Circuit Simulation Project

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Title of the Project

Design of XNOR gate using NAND gate in eSIM

Theory:-

XNOR Gate

The XNOR gate is the complement of the XOR gate. It is a hybrid gate. Simply, it is the combination of the XOR gate and NOT gate. The output level of the XNOR gate is high only when both of its inputs are the same, either 0 or 1. The symbol of the XNOR gate is the same as XOR, only complement sign is added. Sometimes, the XNOR gate is also called the **Equivalence gate**.

NAND GATE:

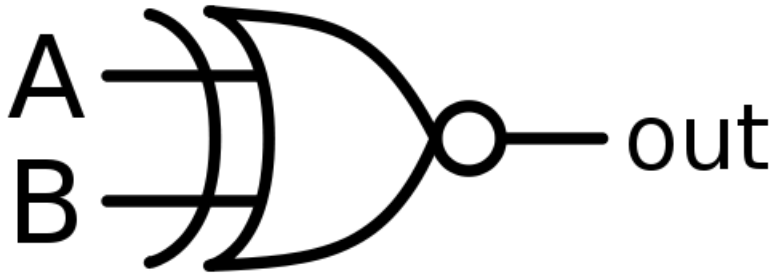
In digital electronics, a NAND gate (NOT-AND) is **a logic gate which produces an output which is false only if all its inputs are true**; thus its output is complement to that of an AND gate. A LOW (0) output results only if all the inputs to the gate are HIGH (1); if any input is LOW (0), a HIGH (1) output results.A NAND gate is a universal gate, meaning that any other gate can be represented as a combination of NAND gates.

2-input Ex-NOR gate

It is a simple form of the hybrid gate XNOR. In this type of XNOR gate, there are only two input values and an output value. There are $2^2=4$ possible combinations of inputs. The output level is high when both inputs are set to high(1). The Boolean expression of 2-input XNOR gate is as follows:

$Y=(A \oplus B)'$

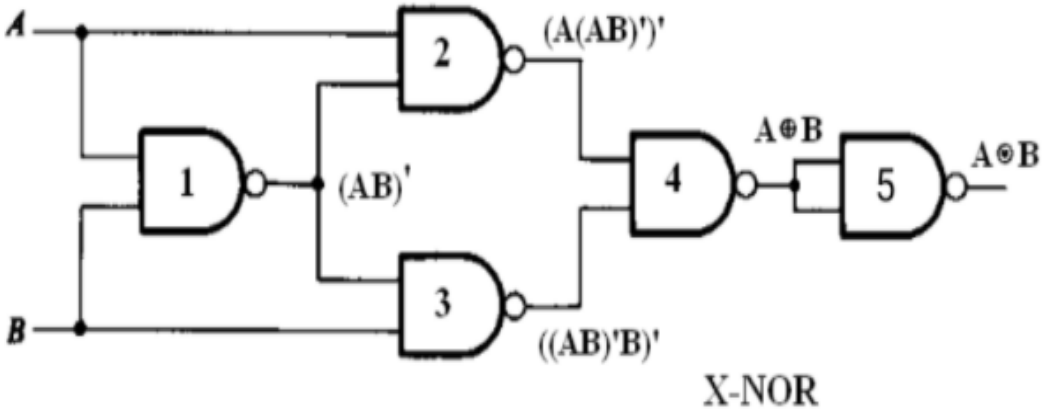
$Y=((AB)'+AB)$



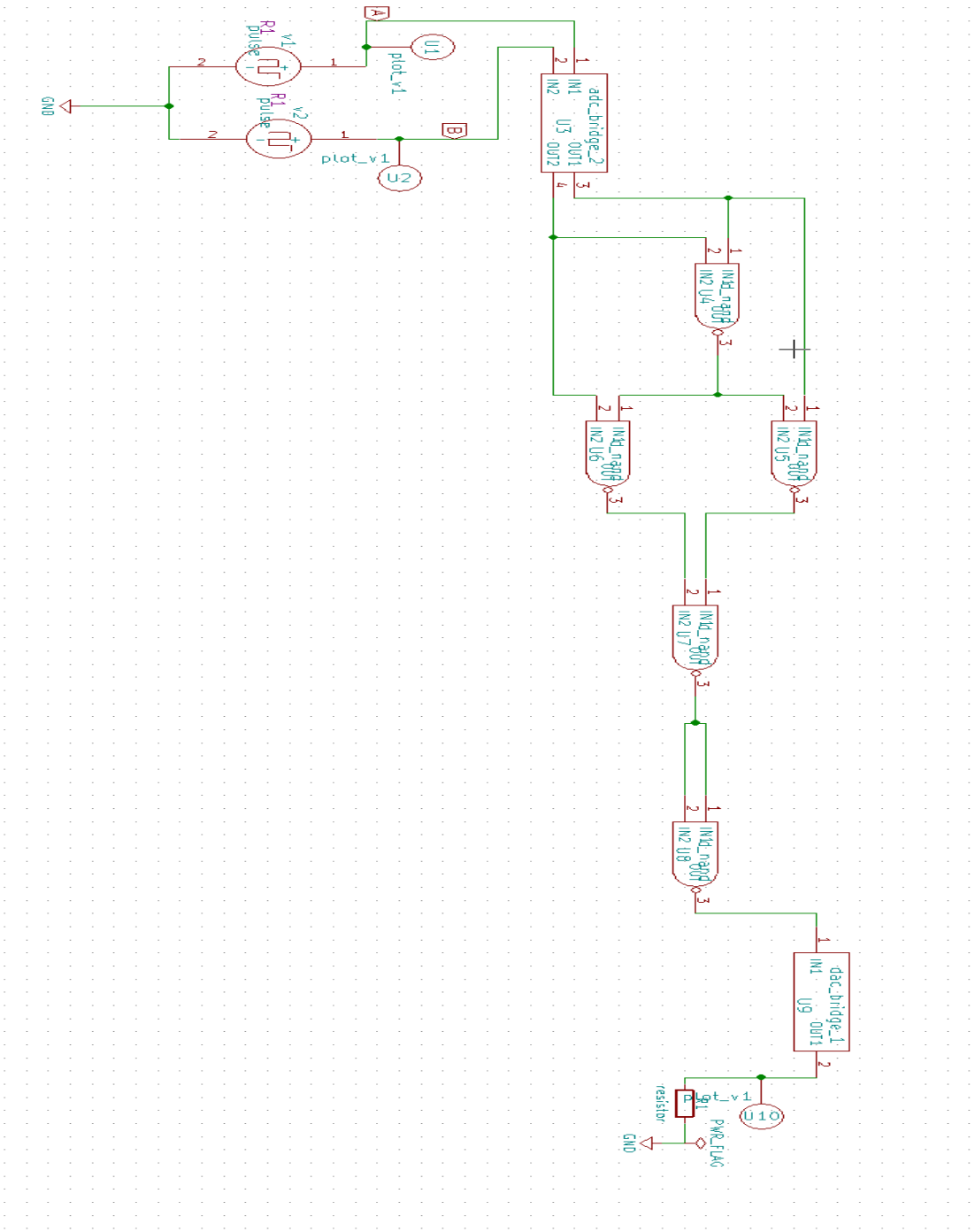
TRUTH TABLE

Inputs		Output
A	B	X
0	0	1
0	1	0
1	0	0
1	1	1

CIRCUIT DIAGRAM



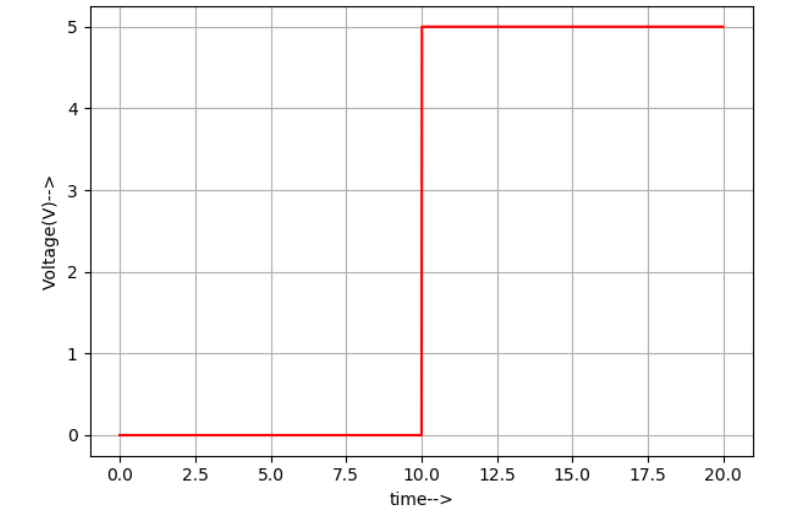
X-NOR


A
B
R1
Pulse
V1
V2
GND
U1
U2
plot_v1
plot_v1
adc_bridge_2
U3
IN1
IN2
OUT1
OUT2
INV_gate
U4
U5
U6
U7
U8
dac_bridge_1
U9
U10
R1
resistor
PWR_FLAG
GND

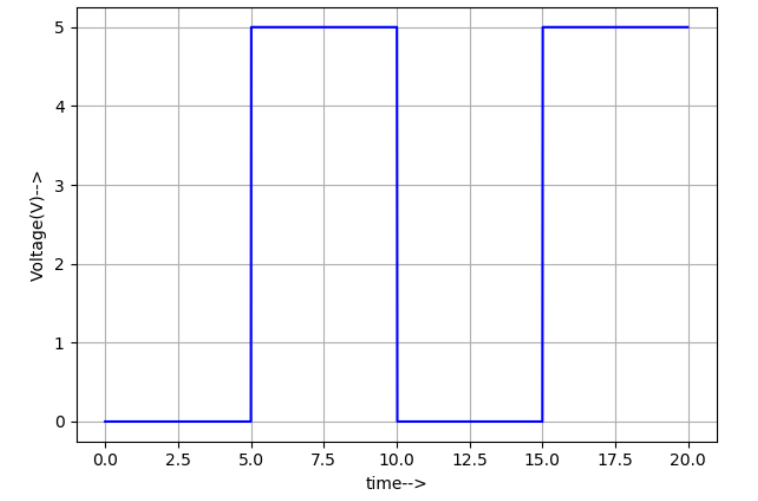
Input:

Python Charts

a

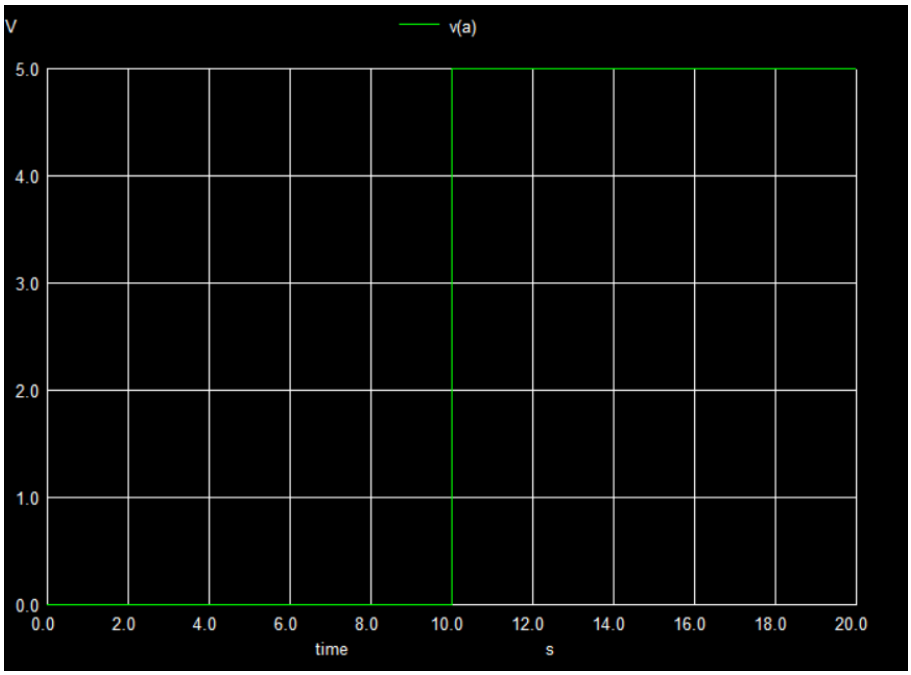


b

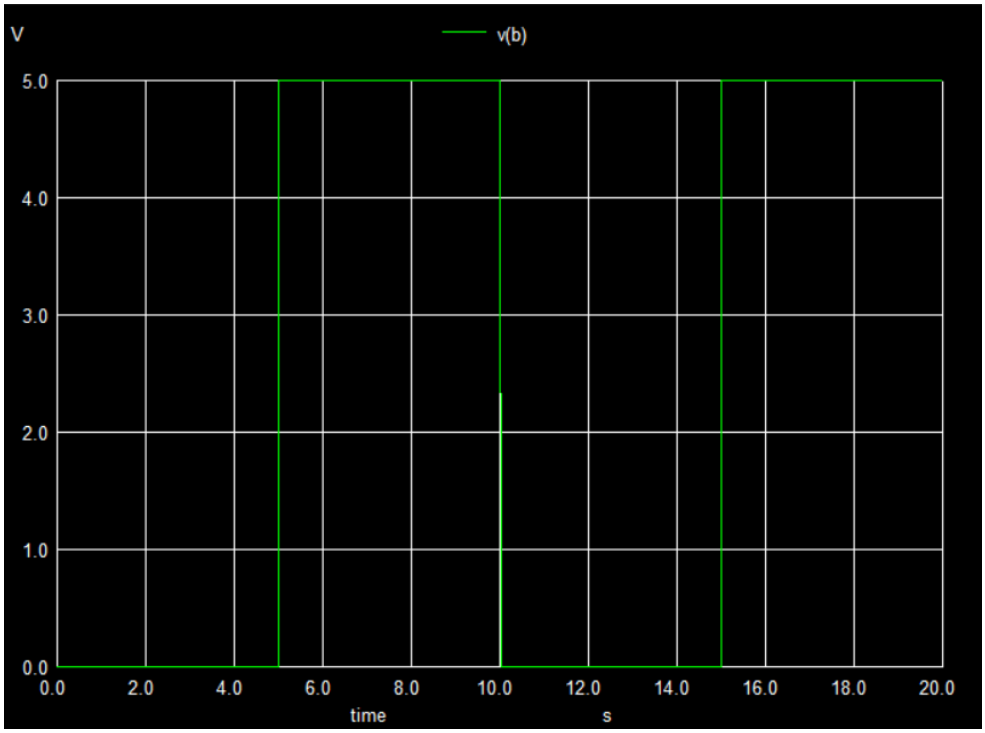


Graph Chart:

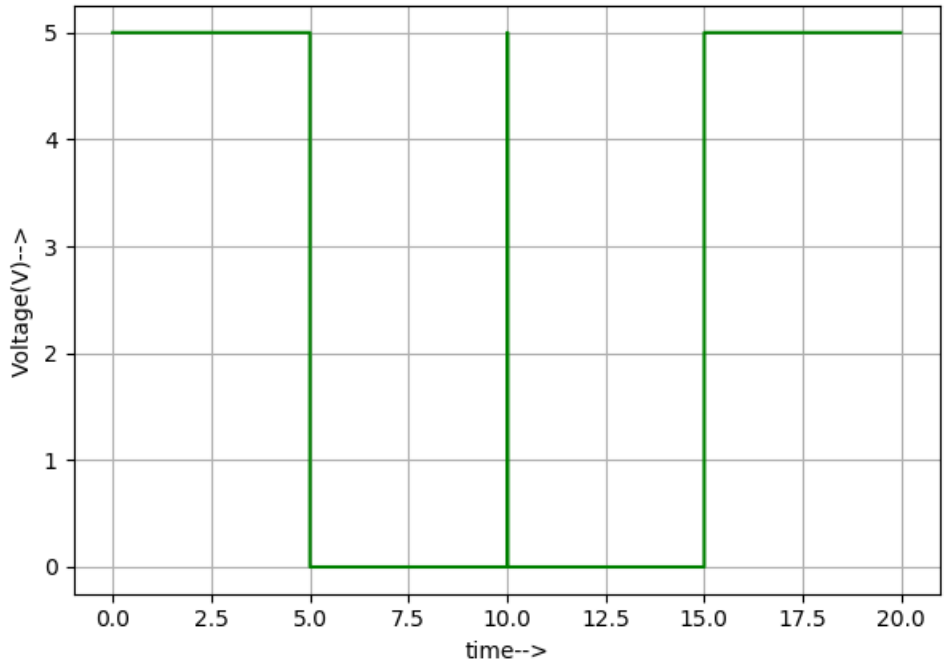
a

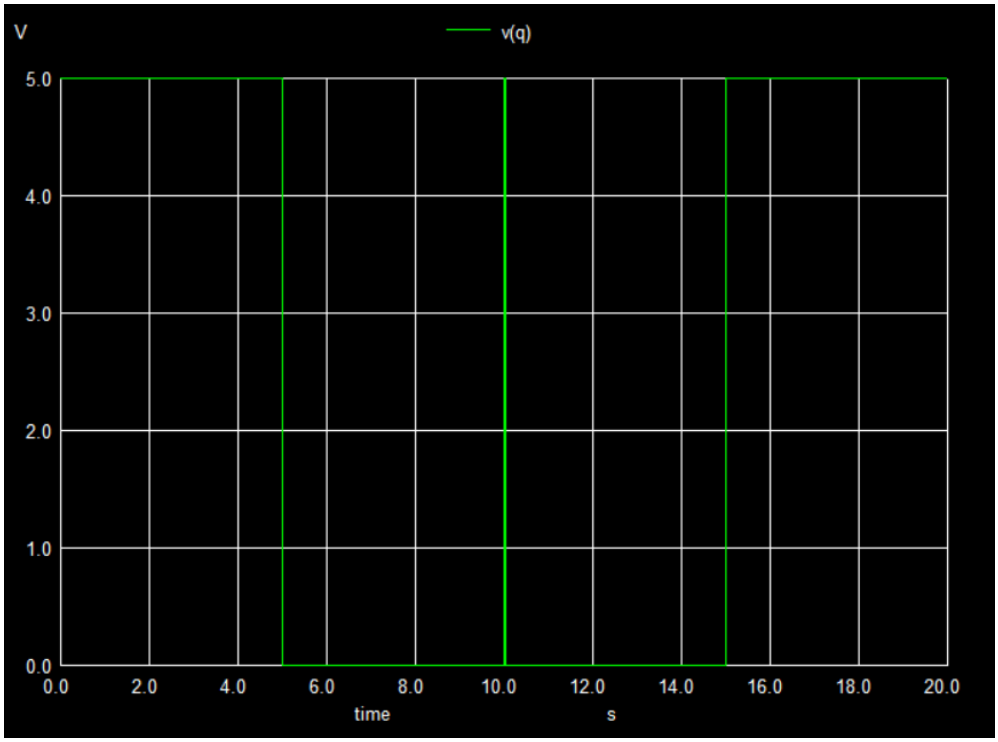


b



Output:


Voltage(V)-->
time-->
0
1
2
3
4
5
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0


V
v(q)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
time
s

References:

https://commons.wikimedia.org/wiki/File:Xnor-gate-en.svg

https://www.youtube.com/watch?v=JCoAF5c-Hjs

https://vlsiuniverse.b

logspot.com/2016/11/xnor-gate-using-nand.html

https://en.wikipedia.org/wiki/NAND_gate#:~:text=In%20digital%20electronics%2C%20a%20NAND,HIGH%20(1)%20output%20results.