Half adder And Full adder Circuits

المعمارية

المرحلة الثانية

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An adder is a digital logic circuit in electronics that implements addition of numbers. In many computers and other types of processors, adders are used to calculate addresses, similar operations and table indices in the ALU and also in other parts of the processors. These can be built for many numerical representations like excess-3 or binary coded decimal.

Adders are classified into two types:

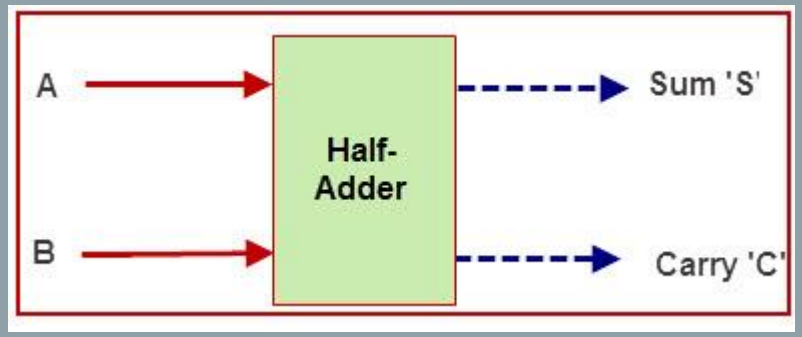
half adder and full adder.

The half adder circuit has two inputs:
A and B, which add two input digits and generate a carry and sum.

The full adder circuit has three inputs:
A and C, which add the three input numbers and generate a carry and sum.

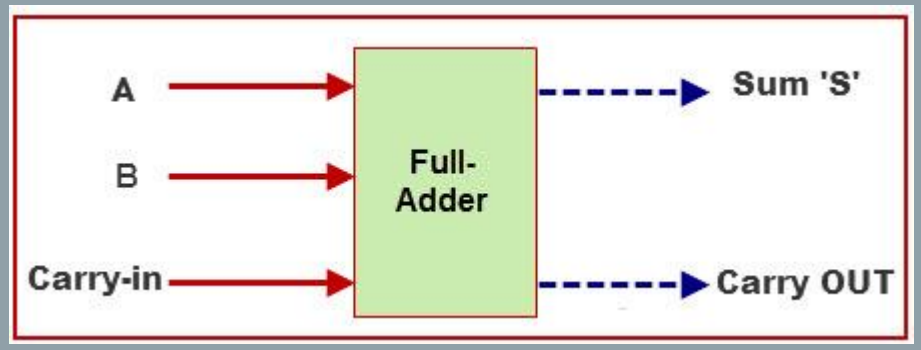
The half adder adds two binary digits produces two outputs as sum and carry;
XOR is applied to both inputs to produce sum and AND gate is applied to both inputs to produce carry.

The full adder adds 3 one bit numbers, where two can be referred to as operands and one can be referred to as bit carried in. And produces 2-bit output, and these can be referred to as output carry and sum.



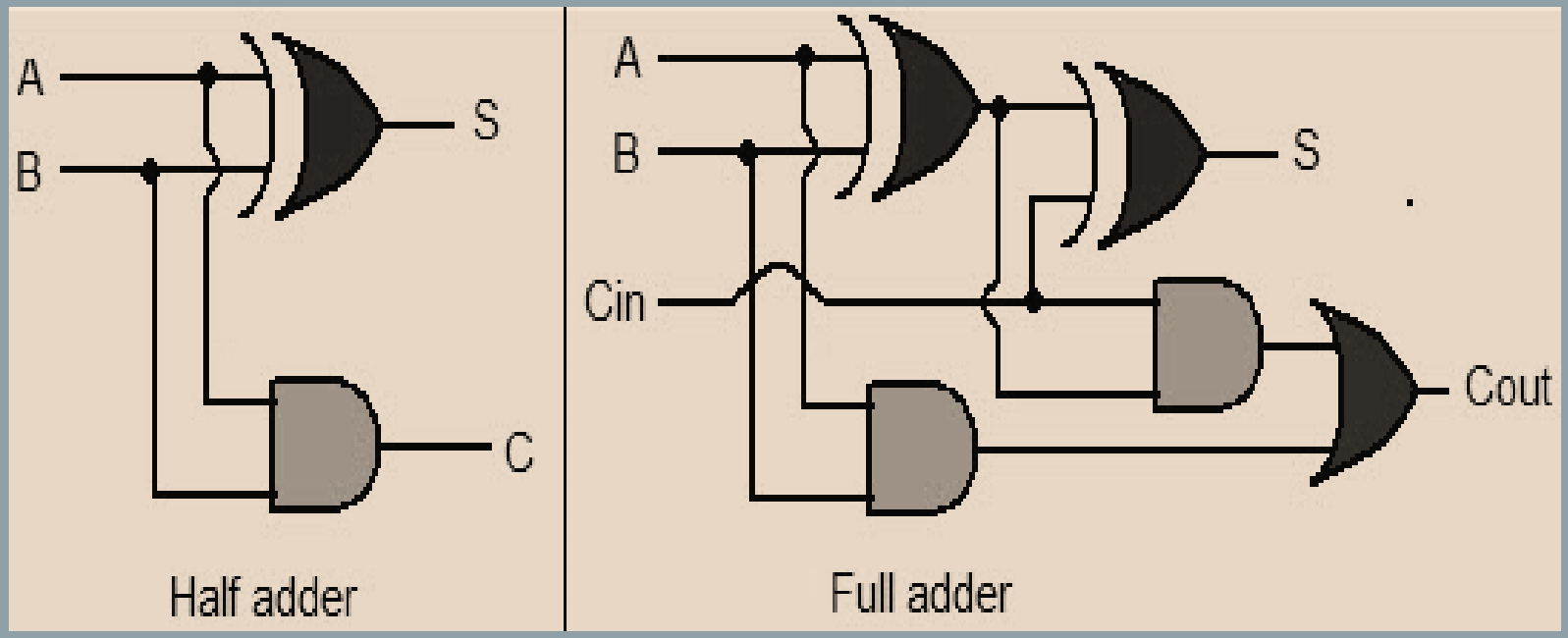
Half Adder Truth Table

INPUTS		OUTPUTS	
A	B	SUM	CARRY
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

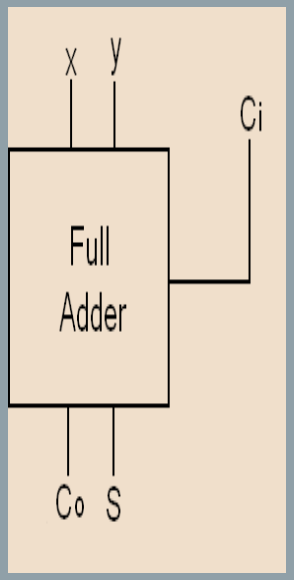


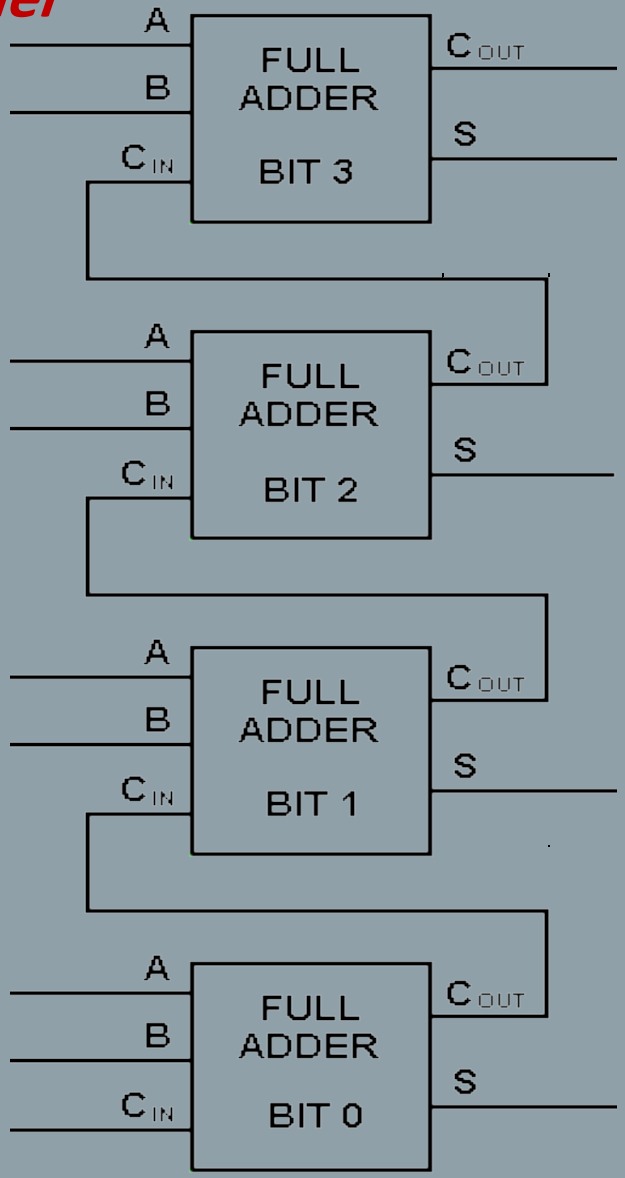
Full Adder Truth Table:

INPUTS			OUTPUT	
A	B	C-IN	C-OUT	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

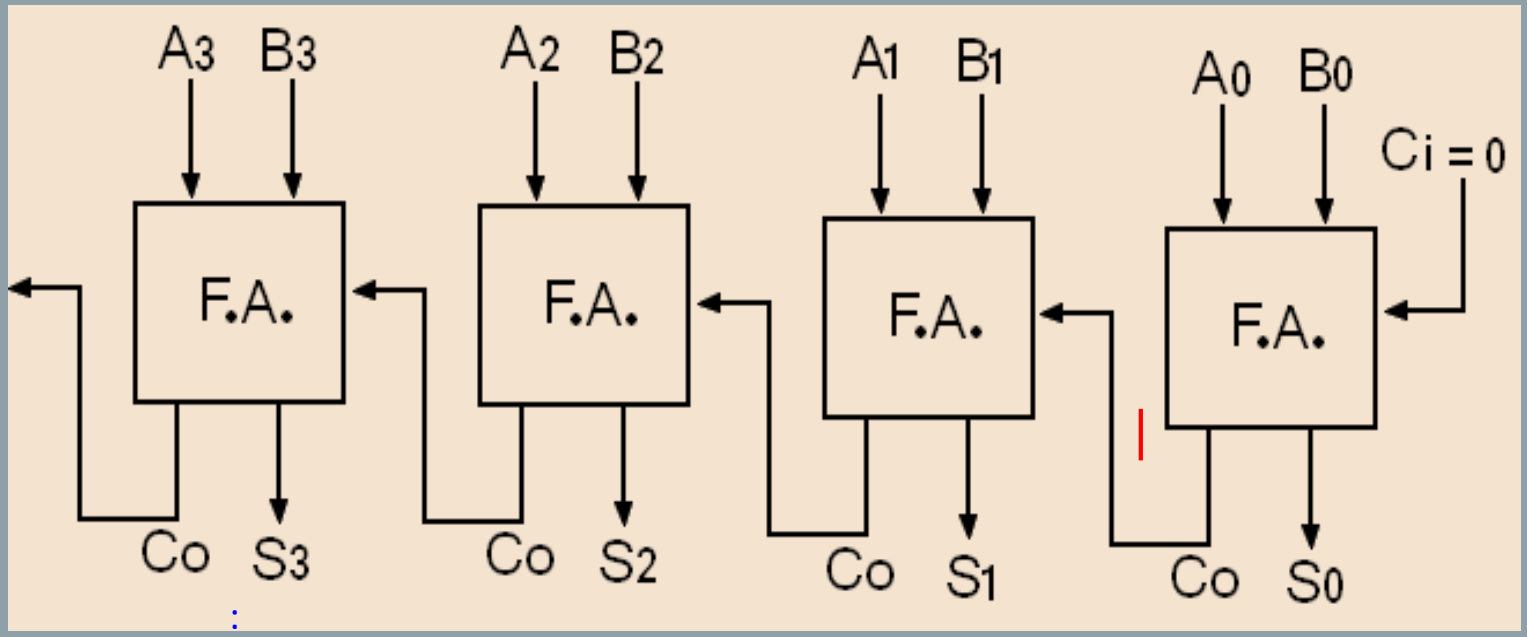

A
B
S
C
Half adder
A
B
Cin
S
Cout
Full adder

Multi-Bit Addition using Full Adder





Implementing a 4-bit parallel adder using 4 FA's

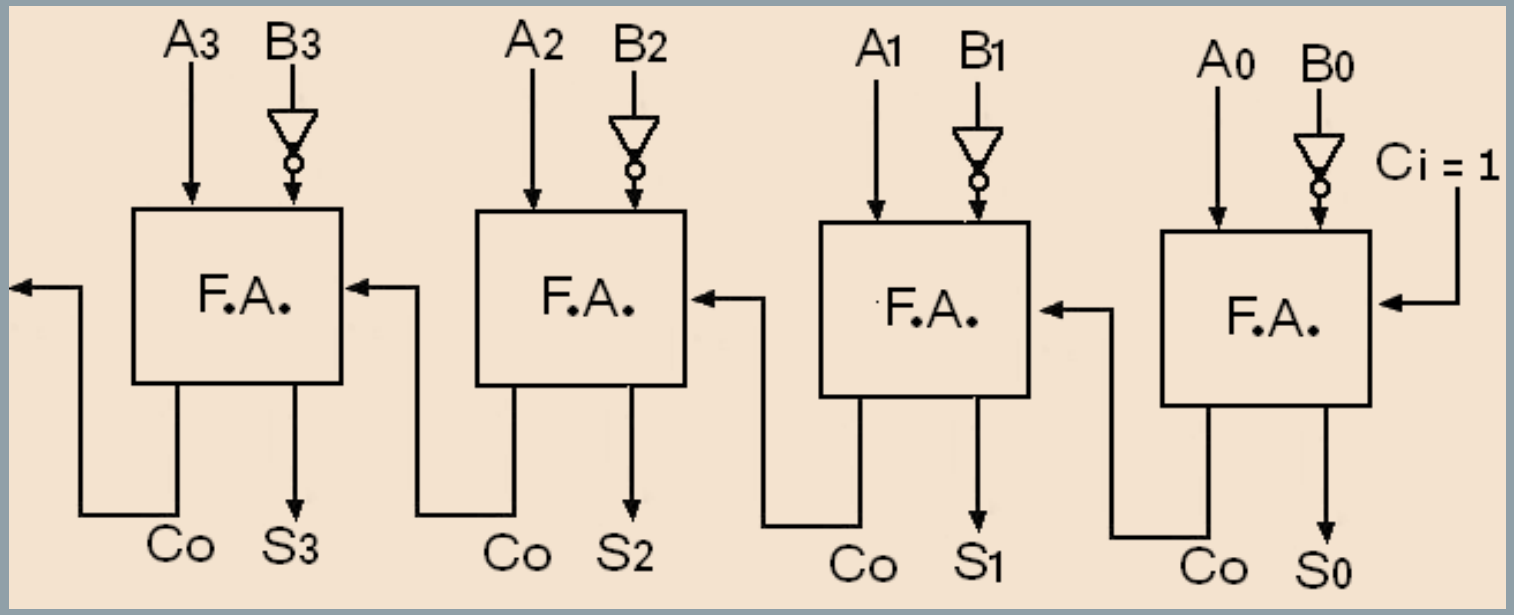


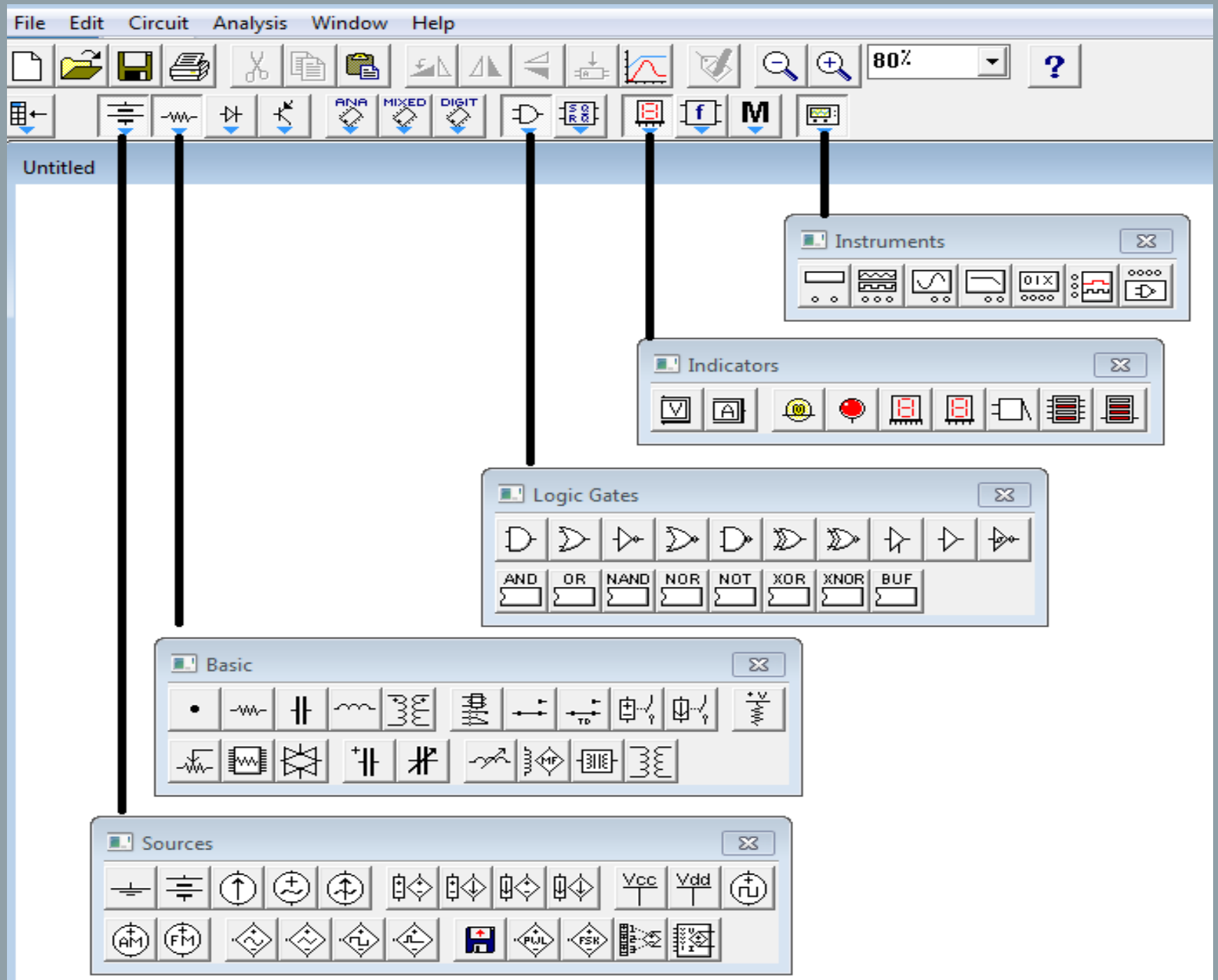
			0
A_3	A_2	A_1	A_0
B_3	B_2	B_1	B_0 +

Design Subtractor from using full adder :

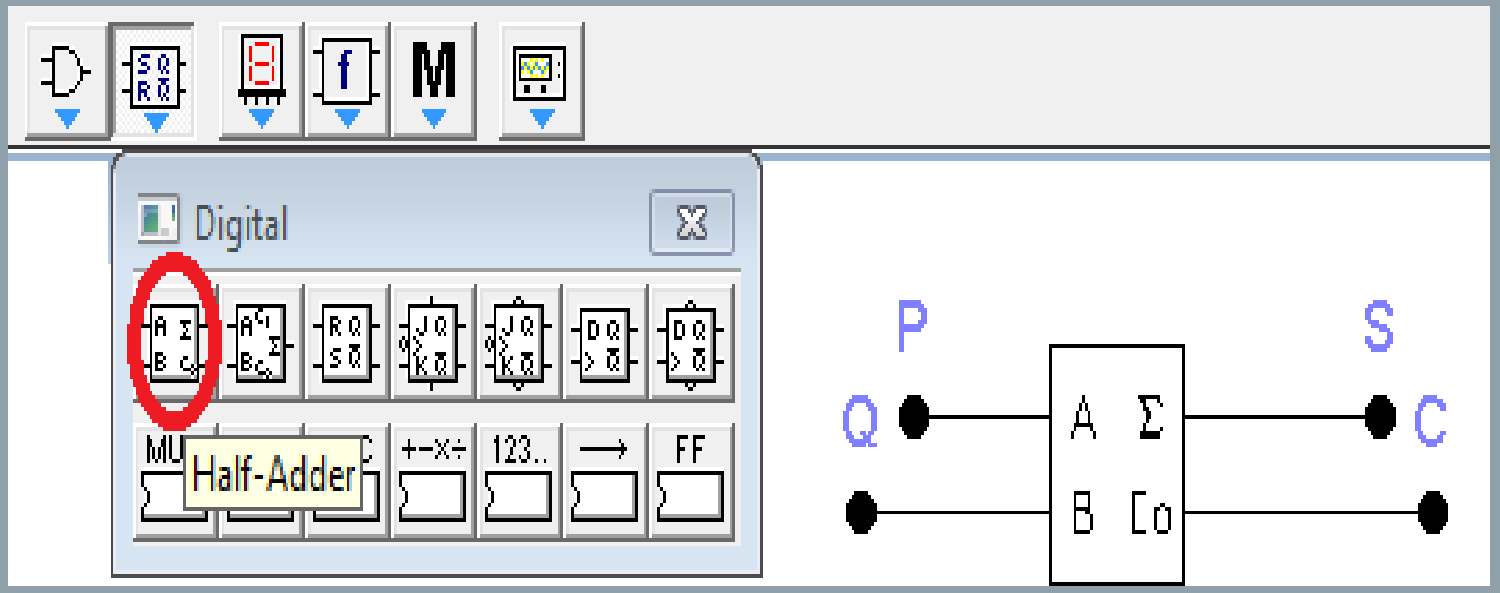
$$= A + (B' + 1)$$
$$= A + (2\text{'s Comp of } B)$$
$$= A - B$$

Design a 4 - bit full subtractor using full adder and additional gates

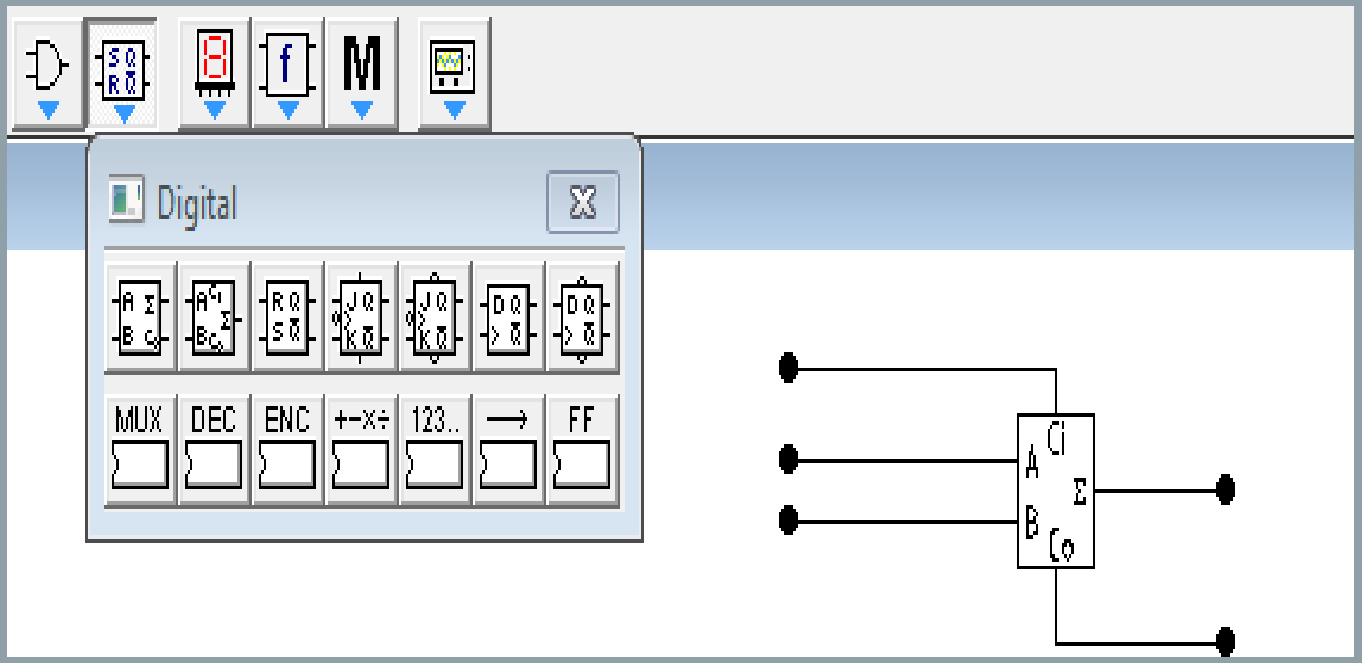


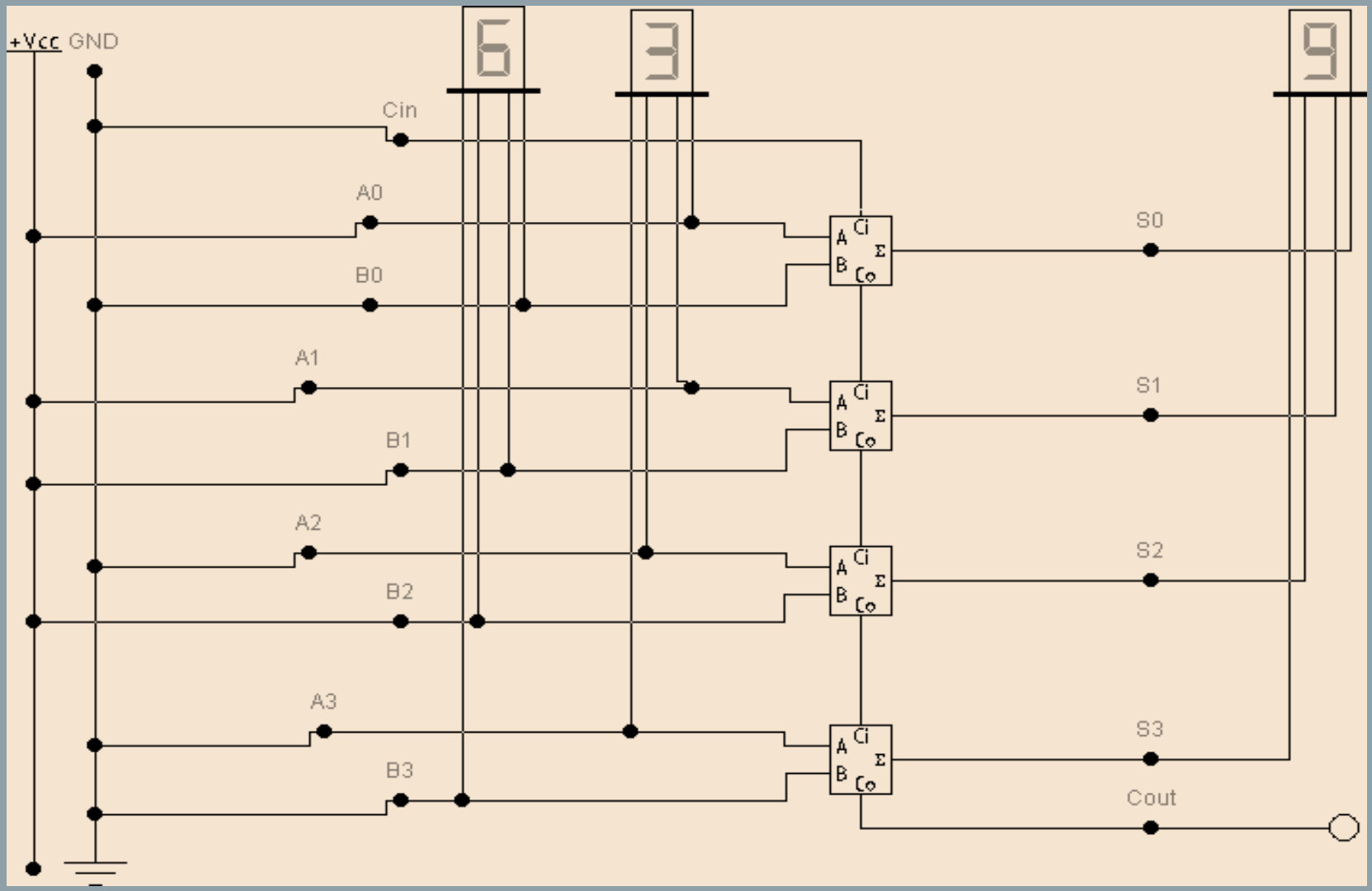

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Implementing HA circuit using EWB

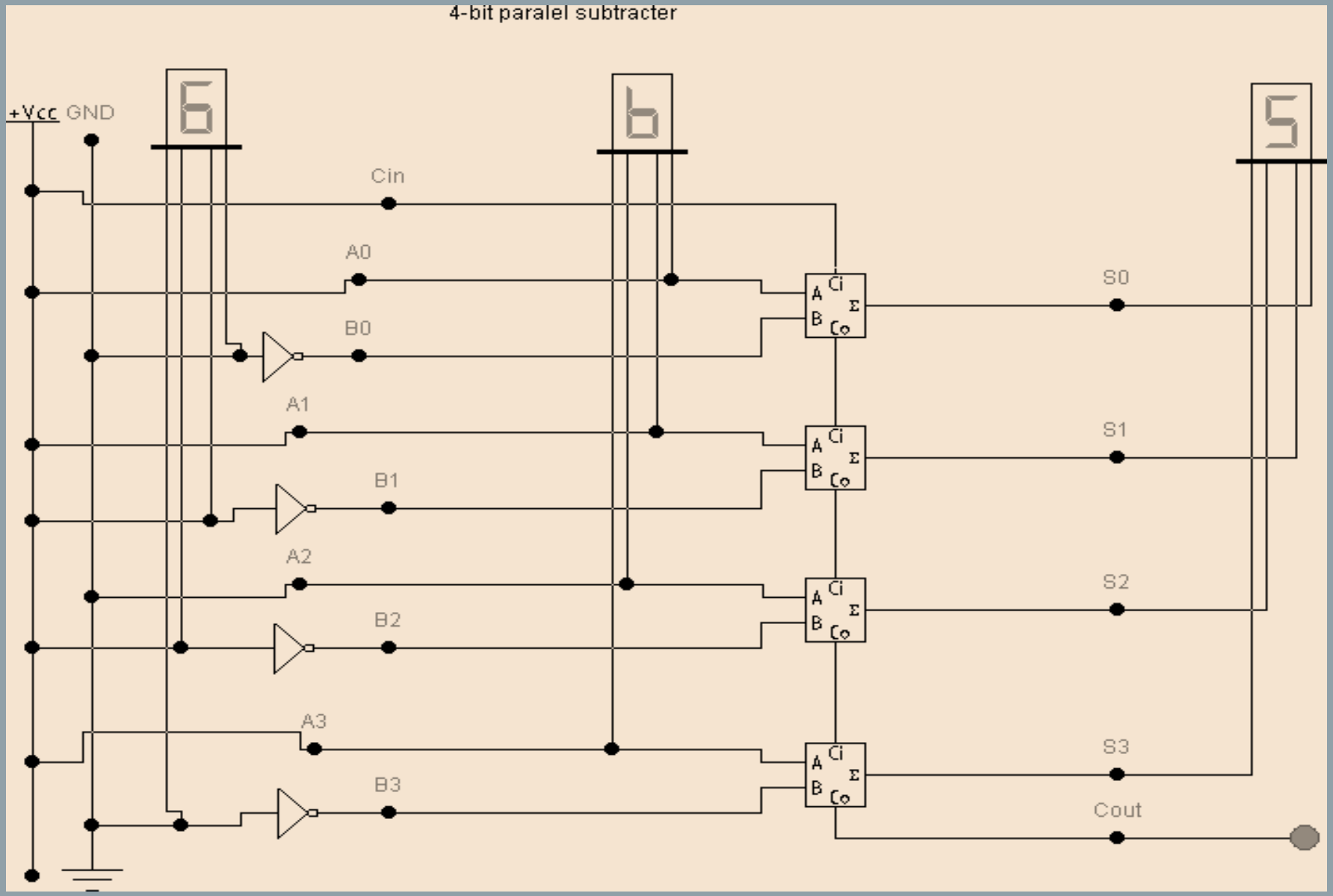


Implementing FA circuit using EWB





Draw using EWB a 4-bit parallel adder circuit (the circuit below shows (6+3=9))



Draw using EWB a 4-bit parallel adder circuit (the circuit below shows (b-6=5))

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