

1. What is a buffer? What are its applications?

A buffer is a digital circuit that returns the same value as the input. It is usually used when we need to create a delay.

2. What is a tri-state buffer?

A tri-state buffer has three inputs. It acts as a wire when the tri-state input is one and an open circuit when it's zero.

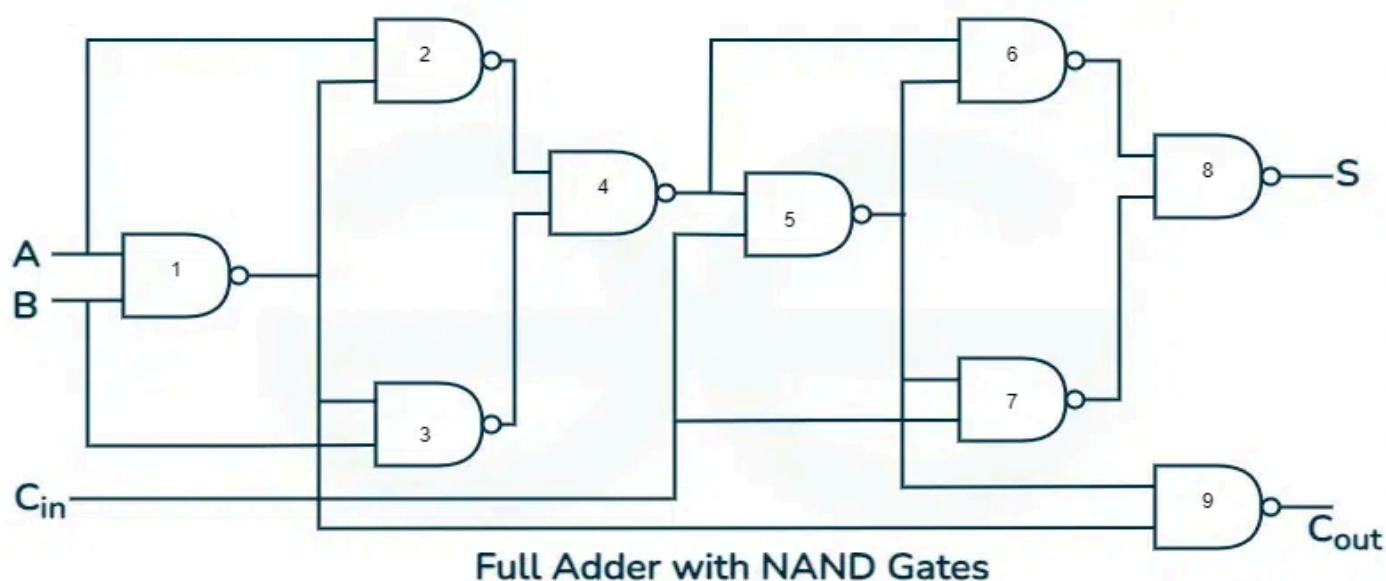
3. What is the difference between NAND and negative input AND gate?

They are both the same in terms of truth table and output behaviour. The only difference is that NAND uses only one inverter, while negative input AND uses two.

4. What is a pull-up and pull-down network?

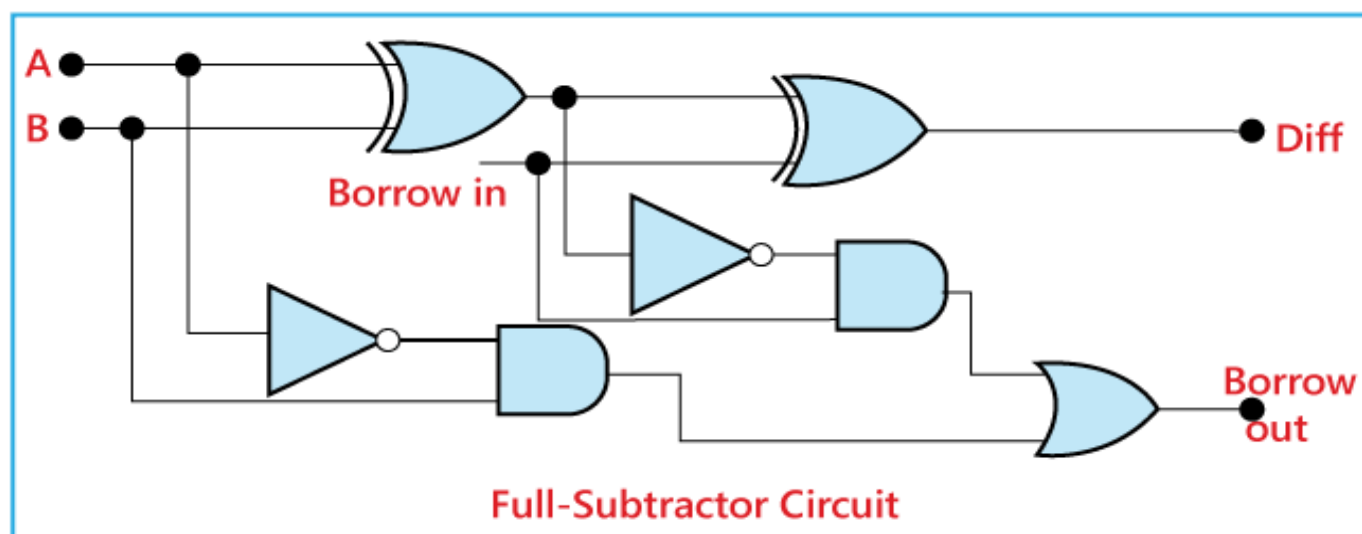
Pullup - a network that provides a low resistance path to Vdd when output is logic '1' and provides a high resistance to Vdd otherwise. Pulldown - a network that offers a low resistance path to Gnd when output is logic '0' and offers a high resistance to Gnd otherwise.

5. Design a full adder using only NAND gates



6. Explain the working of a Full subtractor.

The full subtractor is used to subtract three 1-bit numbers A, B, and C, which are minuend, subtrahend, and borrow, respectively. The full subtractor has three input states and two output states i.e., diff and borrow.



7. Difference between Ripple carry adder and Carry lookahead adder

In ripple carry adders, for each adder block, the two bits that are to be added are available instantly. However, each adder block waits for the carry to arrive from its previous block. So, it is not possible to generate the sum and carry of any block until the input carry is known.

A carry look-ahead adder reduces the propagation delay by introducing more complex hardware. In this design, the ripple carry design is suitably transformed such that the carry logic over fixed groups of bits of the adder is reduced to two-level logic.

8. Explain the comparator with the truth table

A comparator is a circuit with 2 inputs and 3 outputs. It tells us if the inputs are equal or greater than or lesser than the other

A	B	A<B	A=B	A>B
0	0	0	1	0
0	1	1	0	0
1	0	0	0	1
1	1	0	1	0

9. Design a 2x frequency multiplier.

