North South University

Department of Electrical & Computer Engineering

Lab Report

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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Date of Experiment:	26/10/2021
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Objectives:

* Our objective in this experiment is to construct a 2-bit arithmetic unit that can add, subtract two 2-bit inputs and increment, decrement or transfer any of the inputs.

Equipments:

* Trainer Board
* 7404 NOT IC
* 7483 Full Adder IC
* 74F153 MUX IC
* Wires for connection

Block Diagram:

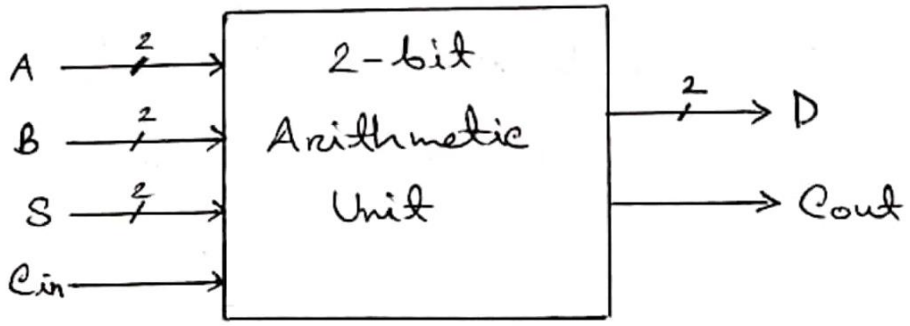

Figure 1: Block Diagram of a 2-bit Arithmetic unit

Truth Table:

S1	S0	Cin	A1	A0	B1	B0	D1	D0	Cout	Microopertion
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 = Transfer A
1	0	1	1	0	1	0	1	1	0	**Increment A** A1 A0 + 0 0 + 1 = Increment A
1	1	0	1	1	0	0	1	0	1	**Decrement A** A1 A0 + 1 1 + 0 = Decrement A
1	1	1	1	0	0	0	1	0	1	**Transfer A** A1 A0 + 1 1 + 1 = Transfer A

Table: Truth Table for a 2-bit Logic Unit

Circuit Diagram:

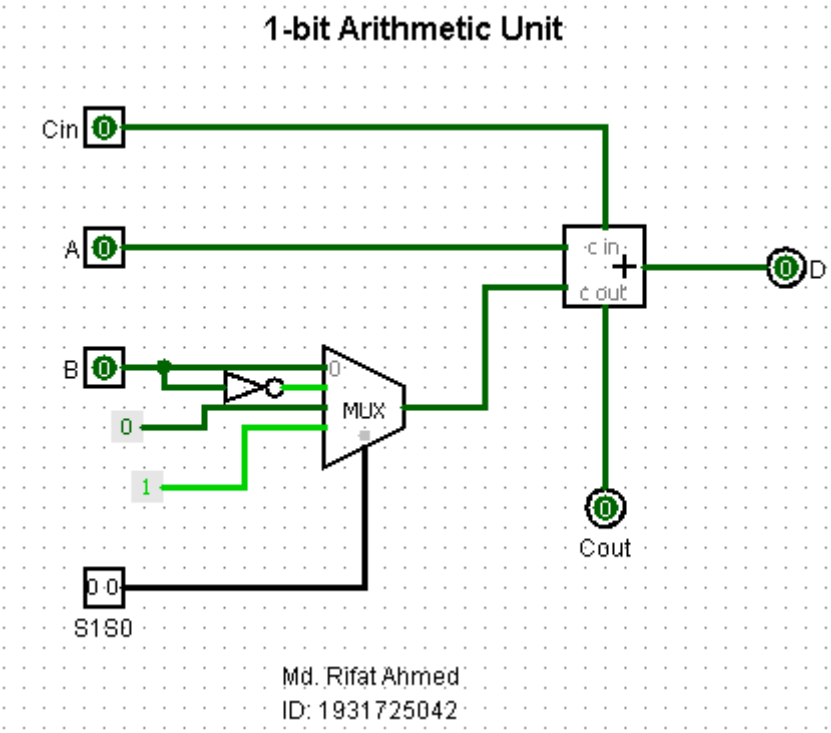

Figure 2: 1-bit Arithmetic Unit

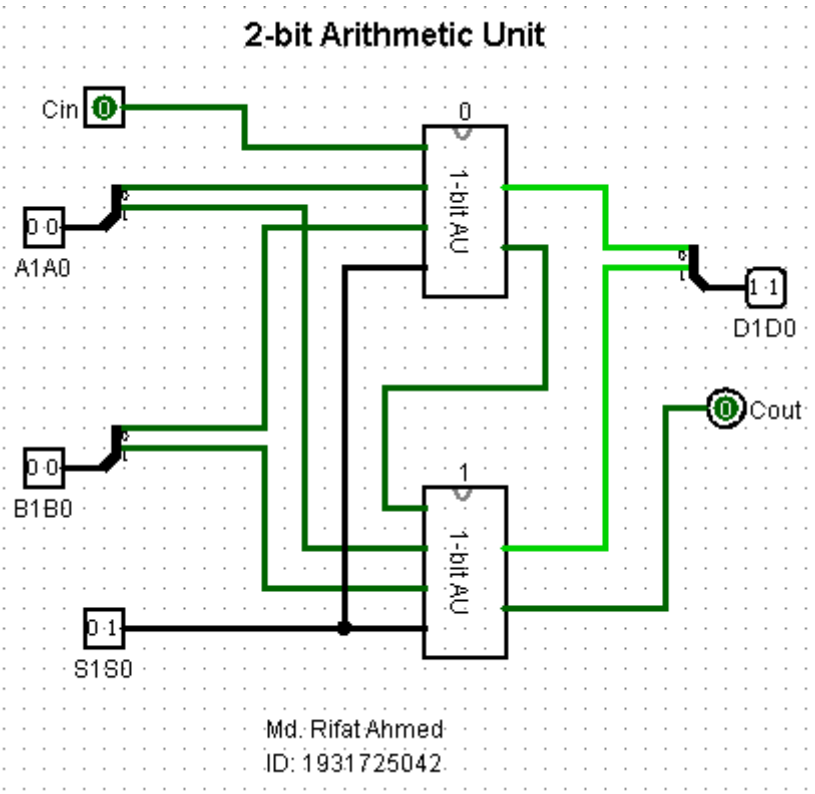

Figure 3: 2-bit Arithmetic Unit

Discussion:

In this experiment we learnt how to construct a 2-bit arithmetic unit.

We designed an AU with seven functions and that's why we had to use a MUX while constructing our 1-bit AU. A full adder has 3 i/p and 2 o/p and we needed an extra input for the select bits. Then we learnt how all these functions were operating in the circuit. For add we had to set S1, S0 and Cin to 0 for add with carry we just had to change Cin to 1. For subtracting we needed a B' and Cin as 1 and for subtract with borrow we needed to change Cin to 0. Then for incrementing A, we just had to add 1 to it so setting Cin as 1 will increment A. Then for decrementing we had to add 3 to A as we can't go backwards and in these cases we'll disregard the Cout and so the result will be decrement of A. Finally for transfer of A we can do it in two ways 1 is to add 0 and set Cin 0 another is to add 3 and set Cin as 1 this way we'll add 4 meaning the result will be same as we'll be disregarding Cout.