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Course code: CSE-1212

Course Title: Introduction to Digital Electronics Lab

Department: Computer Science and Engineering

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I Name of Experiment:

Design and implementation of 2 bit adder and Subtracter using logic getes.

II Objective:

- To design, realize and verify the 2 bit adder and Subtracter circuits using basic gates and universal gates.
- To design, realize and verify 2 bit adder.
- To design, realize and verify 2 bit Subtracter

III Theory of Adder:

A full adder is a combinational circuit has forms the arithme sum of input; it consists of three bits at a time but a half adder cannot do so. In full adder Sum output will be taken from X-OR Gate, Carry output will be taken from OR gate. Here we have used 2 bit full Adder.

Theory of Subtractor:

The full subtractor is a combinational of X-OR, AND, OR Gates. In a full subtractor the logic circuit should have three input and two outputs. The two half subtractor put together gives a full subtractor. The first subtractor will be C and A B. The output will be difference output of full subtractor. The expression AB assembles the borrow output of the half subtractor and the second term is the inverted difference output of first X-OR.

Apparatus:

1. Bread Board
2. Trainer kit
3. 5 v dc (Vcc) power supply
4. X-OR Gate - IC 7486
5. AND Gate - IC 7408
6. OR Gate - IC 7432
7. wire

Circuit Diagram:

1. 2 bit full Adder

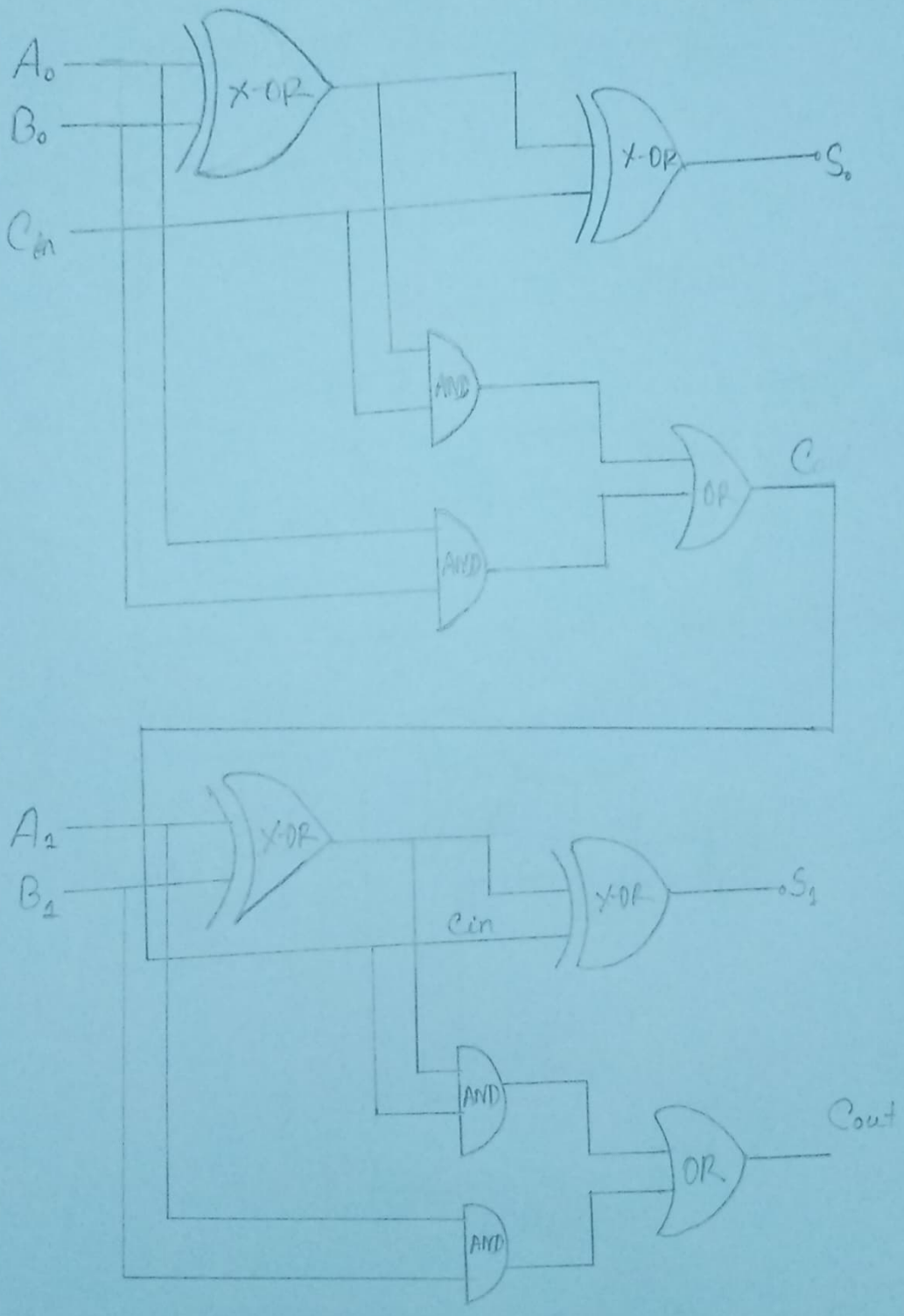

Fig-1: 2 bit Adder using logic gates

2-bit Subtractor:

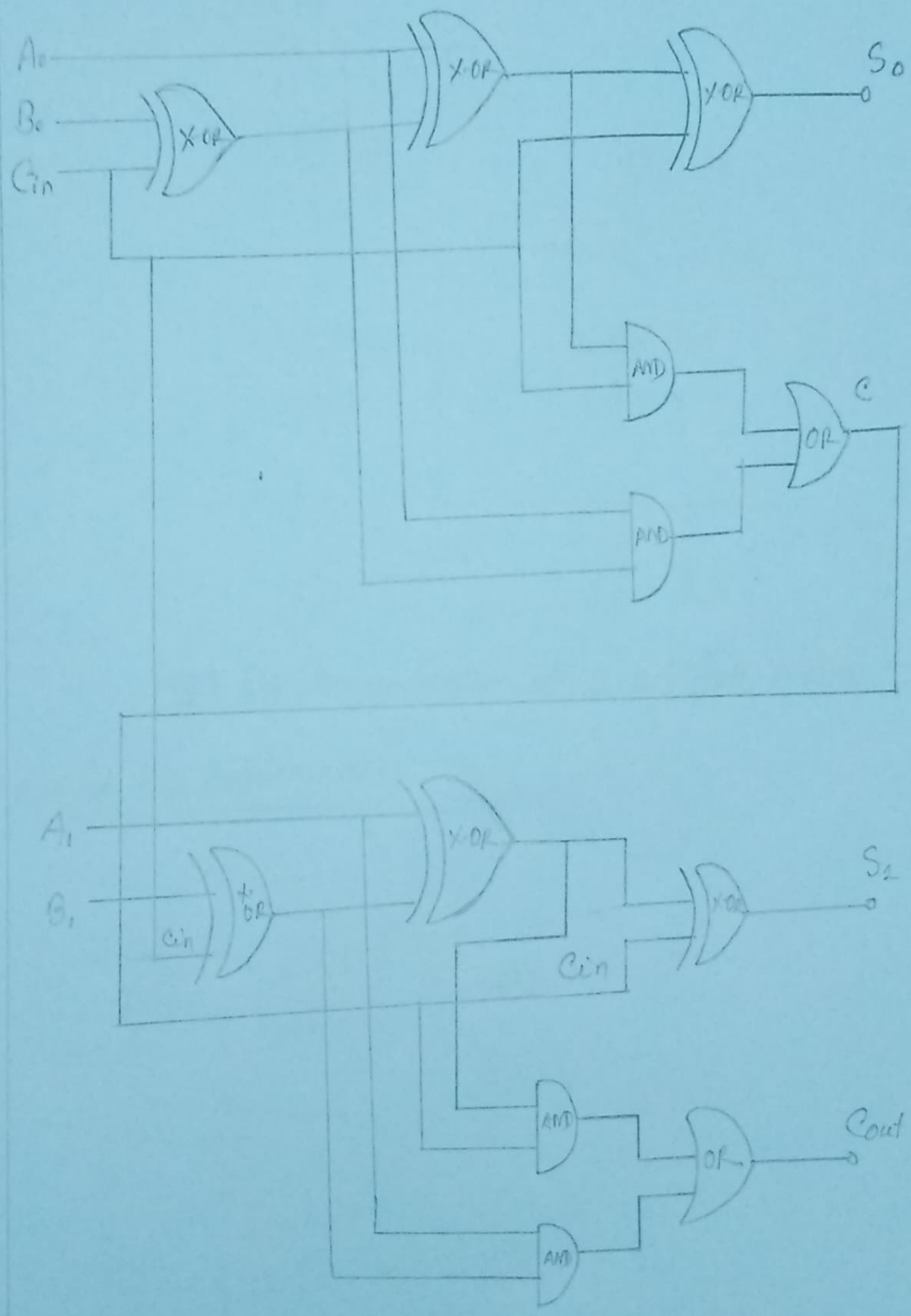

Fig: 2bit Substractor using logic gate

Block Diagram:

1. 2-bit Adder:

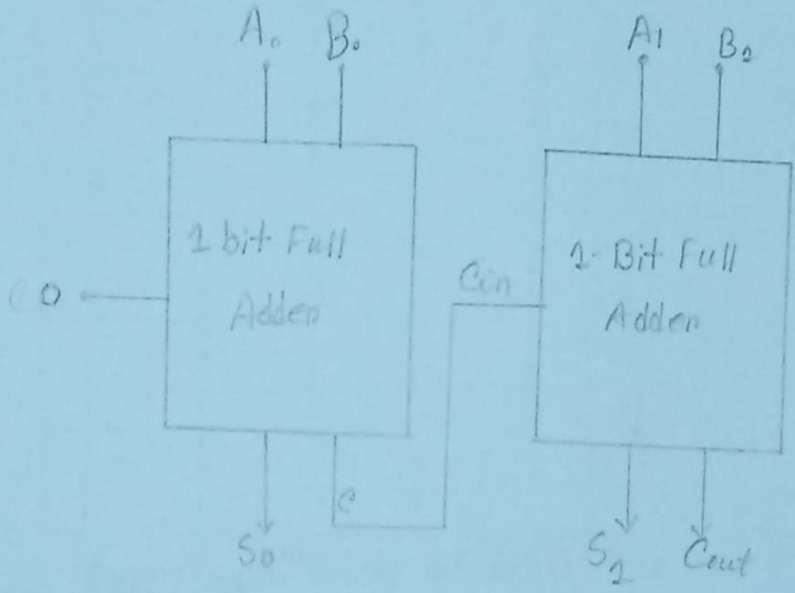

Fig: Fig Configuration of 2 bit full Adder

2. 2- bit full subtractor:

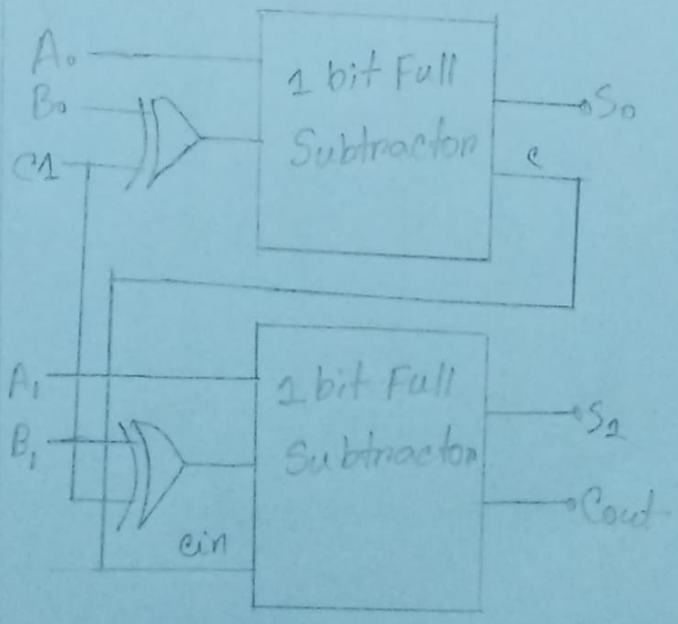

Fig: Configuration of 2 bit full Subtractor

Truth Table:

1. 2 bit Full Adder:

A_1	A_0	B_1	B_0	Cout	S_1	S_0
0	0	0	0	0	0	0
0	0	0	1	0	0	1
0	0	1	0	0	1	0
0	0	1	1	0	1	1
0	1	0	0	0	0	1
0	1	0	1	0	1	0
0	1	1	0	0	1	1
0	1	1	1	1	0	0
1	0	0	0	0	1	0
1	0	0	1	0	1	1
1	0	1	0	1	0	0
1	0	1	1	1	0	1
1	1	0	0	0	1	1
1	1	0	1	1	0	0
1	1	1	0	1	0	1
1	1	1	1	1	1	0

Fig: Truth Table of 2 bit Full adder

2. 2 bit Full Subtractor:

A_1	A_0	B_1	B_0	Cout	S_1	S_0
0	0	0	0	0	0	0
0	0	0	1	0	1	1
0	0	1	0	1	1	0
0	0	1	1	1	0	1
0	1	0	0	0	0	1
0	1	0	1	0	0	0
0	1	1	0	1	0	1
0	1	1	1	1	0	0
1	0	0	0	0	1	0
1	0	0	1	⊗1	0	⊗1
1	0	1	0	0	0	0
1	0	1	1	1	0	1
1	1	0	0	0	1	1
1	1	0	1	0	1	0
1	1	1	0	0	1	1
1	1	1	1	0	0	0

Fig: 2-bit Subtractor of Truth table

Working procedure:

1. 2-bit Adder:

i) Check the components and gates for their working.

ii) Insert the appropriate IC into the IC base.

iii) Make connections as shown in the circuit of diagram of Adder.

iv) Verify the truth table and observe the outputs of 2-bit full adder.

2. 2-bit Full Subtractor:

i) Check the components and gates for their working.

ii) Insert the appropriate IC into the IC base.

iii) Make connections as shown in the circuit diagram of subtractor.

iv) Verify the truth table and observe the outputs of 2 bit full Subtractor.

Results: In case

2 bit Full Adder, Firstly the sum of bit $A_0 + B_0 = S_0$ And Carry C. Secendly the sum of bit $A_1 + B_1 = S_1$ and Carry C is 2nd 2bit Full adder of Cin and Output is Cout. Similarly In case of 2bit Full Subtracton, Firstly the subtraction of $A_0 - B_0 = S_0$ and Carry is 2nd 1 bit full Subtractor of Cin. Then the subtraction of $A_1 - B_1 = S_1$ and Carry is Cout.

Precaution:

i) Check the connection according to the IC pin diagram.

ii) The connection should be tightly.

iii) Check the equipment befor starting the examination.

iv) power supply ~~tr~~turned off when we leave the experimental lab.