

Experiment No 1.

1 Bit Comparator

1. Theory:-

A comparator used to compare two 1-bit binary numbers. It has two binary inputs A, B and three binary outputs: greater than, equal and less than relations. Figure 1. below shows the block diagram and truth table of a single bit magnitude comparator.



(a) Block diagram

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

(b) Truth table

Truth Table

The Boolean functions describing the 1-bit magnitude comparator according to the truth table are: $(A < B) = A'B$ $(A = B) = A'B' + AB = (A \oplus B)'$ $(A > B) = AB'$.

The logic diagram for 1-bit binary comparator implemented by XOR and basic logic gates is shown below in figure 2.

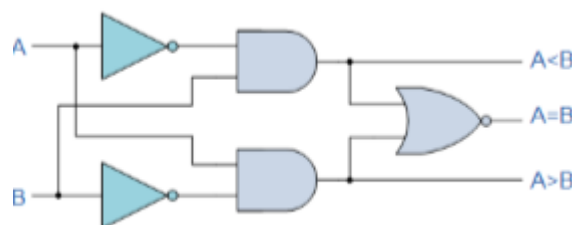


Figure 2. Logic Diagram of 1-bit Comparator

So we conclude that digital comparators actually use Exclusive-NOR gates within their design for comparing their respective pairs of bits.

2. Schematic Diagram:-

The schematic diagram of 1 Bit Comparator circuit in eSim is as follows,

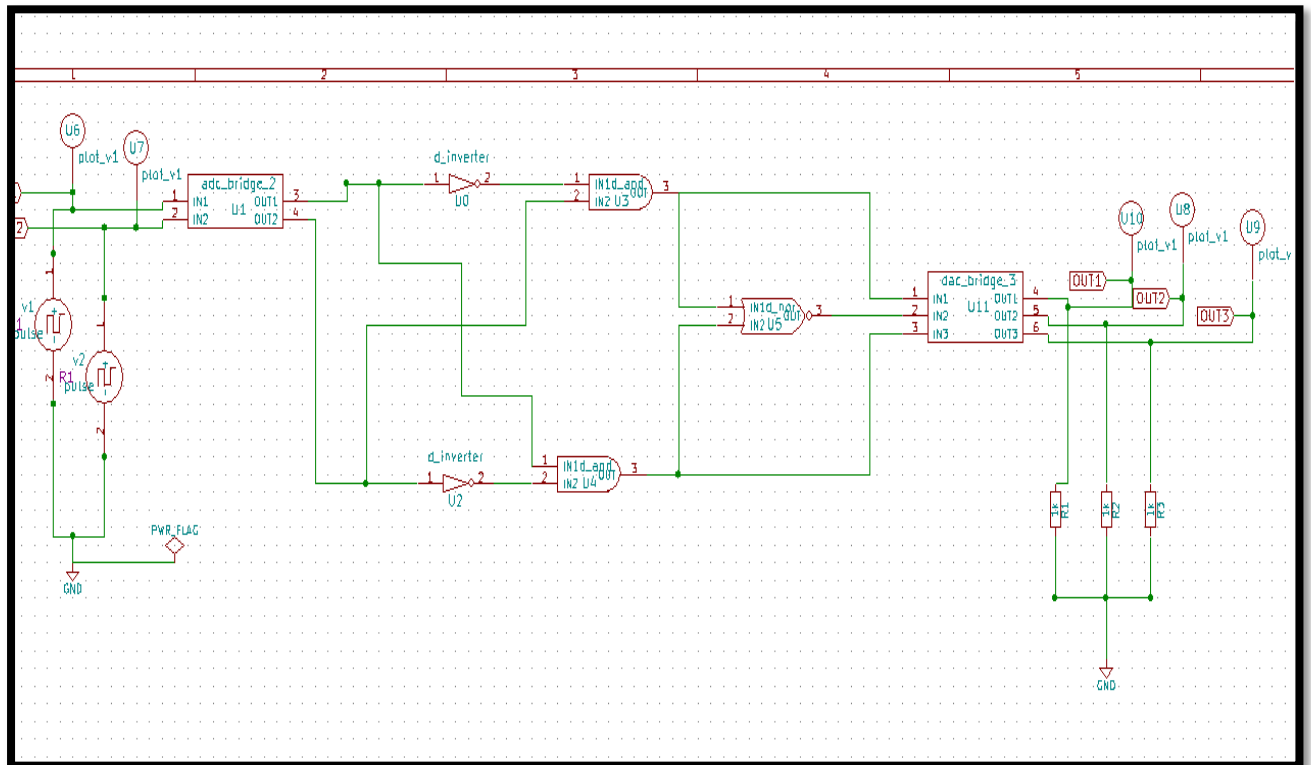


Figure 3. Schematic Diagram of 1 Bit Comparator Circuit.

3. Simulation Results:

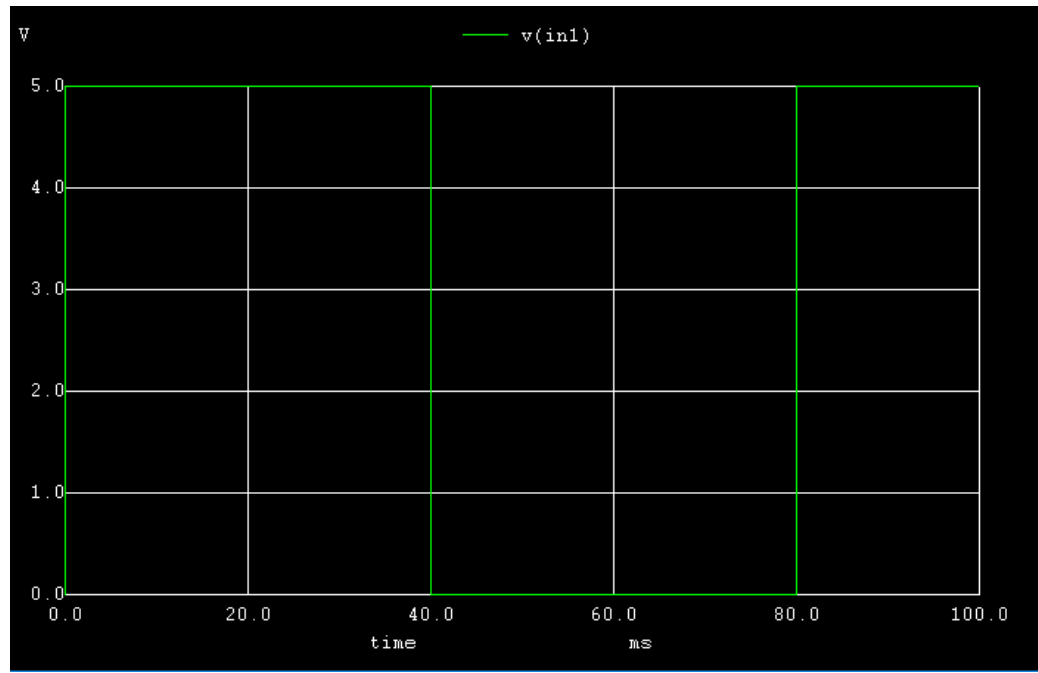


Figure 4:- Ngspice input plot 1

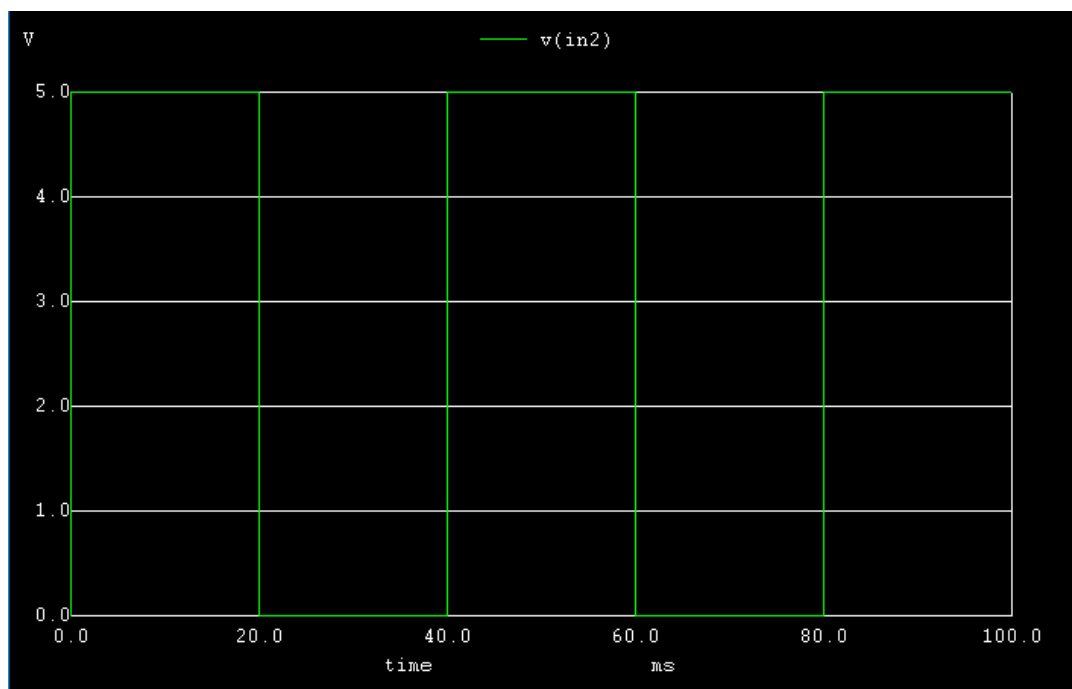
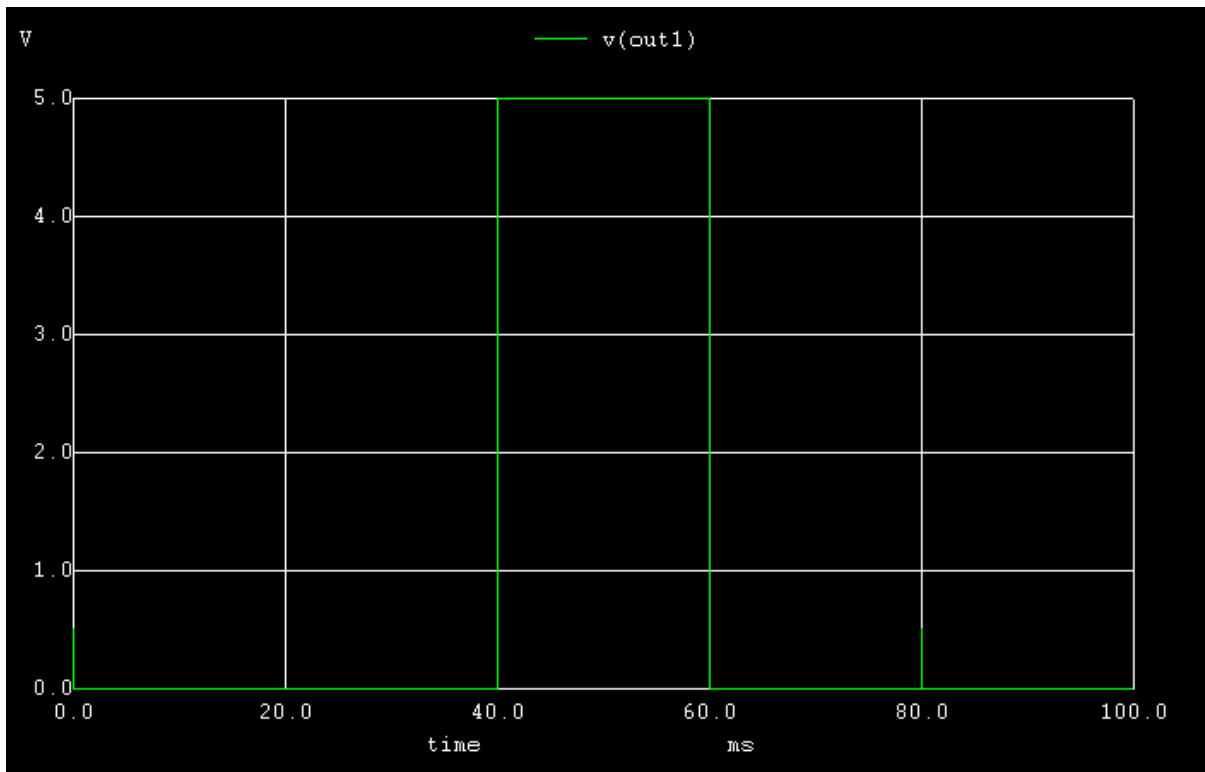
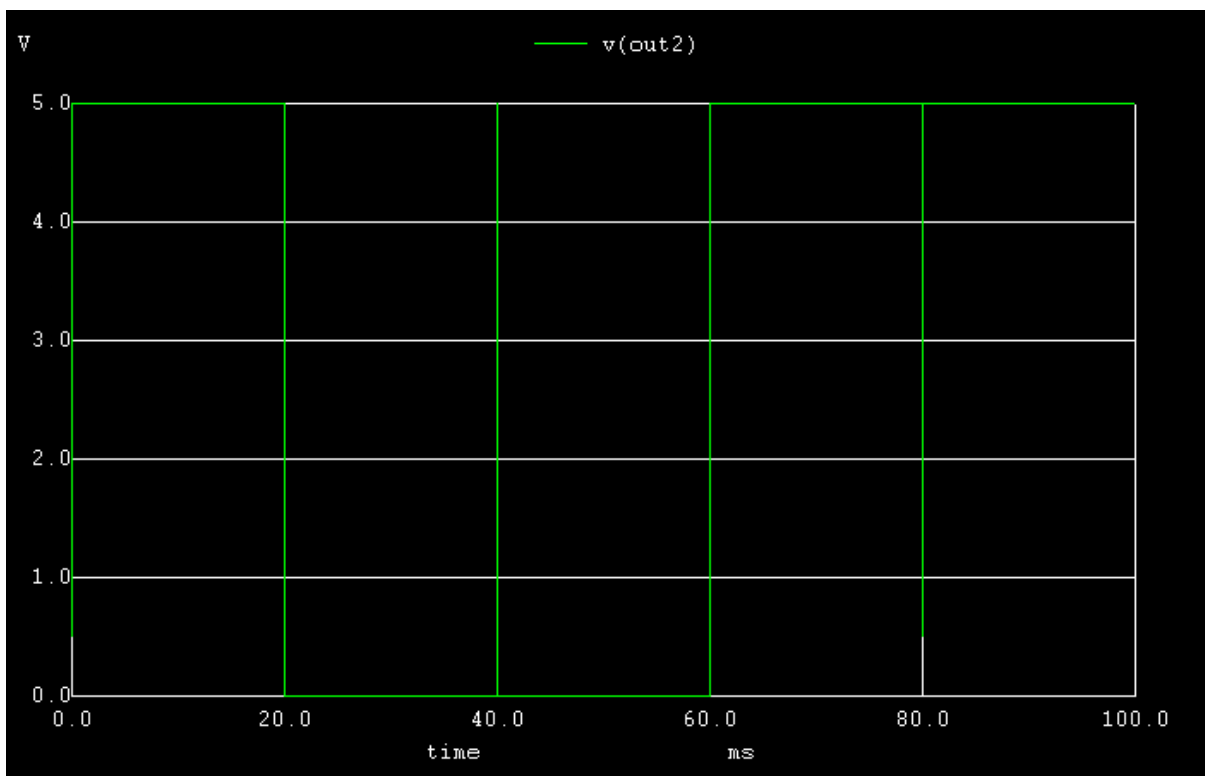
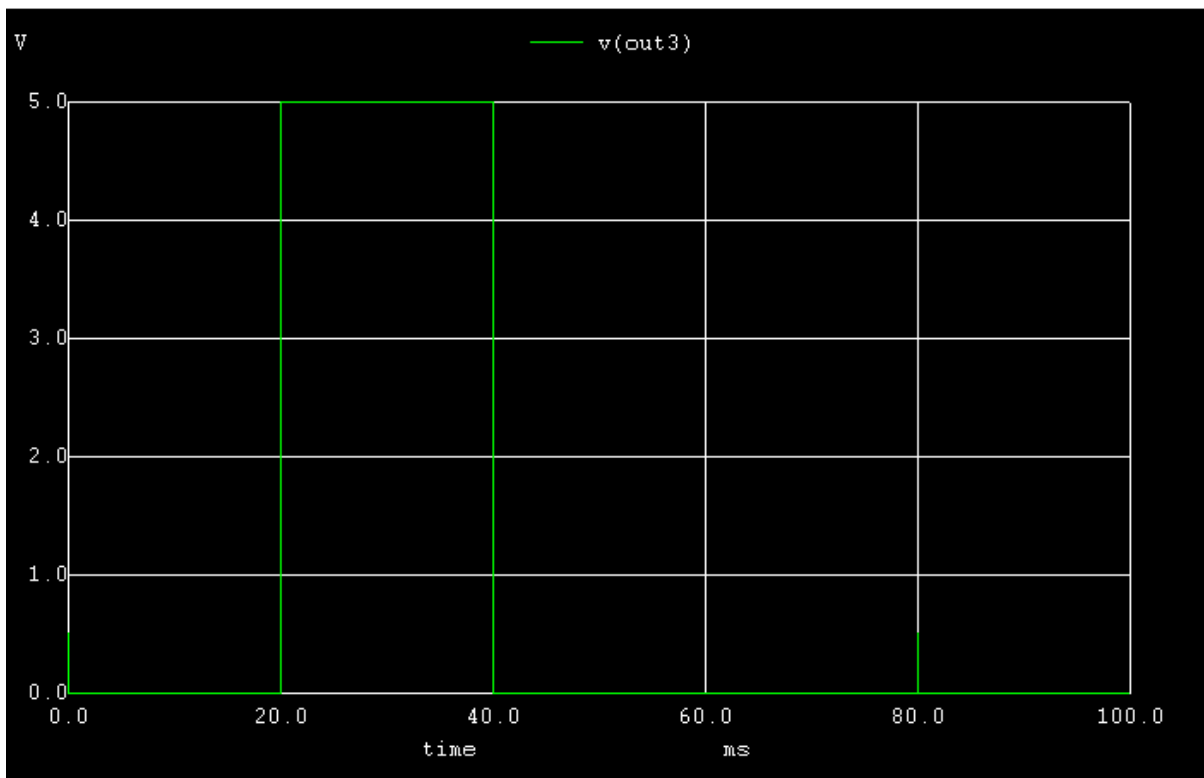
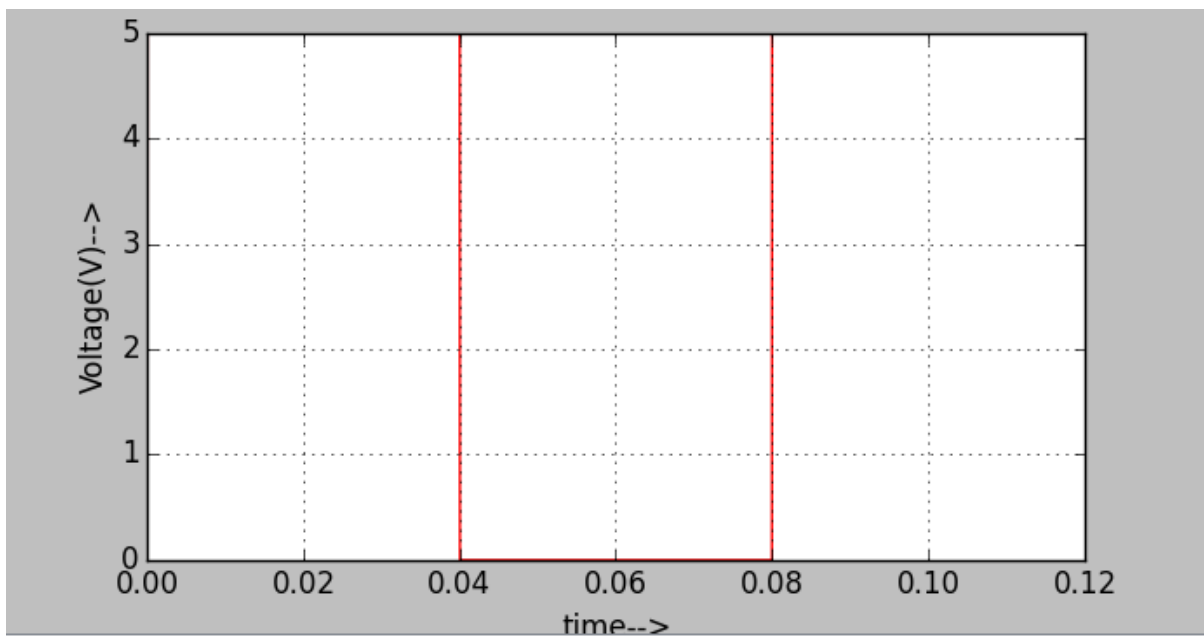


Figure 5:- Ngspice input plot 2

**Figure 6:-** Ngspice output plot 1**Figure 7:-** Ngspice output plot 2

**Figure 8:-** Ngspice output plot 3**Figure 9:-** Python input plot 1

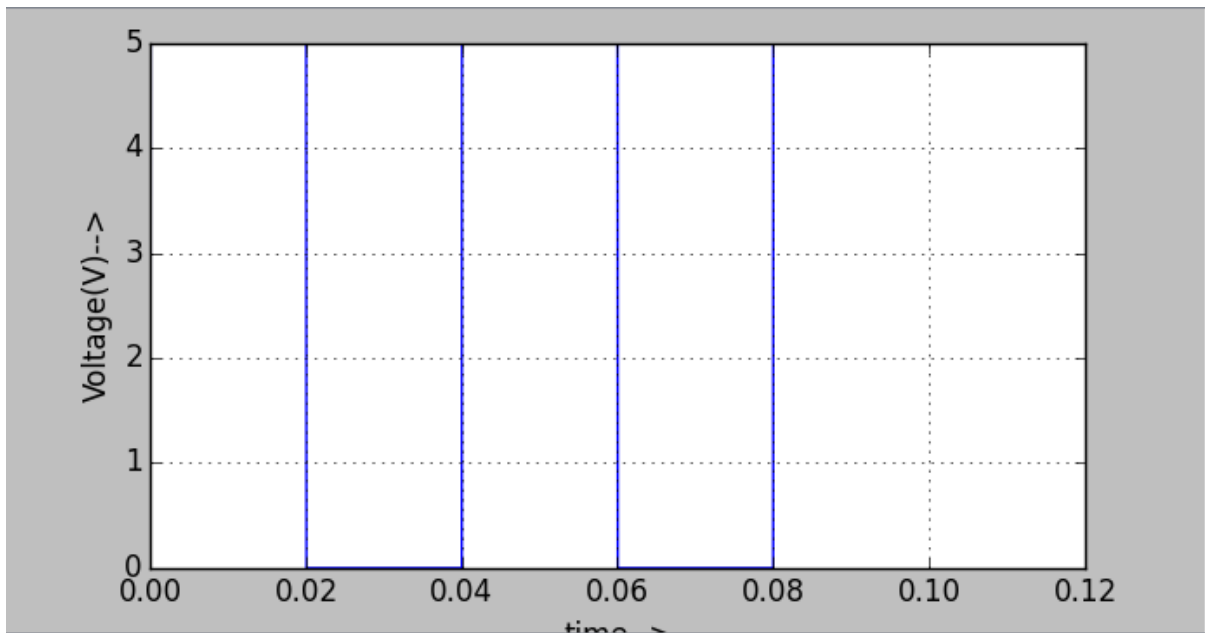


Figure 10:- Python input plot 2

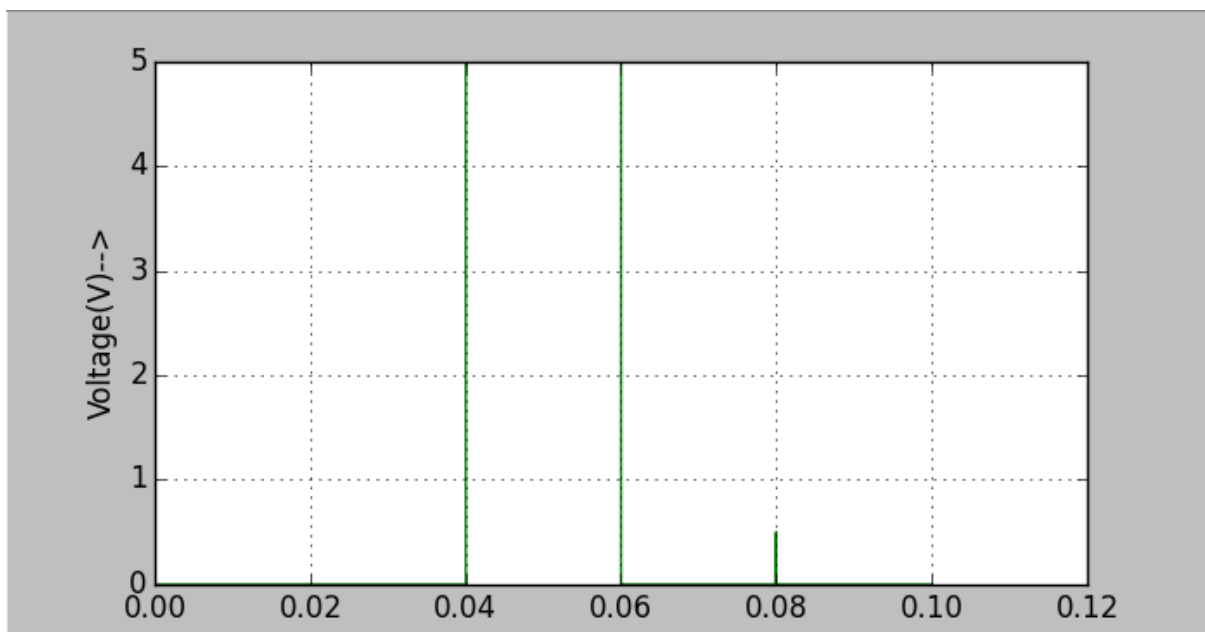


Figure 11:- Python output plot 1

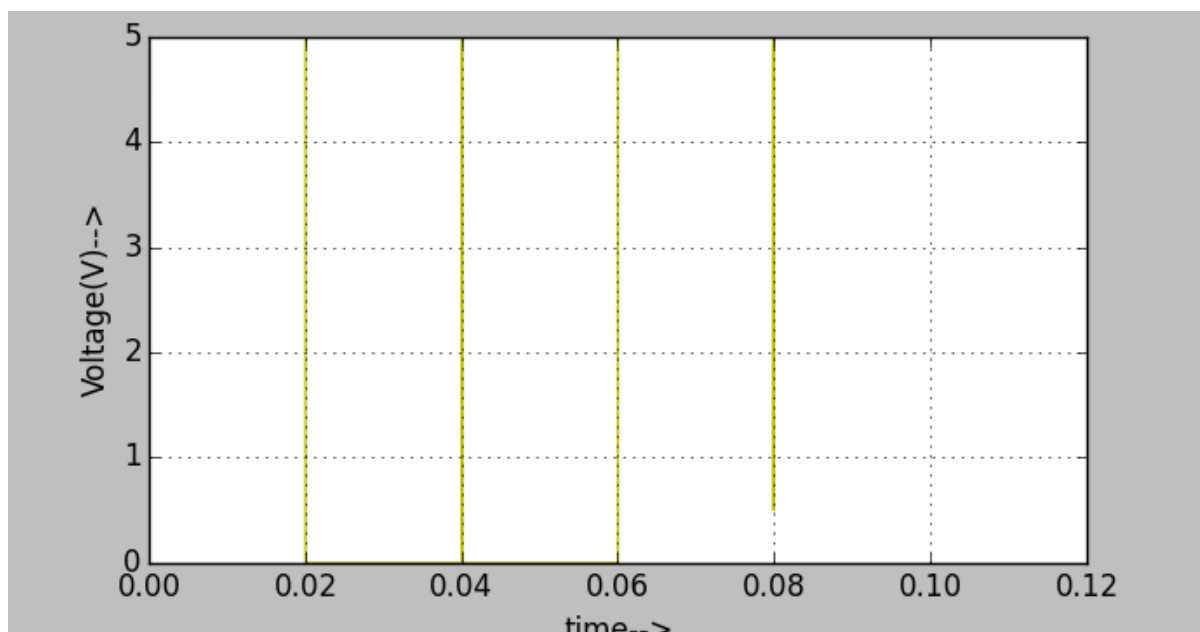


Figure 12:- Python output plot 2

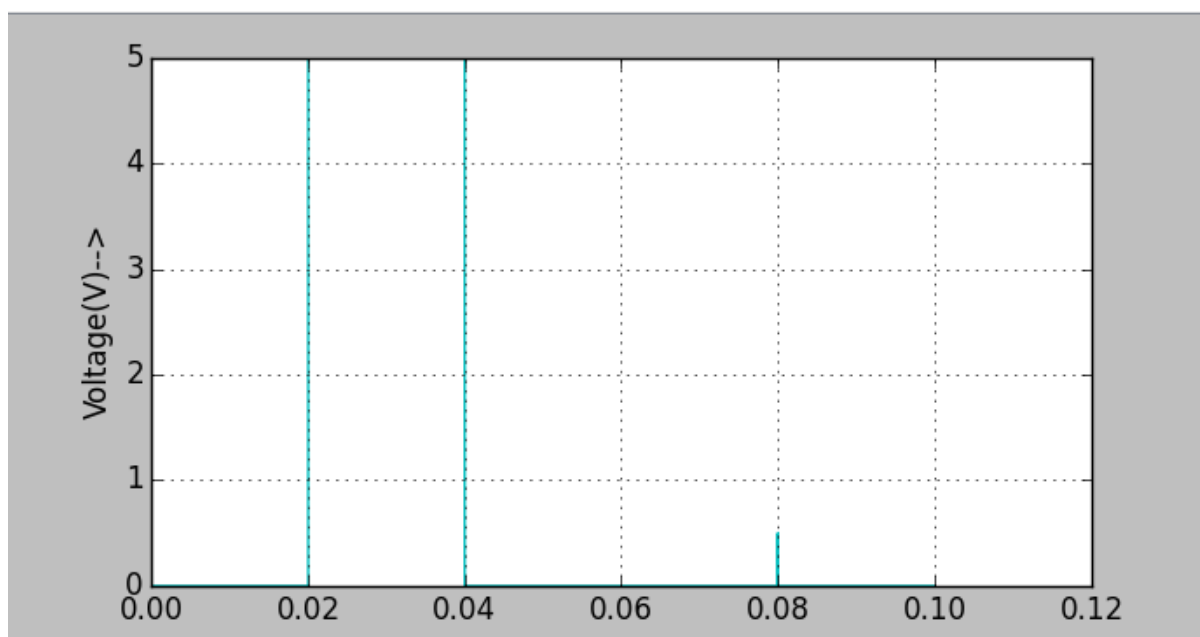


Figure 13:- Python output plot 3

1. Conclusion :- Thus we have studied 1 Bit Comparator circuit using eSim and got the appropriate wave forms.

2. Reference:-

https://www.electronics-tutorials.ws/combination/comb_8.html

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