

North South University

ECE

Lab Report-1

Experiment No: 2

Experiment Title: Design of a 2-bit Arithmetic unit

Course Code: CSE332L

Course Name: Computer Organization & Architecture Lab

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Objective:

- Here we learn how to create 2 bits ALU with following instructions.
 - Add
 - Add with Carry
 - Subtract with Borrow
 - Subtract
 - Transfer A
 - Increment A
 - Decrement A
 - Transfer A
- **Add:** operation adds 2, 2 bit number and Outputs 2 bit number with Carry if there are any
- **Add with Carry:** adds 2, 2 bit number with carry and Outputs 2 bit number with Carry if there are any
- **Subtract with Borrow:** subtract 2, 2bit number with borrow and Outputs 2 bit number with Carry if there are any
- **Subtract:** subtracts 2, 2bit number with borrow and Outputs 2 bit number with Carry if there are any
- **Transfer:** Transfers first bit And Carry, Outputs 2 bit number with Carry if there are any
- **Increment:** Increments by 1 first bit And Carry, Outputs 2 bit number with Carry if there are any
- **Decrement:** Decrements by 1 first bit And Carry, Outputs 2 bit number with Carry if there are any

Block Diagram:

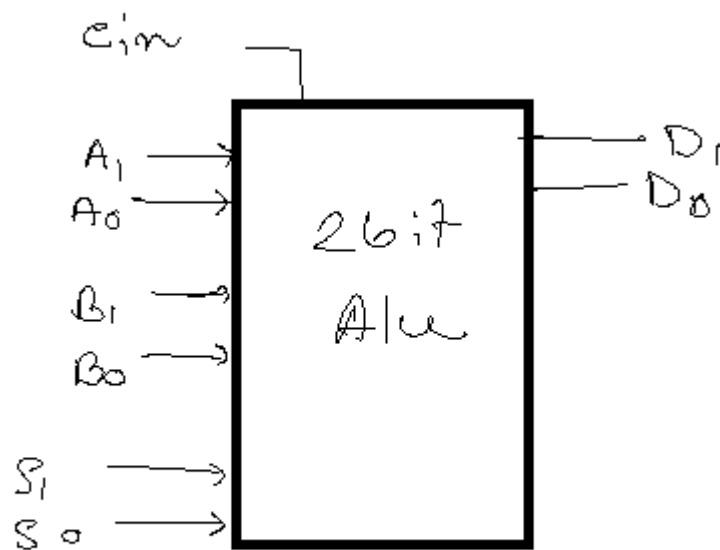


Fig: 2 ALU (block Diagram)

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	1	1	0	1	1	0	1	Subtract
1	0	0	1	1	0	1	1	1	0	Transfer A $A1 A0 + 0 0 + 0 = \text{Transfer A}$
1	0	1	1	0	1	0	1	1	0	Increment A $A1 A0 + 0 0 + 1 = \text{Increment A}$
1	1	0	1	1	0	0	1	0	1	Decrement A $A1 A0 + 1 1 + 0 = \text{Decrement A}$
1	1	1	1	0	0	0	1	0	1	Transfer A $A1 A0 + 1 1 + 1 = \text{Transfer A}$

Circuit diagram:

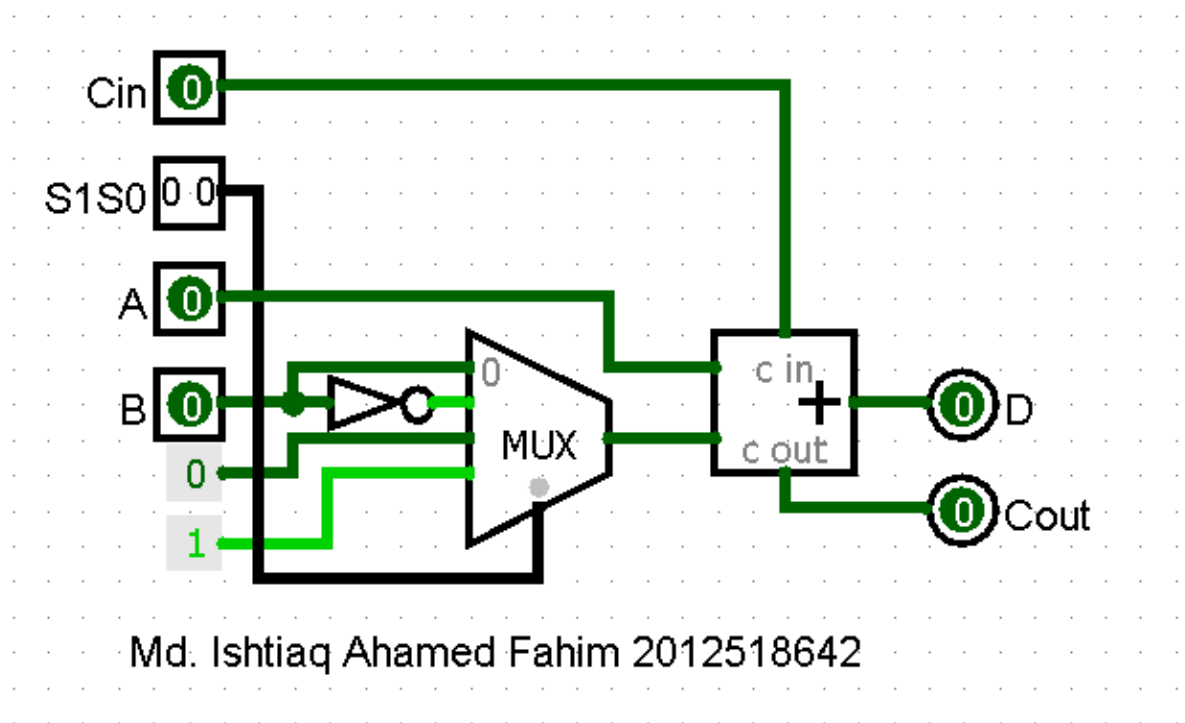


Fig: 1 ALU

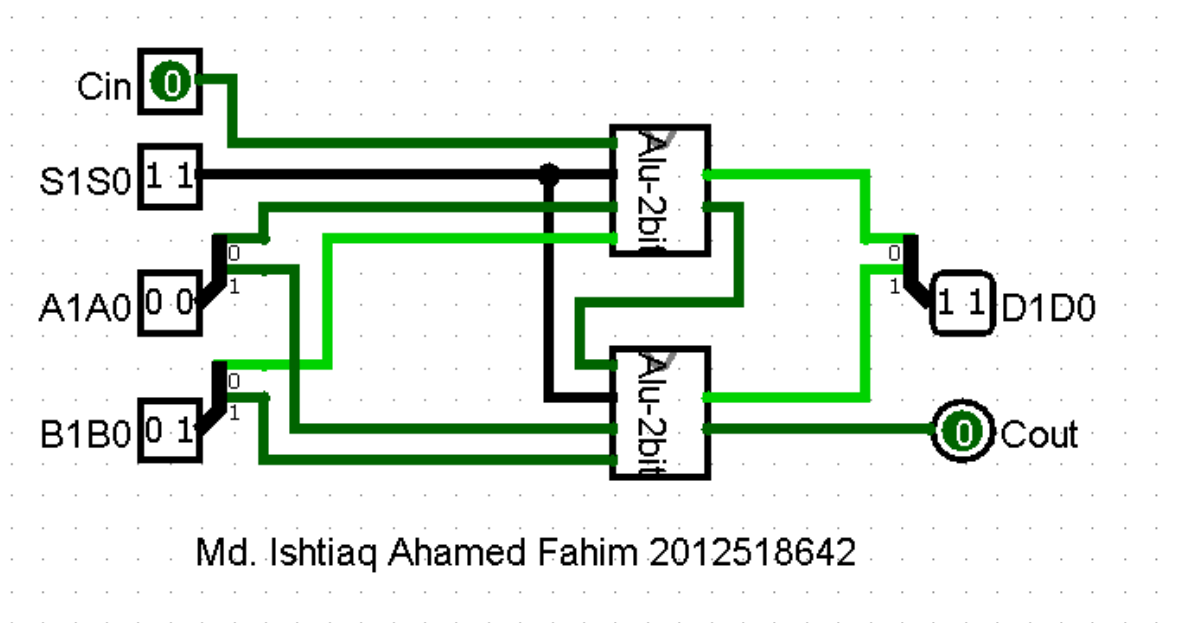


Fig: 2 ALU

Discussion:

We learned how to create 2 bit ALU with help of 1 bit ALU, which can be translated to any bit operation, helping in more complex structure building. We got to understand how MUX helps and how to combine MUX. And a basic circuit of 2 bits ALU that can perform Addition and subtraction of 2, 2 bit number