

**Lab Manual**

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Experiment No: 2**Experiment Name: Design of a 2-bit Arithmetic unit.****Introduction:**

In this experiment you will construct a 2-bit arithmetic unit which is a part of an ALU. The arithmetic unit will be used to add and subtract two 2-bit inputs, A and B, as well as increment, decrement or transfer any of the inputs.

Arithmetic Operations:

Add- Each bit of input A is added with the corresponding bit of input B and the sum appears at the output of each full adder along with any carry out.

Add with carry- Each bit of input A and B are added with the input carry and the sum appears at the output of each full adder along with any carry out.

Subtract- Each bit of input B is subtracted from the corresponding bit of input A and the difference appears at the output of each full adder along with any borrow out.

Subtract with borrow- Each bit of input B is subtracted from A with borrow. The difference and the borrow out appear at the output.

Increment A- Each bit of A is increased by 1 and the result appears at the output of each full adder.

Decrement A- Each bit of A is decreased by 1 and the result appears at the output of each full adder.

Transfer A- Each bit of A appears at the output of each full adder, unmodified.

Equipments:

Trainer board

IC 7404, 7483, 74F153 Wires

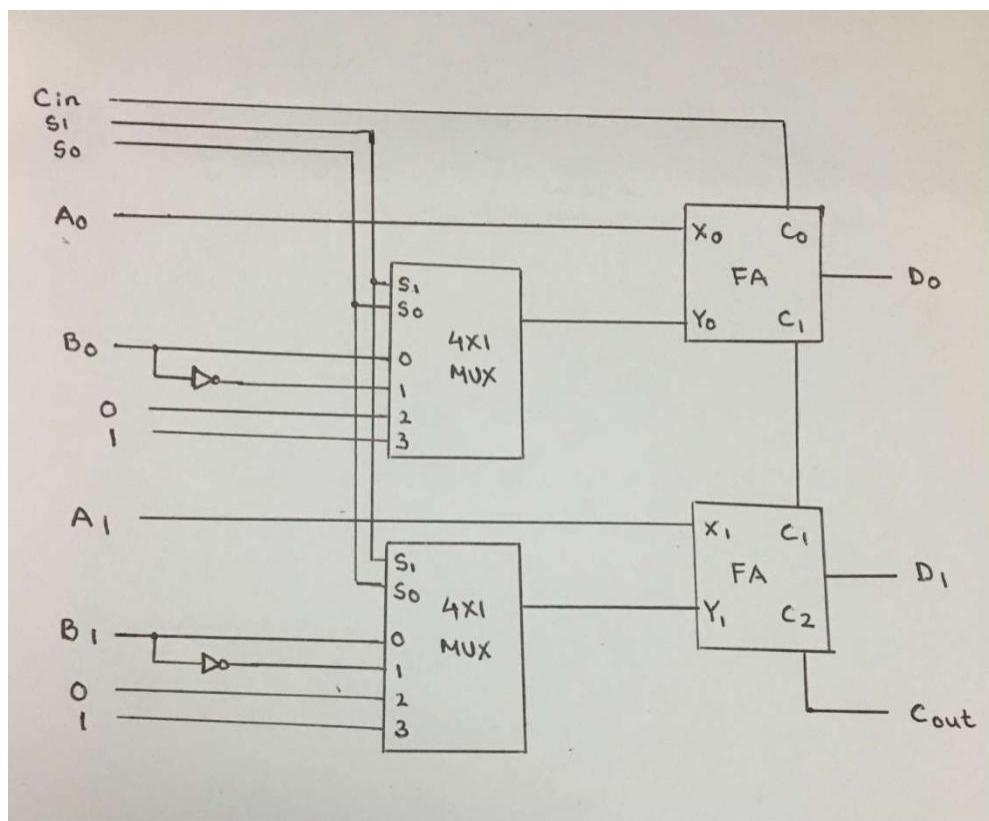
for connection.

Function Table:

Complete the function table according to the output of your Logisim circuit.

S1	S0	Cin	A1	A0	B1	B0	D1	D0	Cout	Microoperation
0	0	0	0	0	0	1				Add
0	0	1	1	0	0	1				Add with Carry
0	1	0	0	1	0	0				Subtract with Borrow

0	1	1	1	1	0	1				Subtract
1	0	0	1	1	0	1				Transfer A
1	0	1	1	0	1	0				Increment A A1 A0 + 0 0 + 1 = Increment A
1	1	0	1	1	0	0				Decrement A A1 A0 + 1 1 + 0 = Decrement A
1	1	1	1	0	0	0				Transfer A A1 A0 + 1 1 + 1 = Transfer A

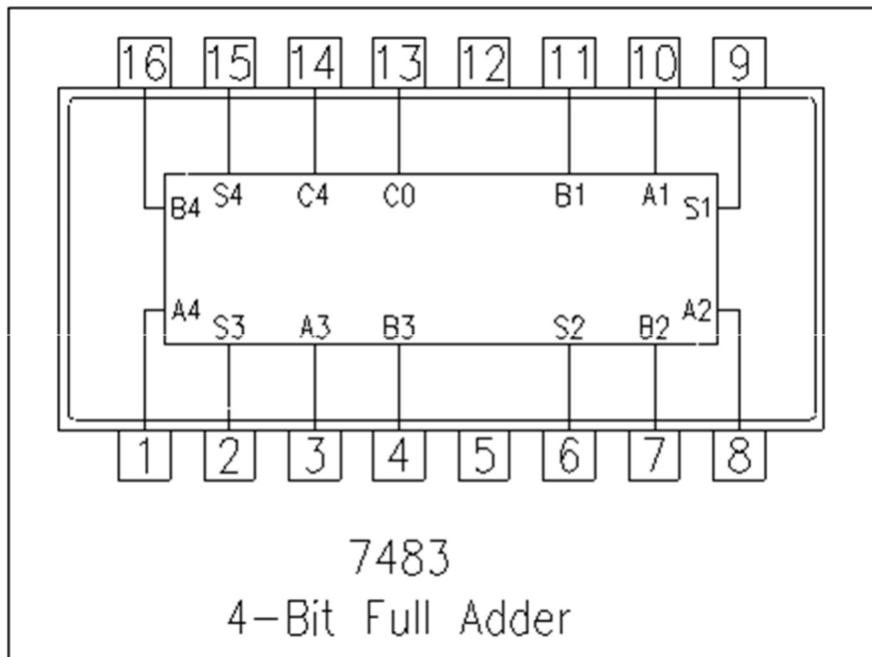
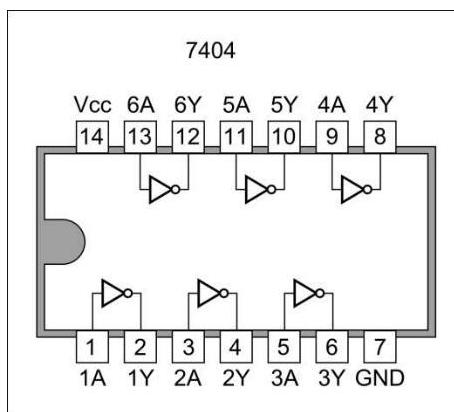
Logic Diagram:Procedure: (hardware)

- 1) Place the ICs on the trainer board.
- 2) Connect V_{cc} and ground to the respective pins of IC.
- 3) Connect the inputs with the switches and the outputs with LEDs.
- 4) Apply various combinations of inputs and observe the outputs.
- 5) Verify the experimental outputs with the Function Table.

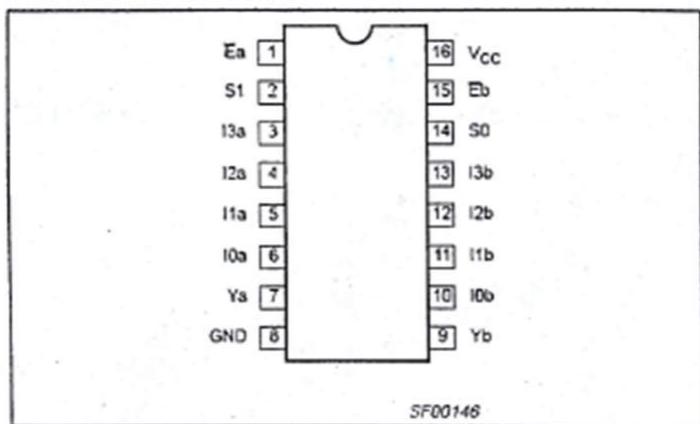
Assignment:

1. Implement the circuit in Logisim. Submit logisim (.circ) file in Google Classroom within the given time by your lab instructor.
2. Prepare and submit the lab report by 11:59 pm today in Google Classroom individually. In the report, you have to include the Screenshot of the circuit as a Circuit Diagram. The screenshot must contain your name and ID along with the circuit.

****Plagiarism and late submission will not be acceptable.**

Pin configuration of ICs:

EEE336/CSE232 LAB
Dual 4x1 Multiplexer 74F153
Data Sheet

PIN CONFIGURATION**INPUT AND OUTPUT LOADING AND FAN-OUT TABLE**

PINS	DESCRIPTION
I0a – I3a	Port A data inputs
I0b – I3b	Port B data inputs
S0, S1	Common Select inputs
Ea	Port A Enable input (active Low)
Eb	Port B Enable input (active Low)
Ya, Yb	Port A, B data outputs