Title of the Experiment: --

RTL Of XOR Gate Using BJT - Design And Simulation using eSim

1. Theory: --

The Exclusive OR Gates give high output when the number of high inputs is odd. If the number of high inputs are even, then the output of the XOR gate will be low. Exclusive OR operations are widely used in digital circuits. It is also known as XOR Gate.
XOR represents the inequality function, i.e. the output is true if the inputs are not the same. A half adder consists a XOR gate and a AND gate. Other uses include subtractors, comparators, and controlled inverters.
Here I used only two bipolar junction transistors to make two input XOR gates. Which has two rectangular pluses at its input and output is taken from the output terminal. In this abstract file I am showing all the plots related to it.

2. Schematic Diagram:

The schematic diagram of two input RTL XOR gate Using BJT in eSim is as shown below:

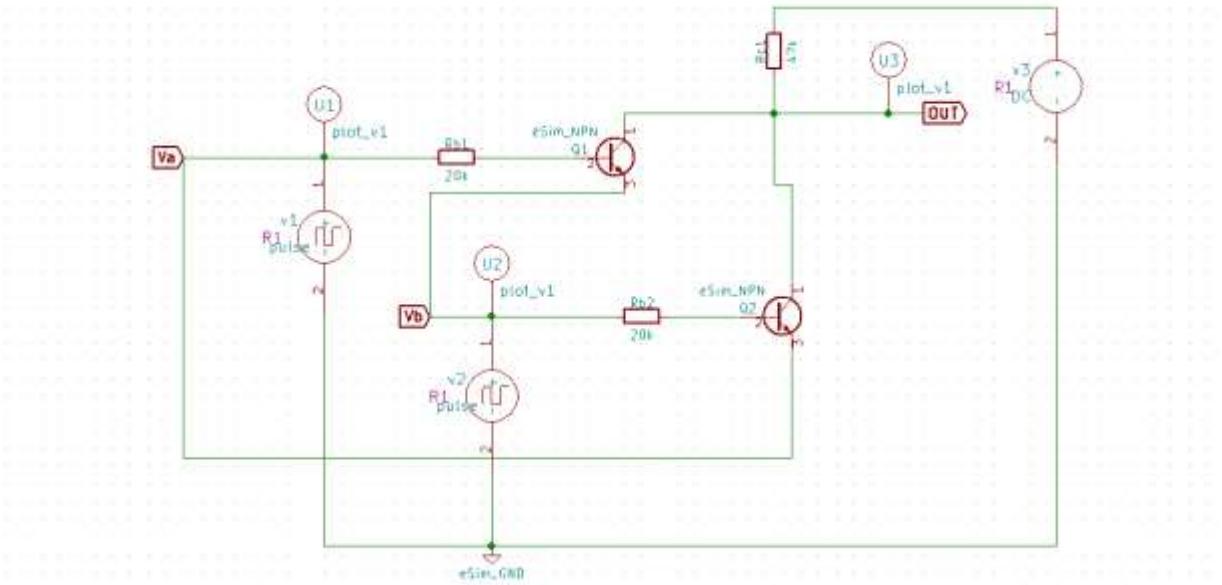

Figure 1: Schematic Diagram of RTL XOR gate.

3. Simulation Results

3.1 NgSpice Plots

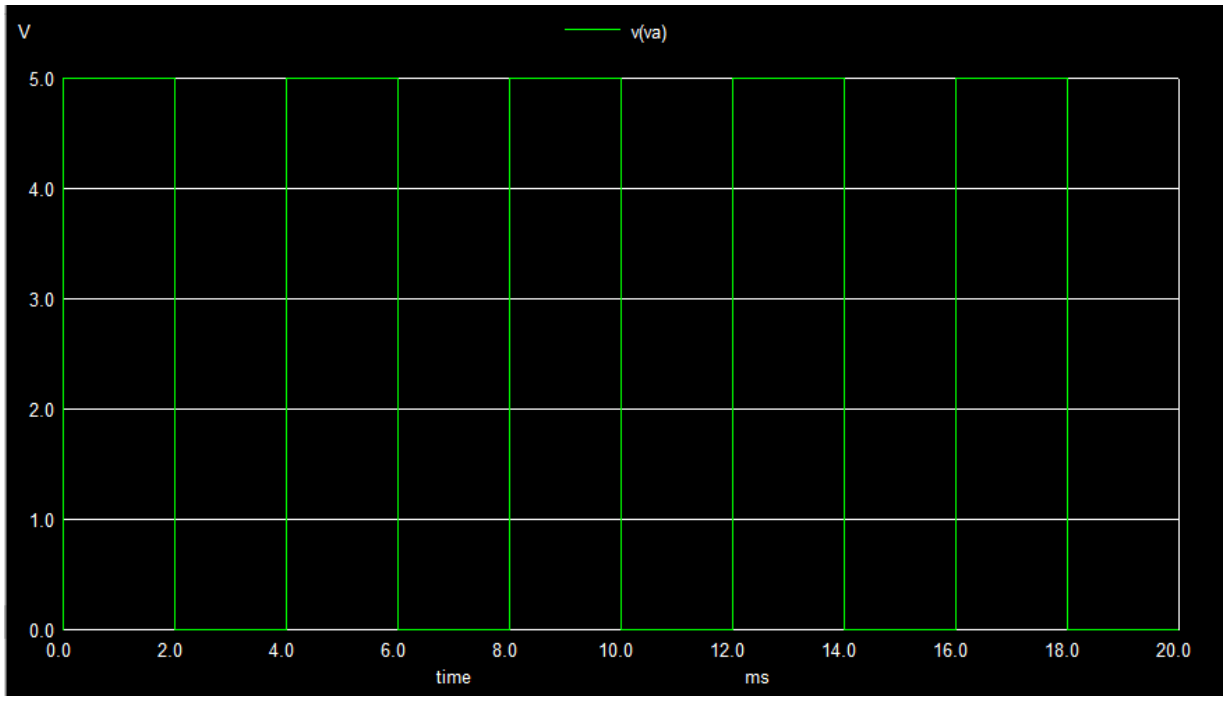

Figure 2: Ngspice Plot of Input Signal V(a).

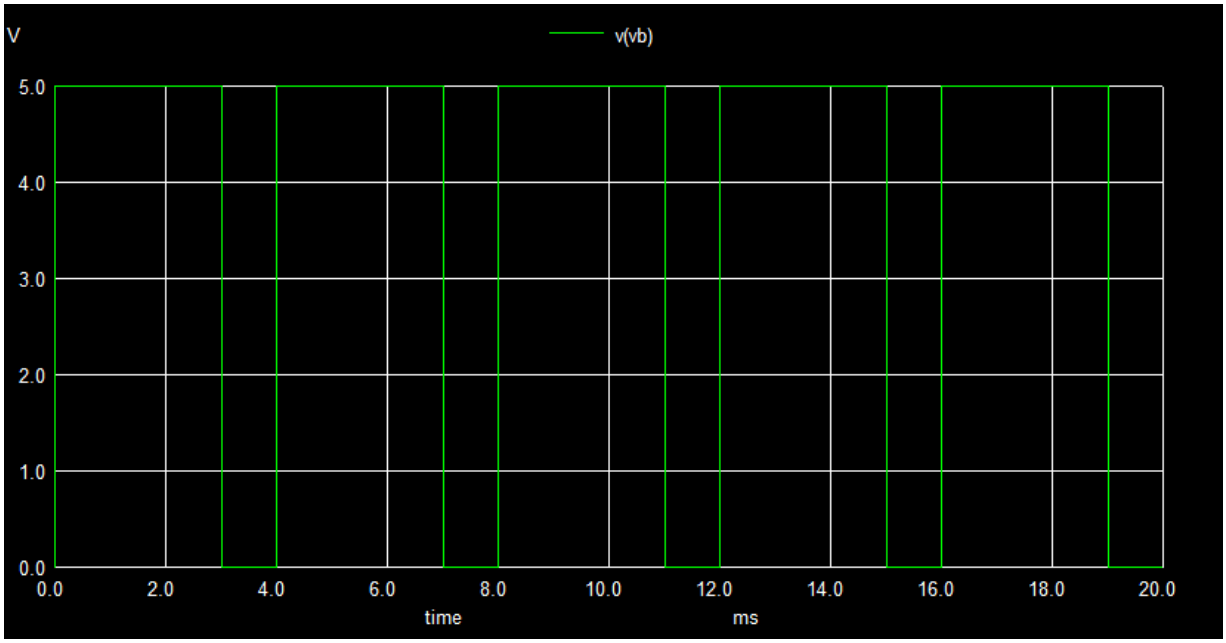

Figure 3: Ngspice Plot of Input Signal V(b).

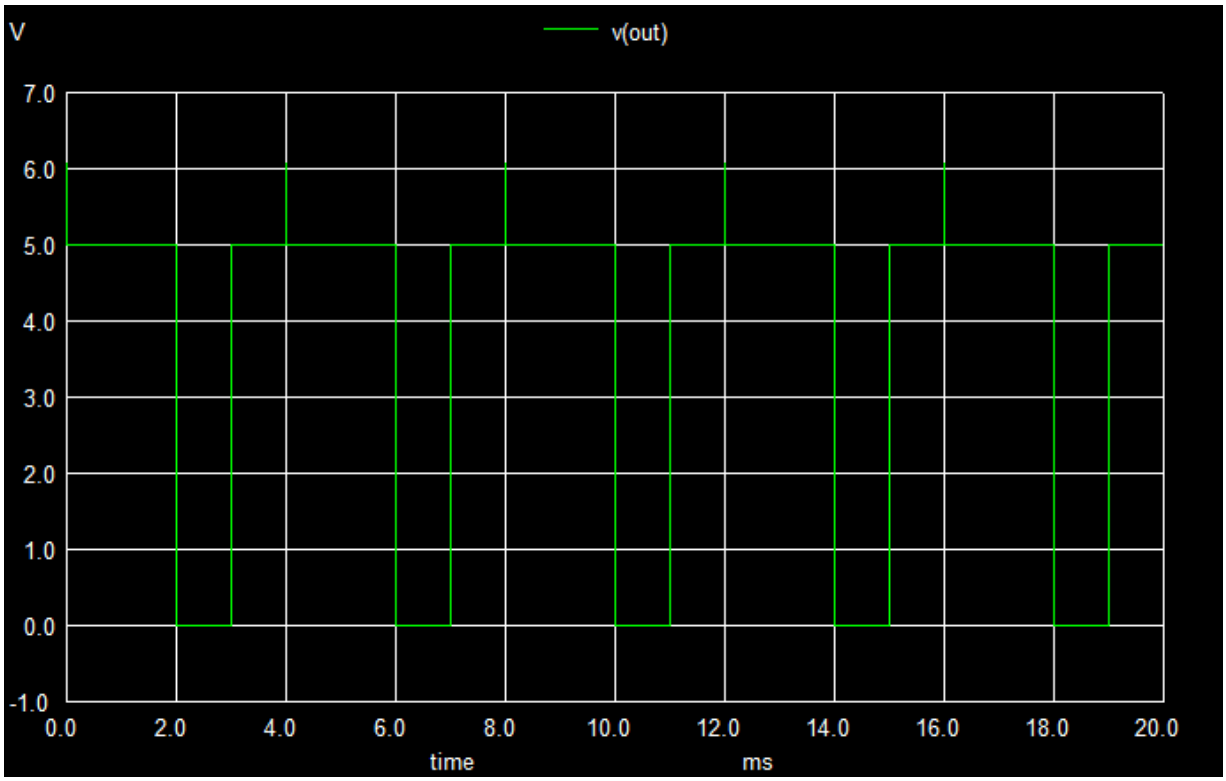

Figure 4: Ngspice Plot of Input Signal V(Out).

3.2 Python Plots

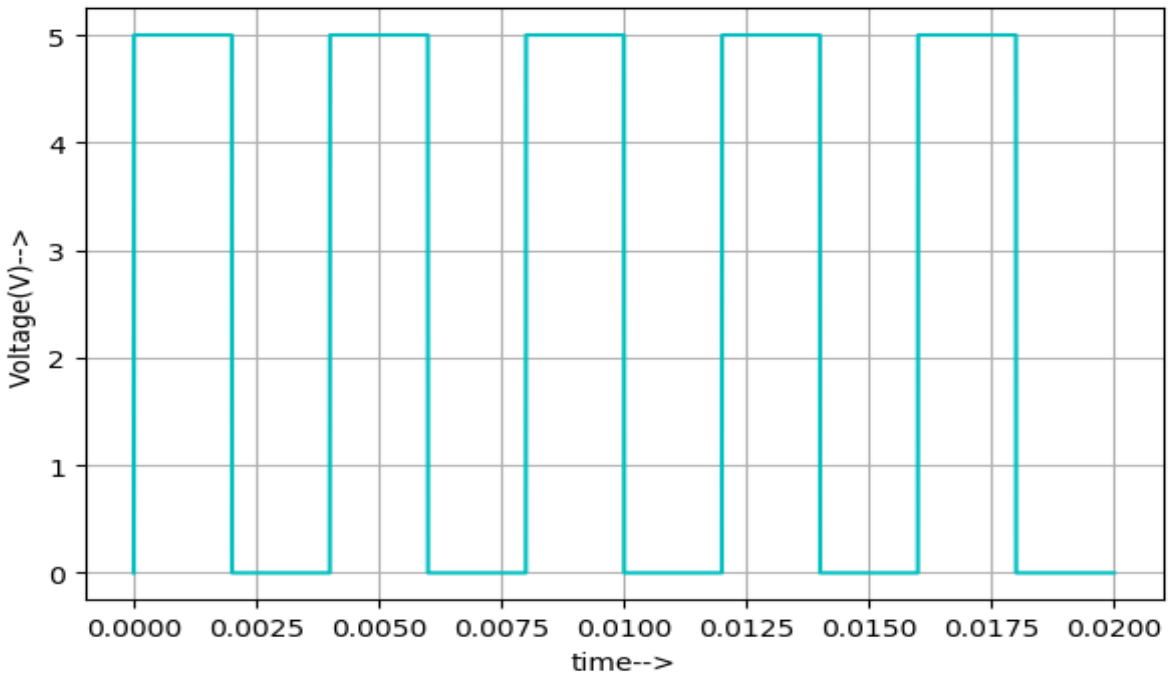

Figure 5: Python Plot of Input Signal V(a).

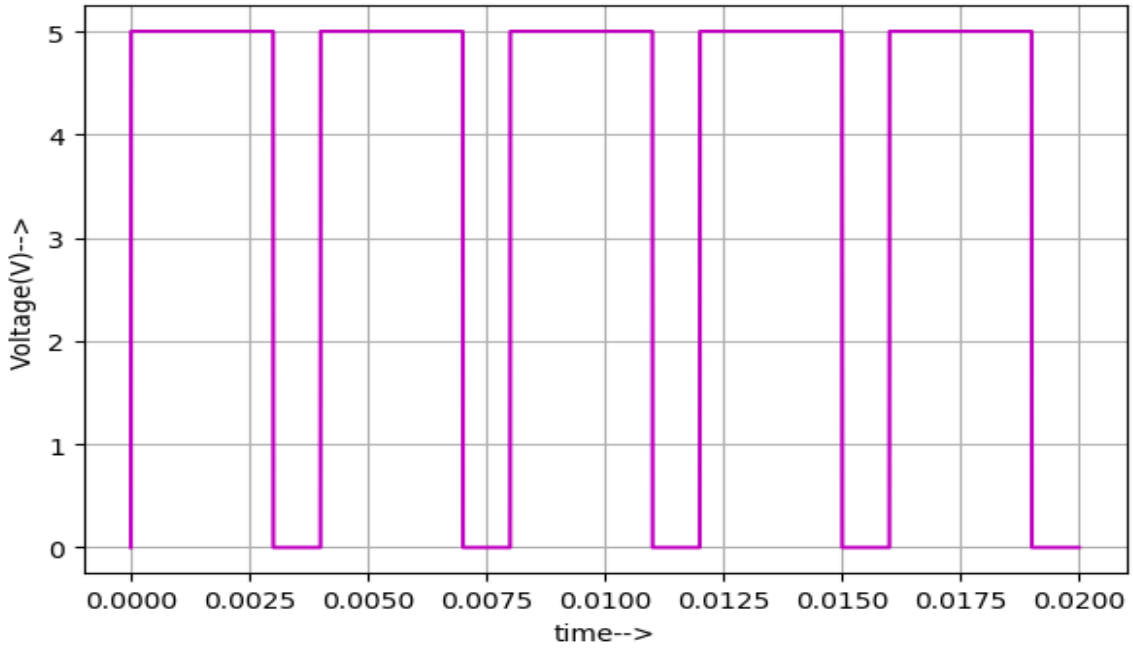

Figure 6: Python plot of Input V(b).

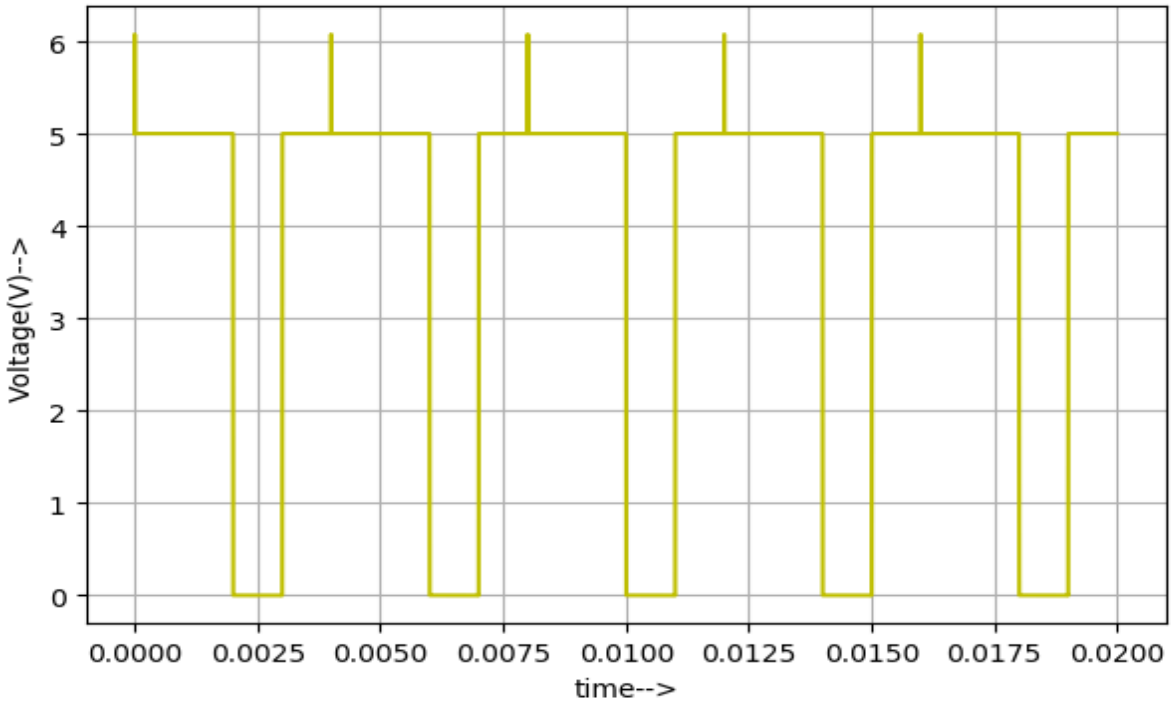

Figure 7: Python plot of Output Signal V(out).

4. Conclusion:

Thus, we have studied the transient response of the RTL XOR gate using BJT using eSim and we get the appropriate waveforms.

5. References:

https://hackaday.io/project/8449-hackaday-ttlers/log/150147-bipolar-xor-gate-with-only-2transistors/