NORTH SOUTH UNIVERSITY
Department of Electrical & Computer Engineering (ECE)

CSE 332 Computer Organization & Architecture
Section: 02
Faculty: Tanjila Farah (TnF)

Lab Report: 01
Name of the Experiment

Submitted By: (Writer's name & ID)

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For Instructor's use only

SCORE:	REMARKS:
PENALTY	

Objective -

- Understanding and appling complex forms of 'Digital Logic Design'.
- Introduction to 'Arithmetic Logic Unit' ALU; as well as practical demonstration of it's use and design.
- Designing multipurpose combinational ~~logic~~ circuit which include adders, subtractors, transfer, increment, and decrement.
- Reinforcing and improving the undersanding of digital logic design.
- Applying theoretical knoledge of degital electronics to make practicel implementation.

List of Equipments -

- Wires
- Trainer board
- Hex Inverter IC - 7404
- 4-bit full adder IC - 7483
- Dual 4-input Multiplexer IC - 74F153

Theory -

An 'Arithmetic Logic Unit (ALU)' is a fundamental component of any computer's 'central Processing Unit (CPU)'. It performs arithmetic and logic operations on digital data. The operations may include addition, subtraction, multiplication, division, increment / decrement, logic 'and', 'or', 'not', 'xor', and 'shift' operation.

Here we are to built a 2-bit arithmetic unit. To do that we ~~need~~ would use;

- two 4 × 1 MUX
- two full adders
- two 2-bit digital inputs '$A_0 B_0$' and '$A_1 B_1$'
- two selection inputs 'S_0' and 'S_1'
- one carry input 'c'.
- HEX inverters

and a trainer board and wires.

To implement our 2-bit arithmetic unit; we connect both selection bits to the MUXs. Then we connect A_0 as the first input in adder no. 1 and A_1 as first input in adder no. 2. Now we connect B_0 at the MUX no. 1's I_0 input and $\overline{B}_0$ at MUX no. 1's I_1 input. B_1 connects to MUX no. 2 the same way as B_0 connects to MUX no. 1. The Carry bit 'C' connects to the adder no. 1's C_{in} and we take adder no. 1's C_{out} and put it as ~~input~~ C_{in} at adder no. 2. ~~To finish our design~~ Now we input '0' at ~~and~~ both MUX's I_2 and '1' at both MUX's I_3. ~~A1 Also~~ Finally we connect MUX's no. 1's output as the second input in adder no. 1 and MUX no. 2's output as second input in adder no.2 . Now we have our outputs

~~in~~ as D_0 from adder no. 1, D_1 from adder no.2,

and carry output from adder no.2's cout.

To do arithmetic operations in this

arithemtic unit; to add make $S_0 = 0$ and $S_1 = 0$,

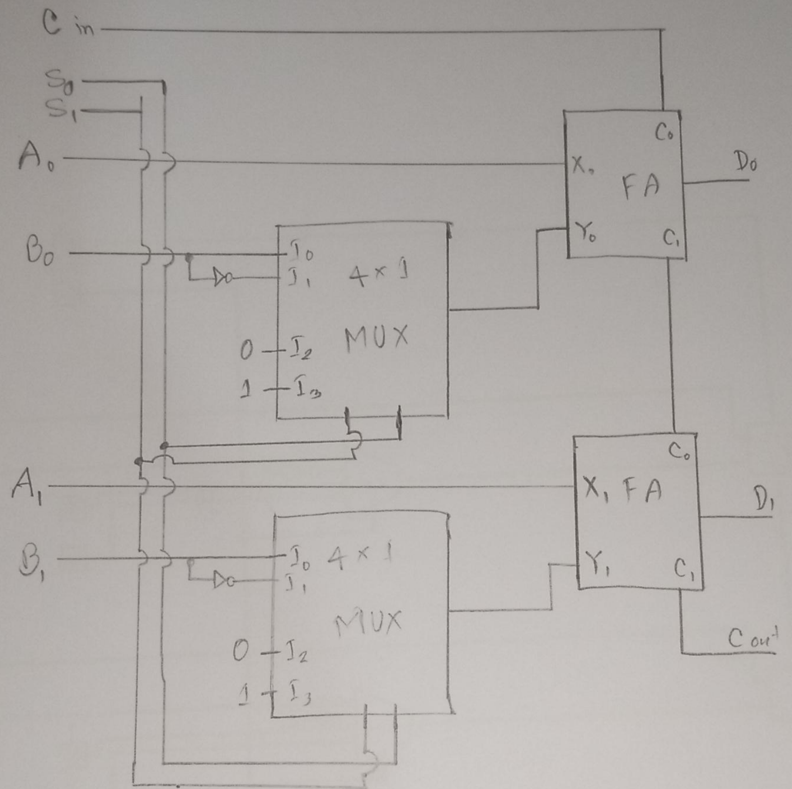
to subtract $S_0 = 1$ and $S_1 = 0$, to transfer

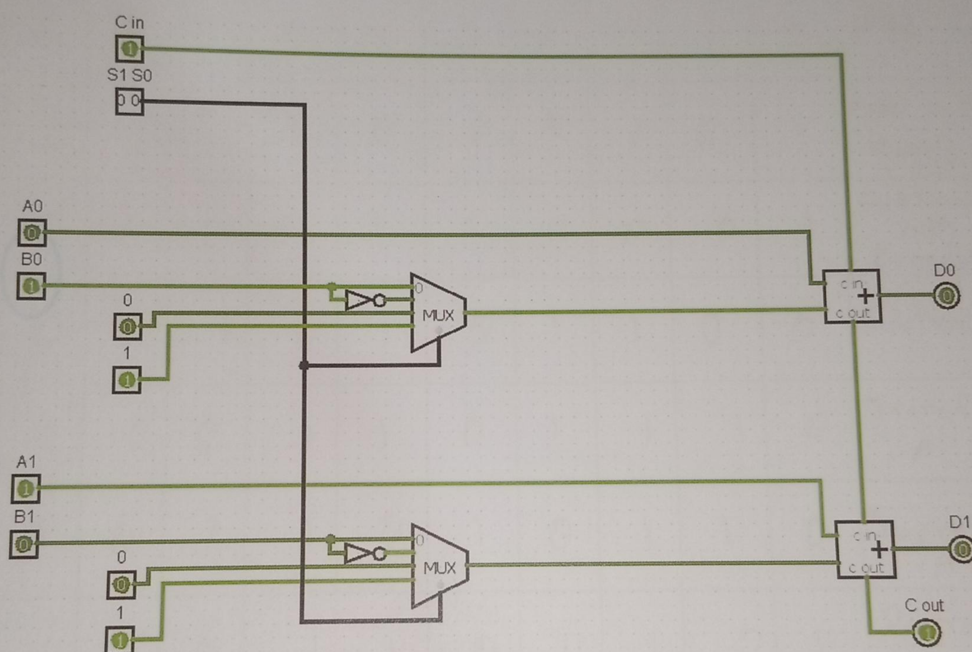
$S_0 = C_{in}$ and $S_1 = 1$, to increment $S_0 = 0$, $S_1 = 1$

and $C_{in} = 1$, to decrement $S_0 = 1$, $S_1 = 1$, and

$C_{in} = 0$.

Circuit Diagram :-




C in
S1 S0
A0
B0
0
1
MUX
c in
c out
D0
A1
B1
0
1
MUX
c in
c out
D1
C out

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	0	Subtract
1	0	0	1	1	0	1	1	1	0	Transfer A
1	0	1	1	0	1	0	1	1	0	Increment A
1	1	0	1	1	0	0	1	0	1	Decrement A
1	1	1	1	0	0	0	1	0	1	Transfer A

Discussion -

In this lab we made a 2-bit arithmetic unit. At the start of the lab our lab instructor tought us how this logic works and shown ~~us~~ us. how we ~~would~~ should make it at our trainer boards. In accordance to our lab instructor, we first placed the IC's on our trainer board and connected the Vcc an ~~gnd~~ GND of all the IC's. Then we connected all the inputs according to the instructions as well as write the places ~~wree~~ where the inputs and connections are, so we could ~~detect~~

~~may~~ easily find and fix them when it may occure. However, once we were done with connecting all the inputs in our IC's and powered the circuit, we simply did not get ~~and~~ any logical outcome. Two out of three output LED's were always on no matte what input we gave. After ~~checking~~ some time of trying to fix our circuit, we just replace all the IC's in our trainer board. Yet we didn't get any logical result. Again two out of three outputs were always on. The lab ended without us being able to ~~finish~~ achive any result. Upon noticing our problem, the lab instructor told us to always ~~check~~ ~~check~~ cheak the IC's before connecting them ~~to~~ with wires and power supply. We then ~~simpley~~ simply wrote down the 'Function Table' according to the theory. Looking back on it; we realy should have been more careful when we were building the design. I realy hope we could do better moving forword.