EXPERIMENT 04:

Implementation of a Half Adder and a Full Adder using gates.
Implementation of 4-bit Adder and Subtractor using 74LS83 & 74LS86.

Objectives:

To implement a half adder and a full adder using gates and implementing 4-bit adder and subtractor using 74LS83 & 74LS86.

Equipment/Tool:

Trainer, IC – XOR, IC-OR, IC-AND, IC74LS83 (4-bit adder), 74LS86 (XOR).

Background theory:

A half adder is a combinational circuit that adds two binary inputs. It gives two outputs, S as the sum and C as the carry of the inputs.

A full adder is a combinational circuit that adds three binary inputs X, Y and Z. The input Z is the carry input from another addition. It gives two outputs, S as the sum and C as the carry of the inputs.

The circuit for the adder/subtractor shown in figure 4.3 is used to do binary additions and subtractions. If Cin=0, addition is performed and if Cin=1, subtraction is performed.

Tasks:

- Write a truth table for a half adder, design a simplified circuit for it. Implement it on trainer and verify the results.
- Write a truth table for a full adder, design a simplified circuit for it. Implement it on trainer and verify the results.
- Fill in the truth table.
- Design the complete circuit on the trainer and verify the results.
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Procedure

Task 1 & 2

Fill in the following truth table of half adder and full adder and draw the circuit from them.

Table for Full Adder

A	B	C	Sum	Carry
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Table for Half Adder

A	B	Sum	Carry
0	0		
0	1		
1	0		
1	1		

Circuit Diagram:

i) **Circuit diagram for Half Adder**

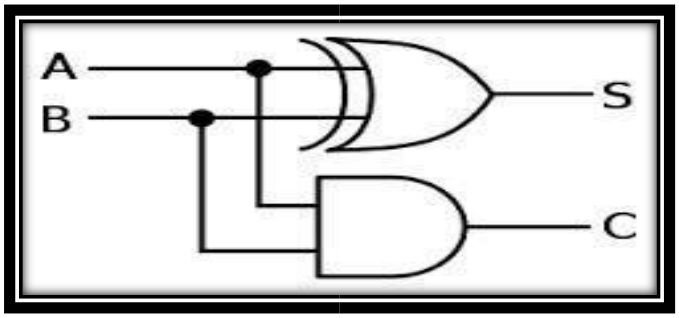


Figure 4.1. Half Adder

ii) **Circuit diagram for Full Adder**

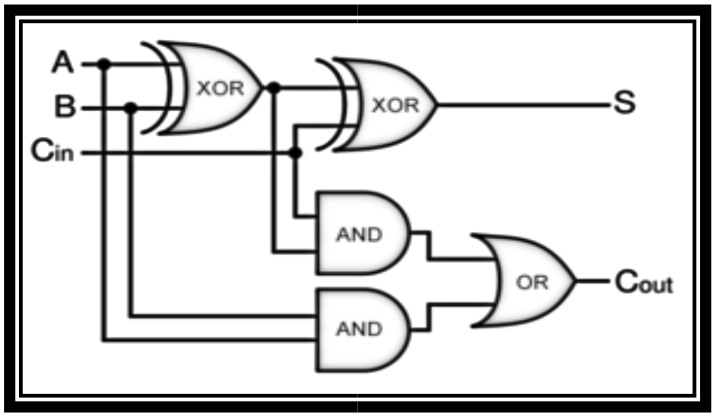


Figure 4.2. Full Adder

Task 3 & 4:

Following is the circuit diagram. Implement it on the trainer and verify the results:

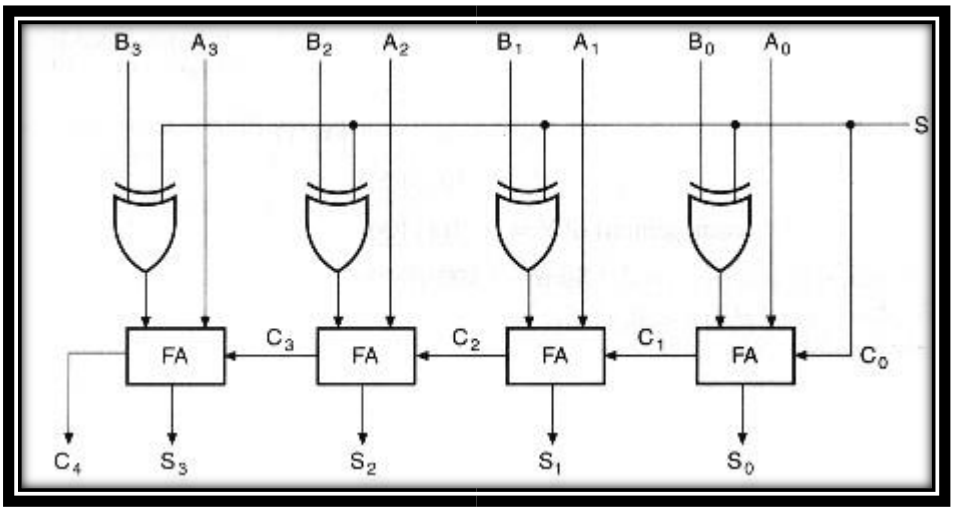
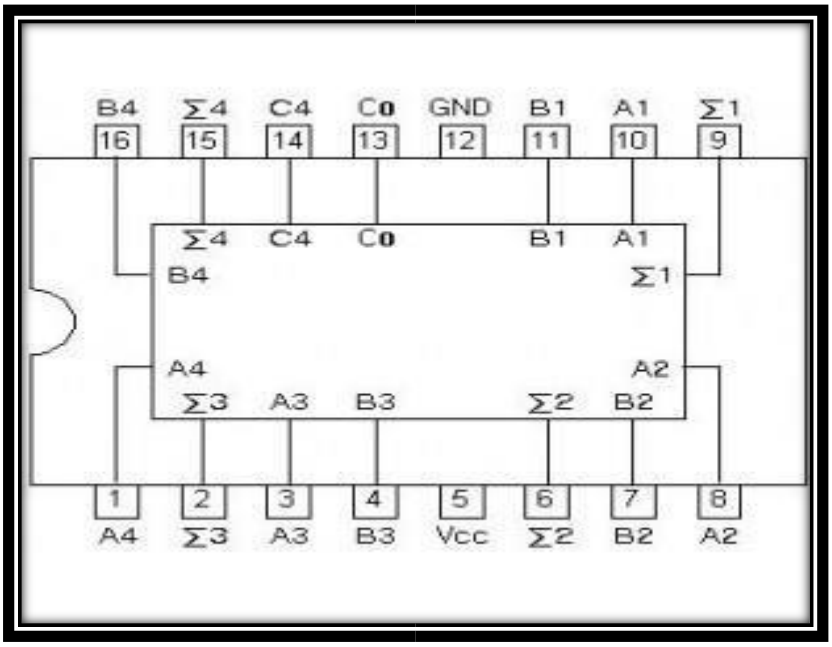


Figure 4.3. Circuit for 4-bit Adder

This is a 4-bit adder/subtractor circuit. FA is full adder. The operation depends upon Cin. If Cin=0, addition is performed and if Cin=1, subtraction is performed.

Pin Configuration of 74LS83:



Exercise in Lab:

Fill in the following truth table and verify your results and show it to the instructor:-

1)

A3	A2	A1	A0
B3	B2	B1	B0
S3	S2	S1	S0

2)

A3	A2	A1	A0
B3	B2	B1	B0
S3	S2	S1	S0