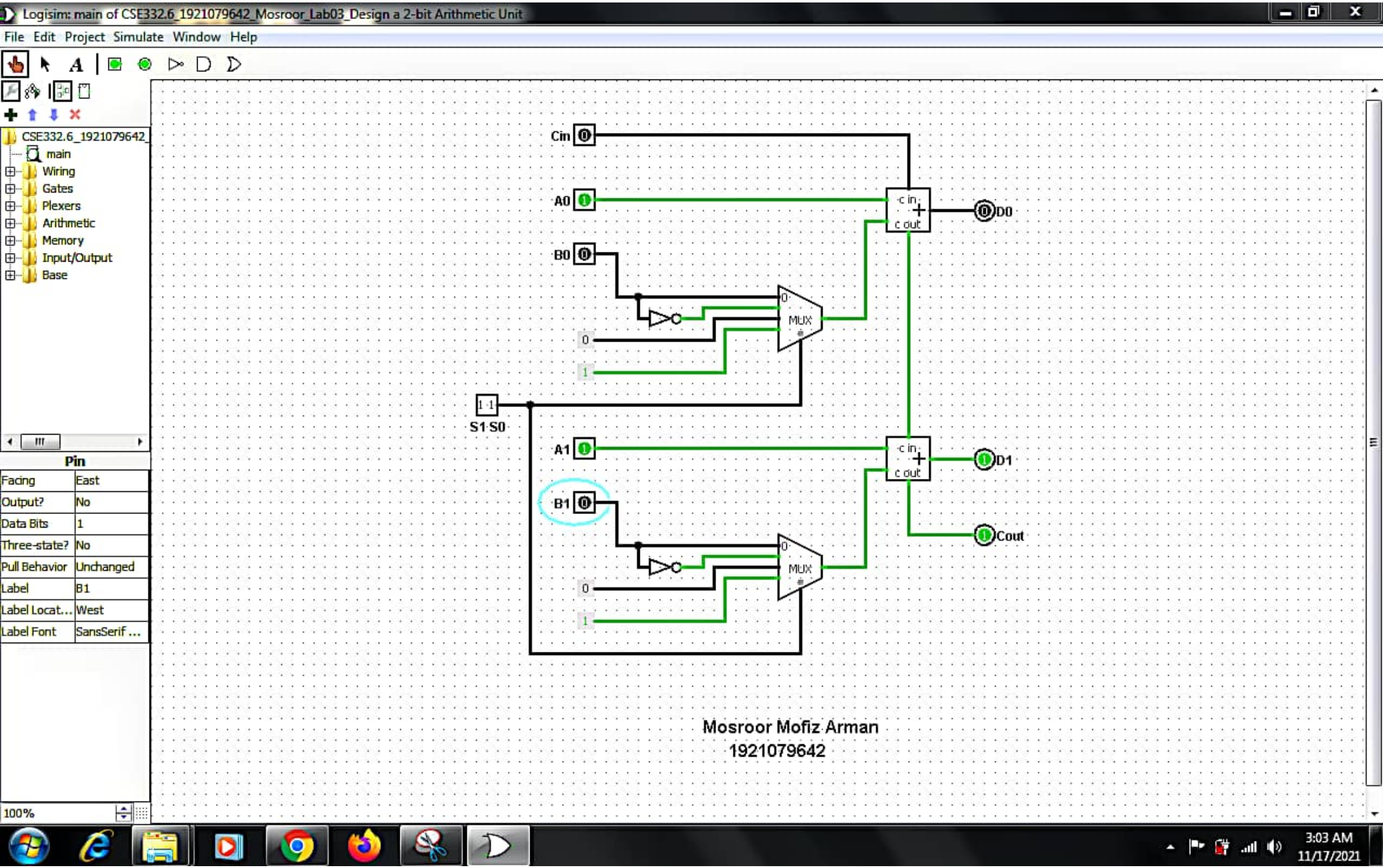
Increment A


Logisim: main of CSE332.6_1921079642_Mosroor_Lab03_Design a 2-bit Arithmetic Unit
File Edit Project Simulate Window Help
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Wiring
Gates
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Memory
Input/Output
Base
Pin
Facing East
Output? No
Data Bits 1
Three-state? No
Pull Behavior Unchanged
Label B1
Label Locat... West
Label Font SansSerif ...
100%
Cin
A0
B0
S1 S0
A1
B1
MUX
MUX
c in
c out
c in
c out
D0
D1
Cout
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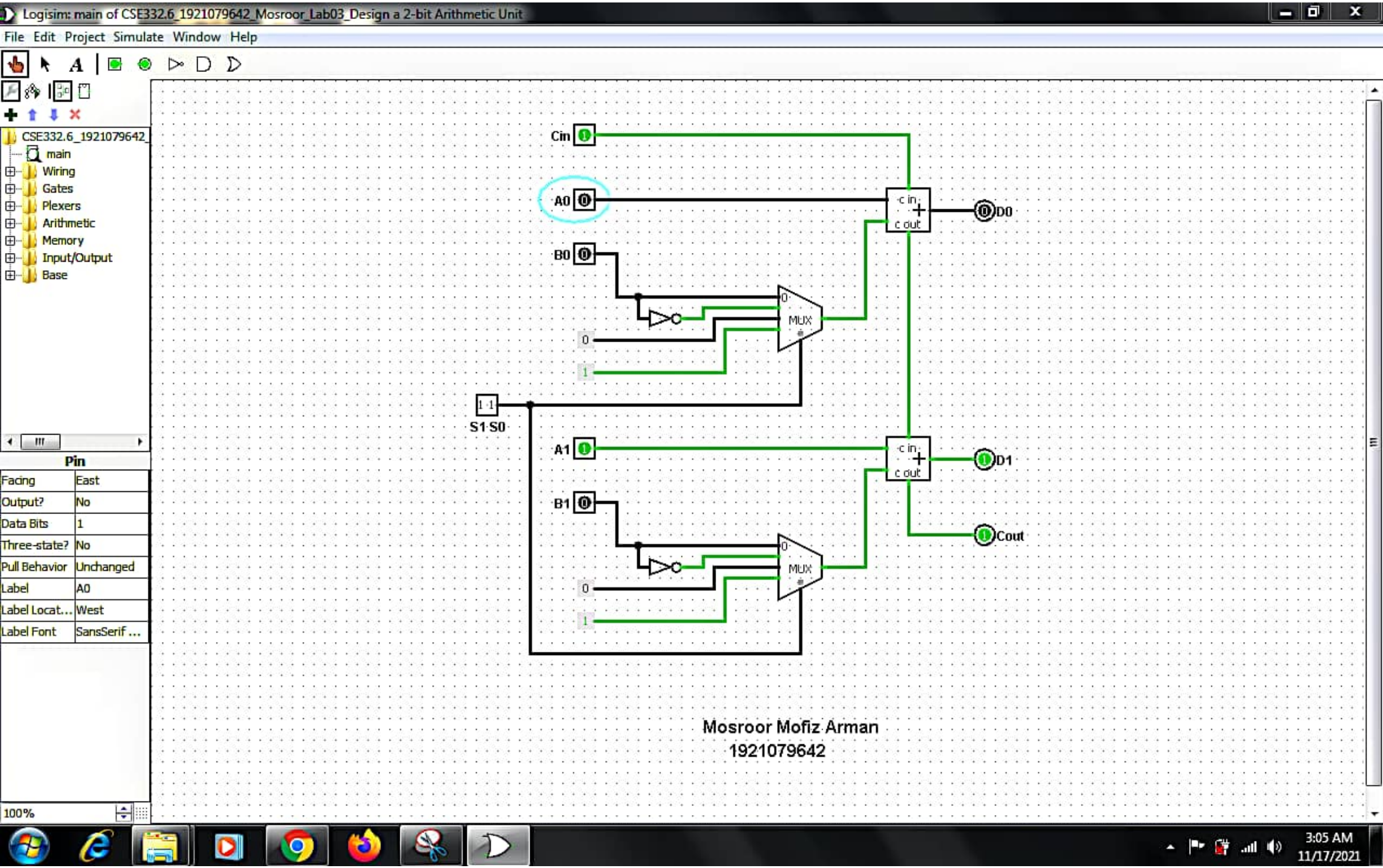
11/17/2021

Decrement A



Transfer A(A1 A0 + 1 1 + 1 = Transfer A)

Discussion:

In this experiment, we had to design a 2-bit arithmetic logic unit with NOT gate. We have used Logisim software and designed the logic part using Logisim software. That's why we did not have to deal with any hardware instructions. We took one input's compliment, one MUX as we took inputs in it and one adder to sum the bit and determine if there is a carry bit or not. We did several micro-operations in Logisim software. There is a list of micro-operations we had done with the arithmetic logic unit.

1. Add.

(2) Add with carry

(3) Subtract with borrow

(4) Subtract

(5) Transfer A

(6) Increment A

(7) Decrement A

(8) Transfer A.

After designing the logic part, we had to check the circuit for the above micro-operations and inserted the value of the following micro-operations from the logisim circuit to the truth table. Finally, we had submitted the (.circ) file to our lab instructor on the canvas platform.