FULL ADDER

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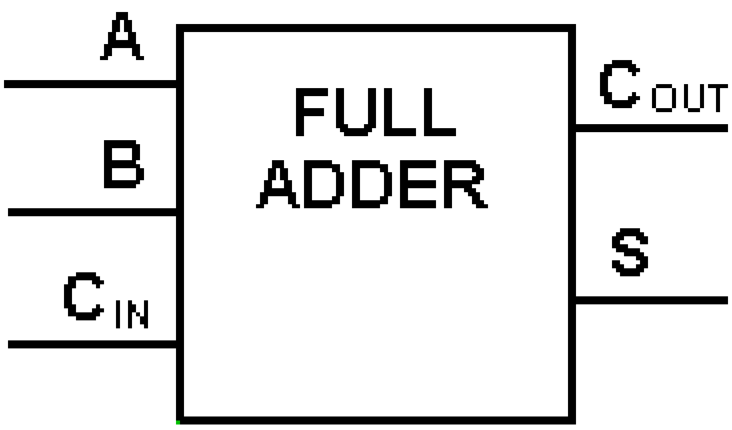
- Full adder circuit performs addition

- It is so called because it adds together two binary digits plus a carry-in digit to produce a sum and carry-out digit

- The main difference between a half-adder and a full-adder is that, the full-adder has three inputs and two outputs

- The first two inputs are A and B and the third input is an input carry designated as Cin



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

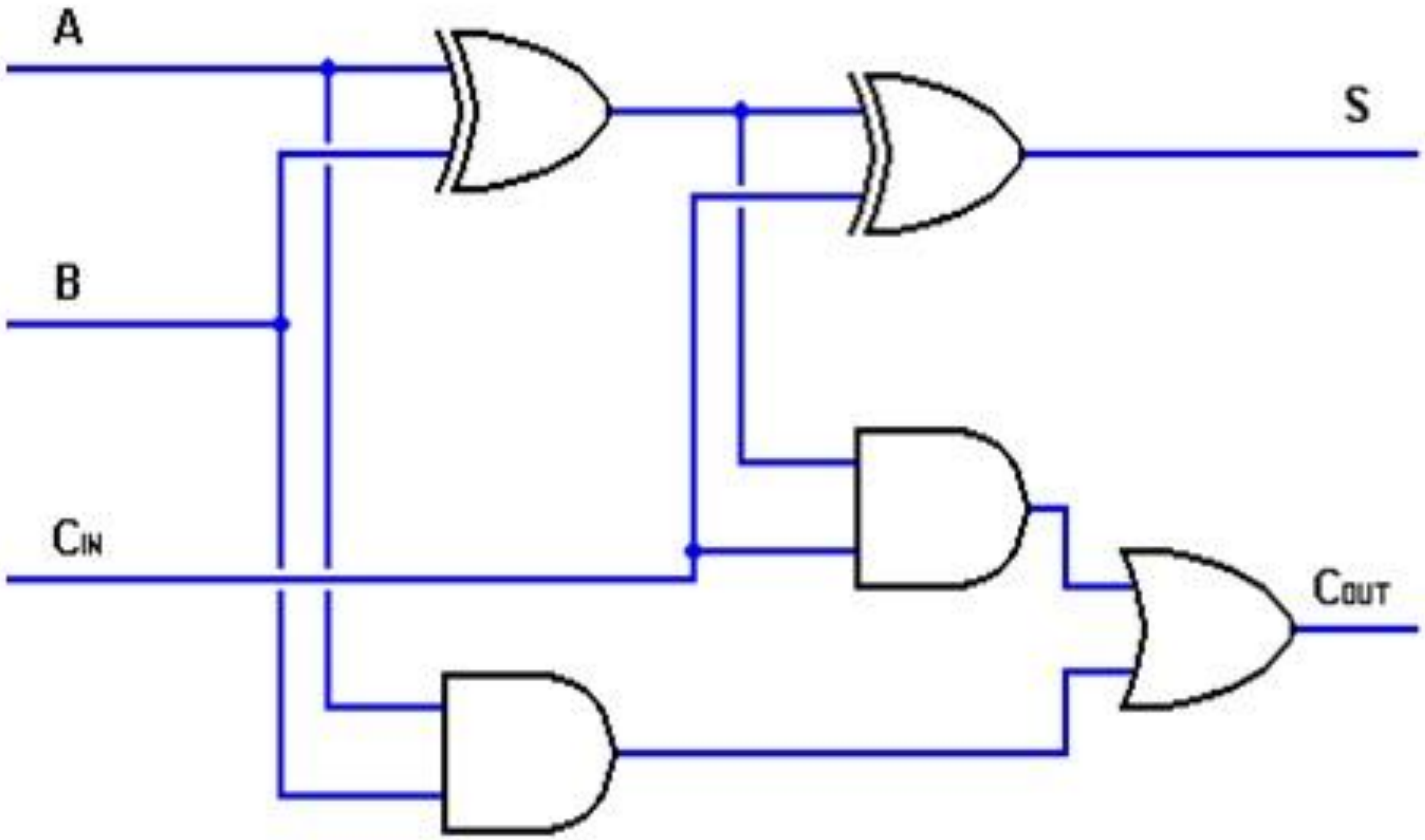
From the truth table, the Sum output is only a logic 1 when one or three (but not two) of the inputs is logic 1. The Boolean expression for this in reduced form:

$$Sum = Cin \oplus (A \oplus B)$$

From the truth table, the Cout is only a logic 1 when *two or three* of the inputs is logic 1. The Boolean expression for this is (in reduced form):

$$Cout = (A.B)+(Cin.(A \oplus B))$$

Realization of Full adder



- We can implement a full adder circuit with the help of two half adder circuits

- First half adder will be used to add A and B to produce a partial Sum

- The second half adder logic can be used to add Cin to the Sum produced by the first half adder to get the final S output

- If any of the half adder logic produces a carry, there will be an output carry. Thus, COUT will be an OR function of the half-adder Carry outputs

Schematic representation of a full adder using half adders