Experiment No 3.

Gray to Binary Converter

1. Theory:-

The **reflected binary code** (**RBC**), also known just as **reflected binary** (**RB**) or **Gray code** is an ordering of the binary numeral system such that two successive values differ in only one bit (binary digit). The reflected binary code was originally designed to prevent spurious output from electromechanical switches. Today Gray codes are widely used to facilitate error correction in digital communications such as digital terrestrial television and some cable TV systems.

Gray Code Input				Binary Code Output			
G3	G2	G1	G0	B3	B2	B1	B0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	1	0	0	1	0
0	0	1	0	0	0	1	1
0	1	1	0	0	1	0	0
0	1	1	1	0	1	0	1
0	1	0	1	0	1	1	0
0	1	0	0	0	1	1	1
1	1	0	0	1	0	0	0
1	1	0	1	1	0	0	1
1	1	1	1	1	0	1	0
1	1	1	0	1	0	1	1
1	0	1	0	1	1	0	0
1	0	1	1	1	1	0	1
1	0	0	1	1	1	1	0
1	0	0	0	1	1	1	1

Table1

Figure 1. Truth Table for Gray to Binary code converter

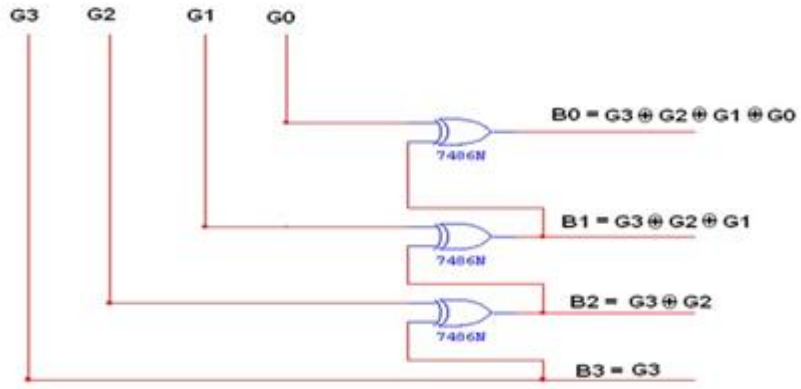
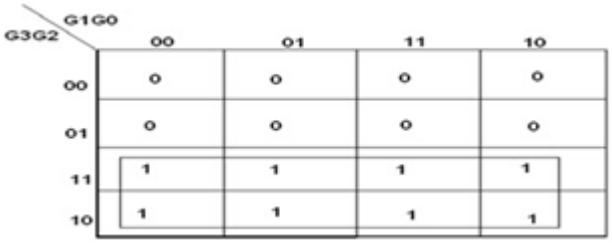


Figure 2. 4- bit Gray to Binary code Converter.

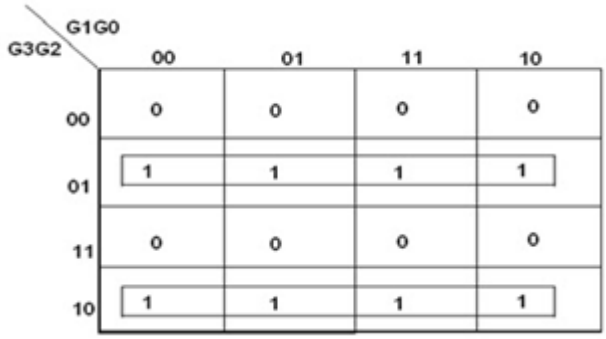
The K – map for various binary outputs and the corresponding simplified expression are given below:

For output B_3



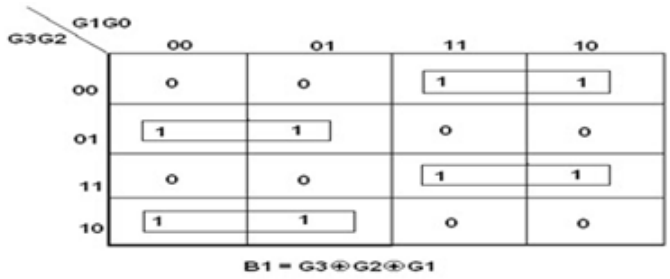
Kmap for B3 :- B3 = G3

For output B_2



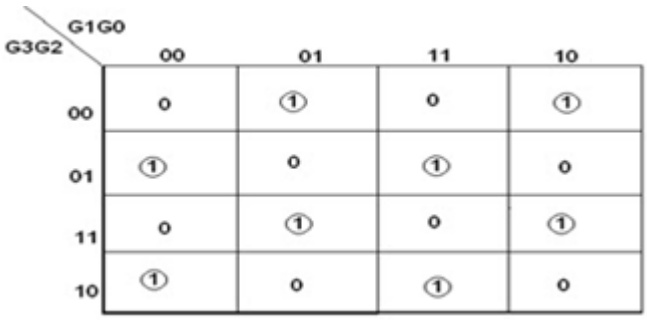
Kmap for B2:- B2 = G(3)⊕G(2)

For output B_1



K –map for B1 = G1⊕G2⊕G3

For output B_0



K-map for B0 = G2⊕G3⊕G1⊕G0

2. Schematic Diagram:-

The schematic diagram of Gray to Binary Converter circuit in eSim is as follows,

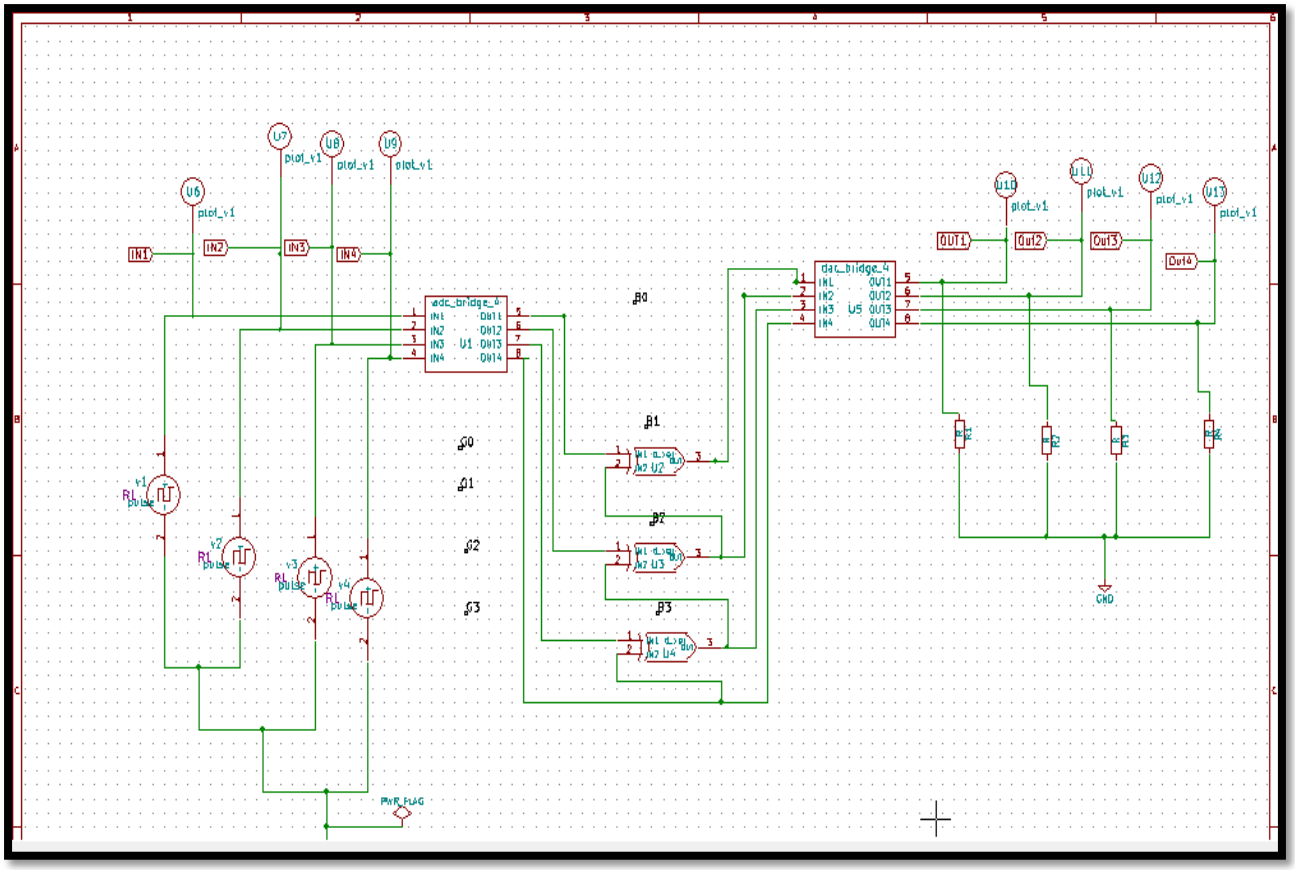


Figure 3:- Schematic of Gray to Binary Converter

3. Simulation Results:

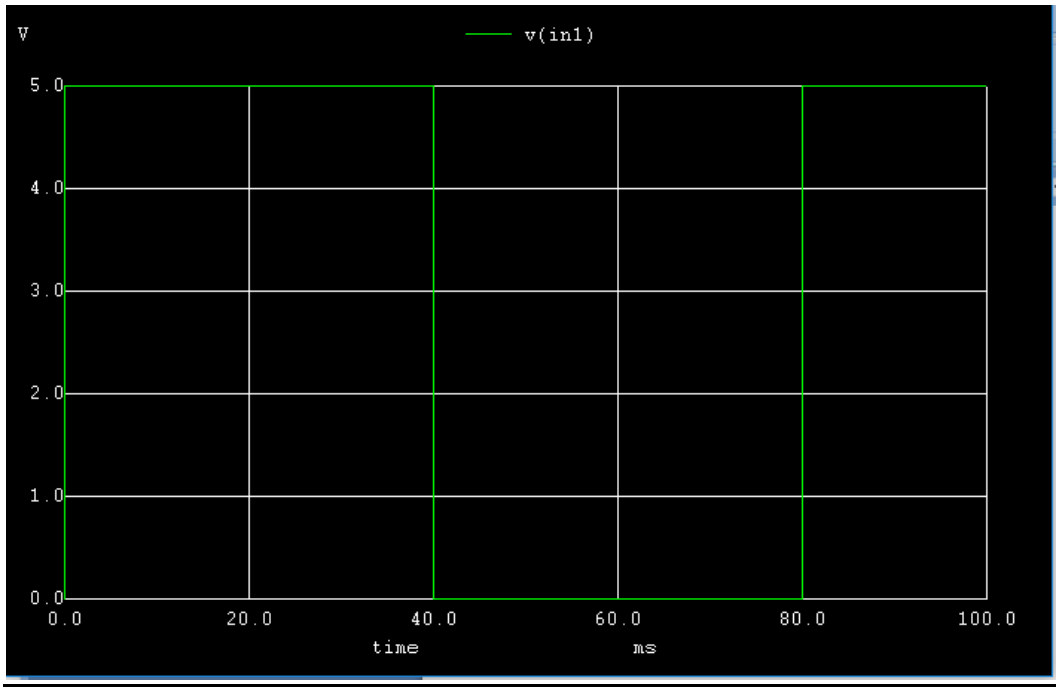


Figure 4 :-Ngspice input plot 1

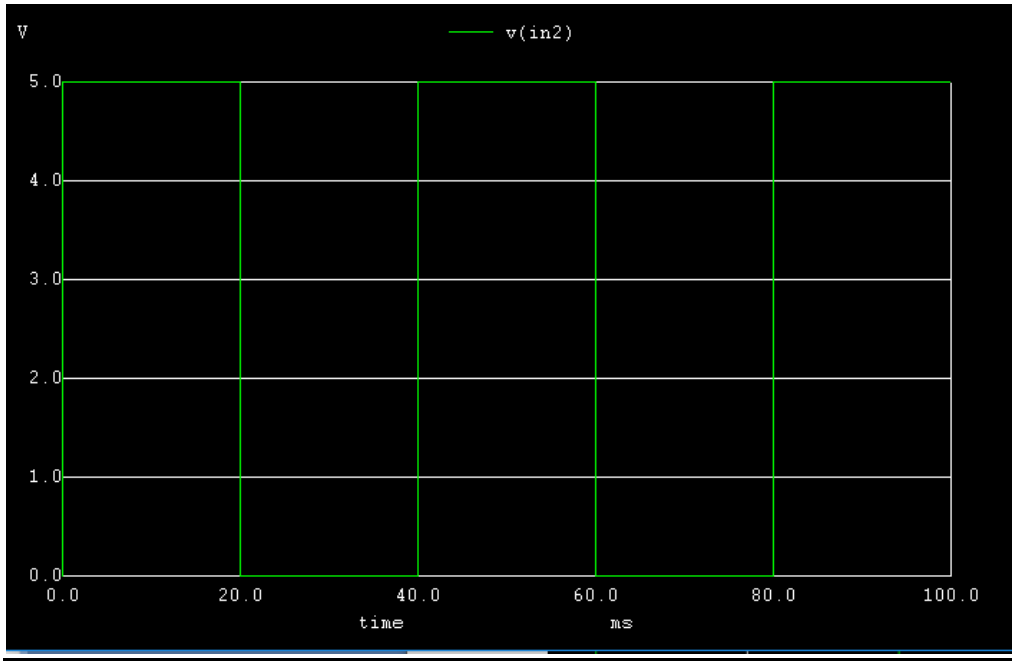


Figure 5:-Ngspice input plot 2

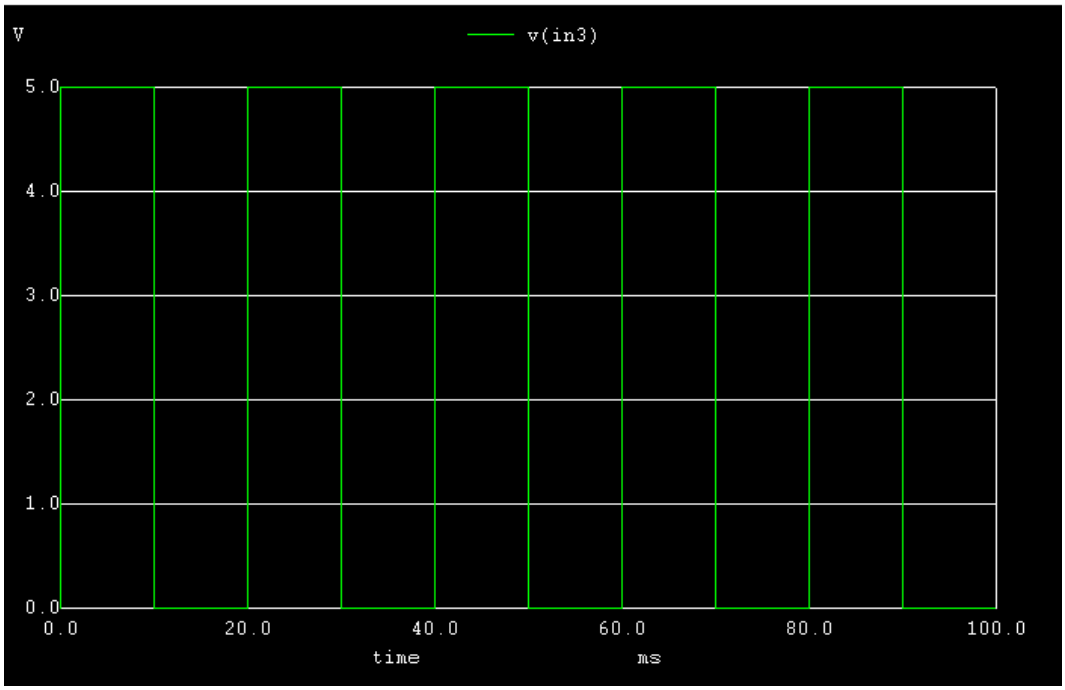


Figure 6:-Ngspice input plot 3

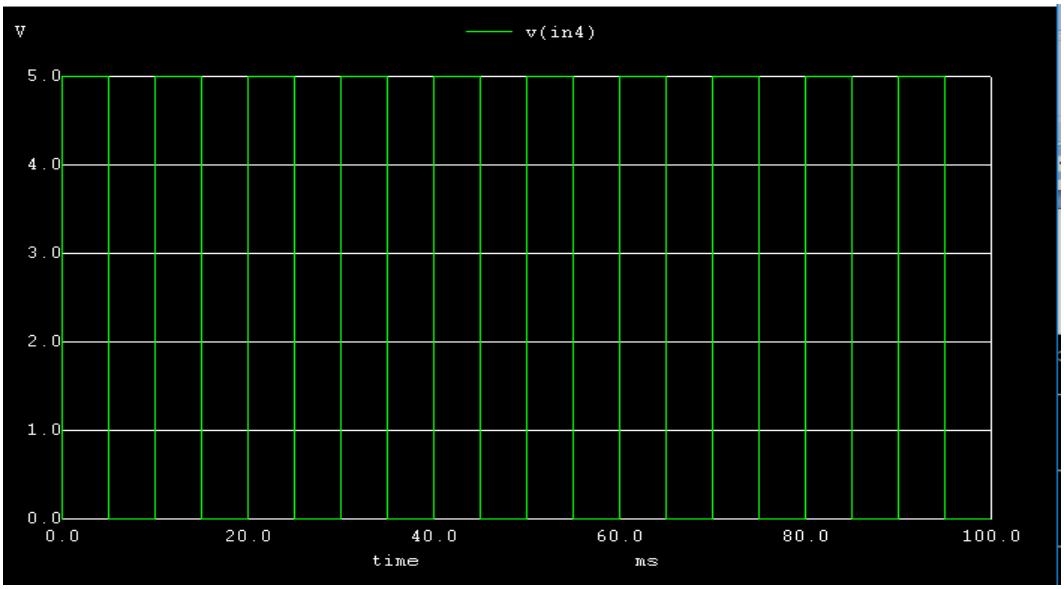


Figure 7:-Ngspice input plot 4

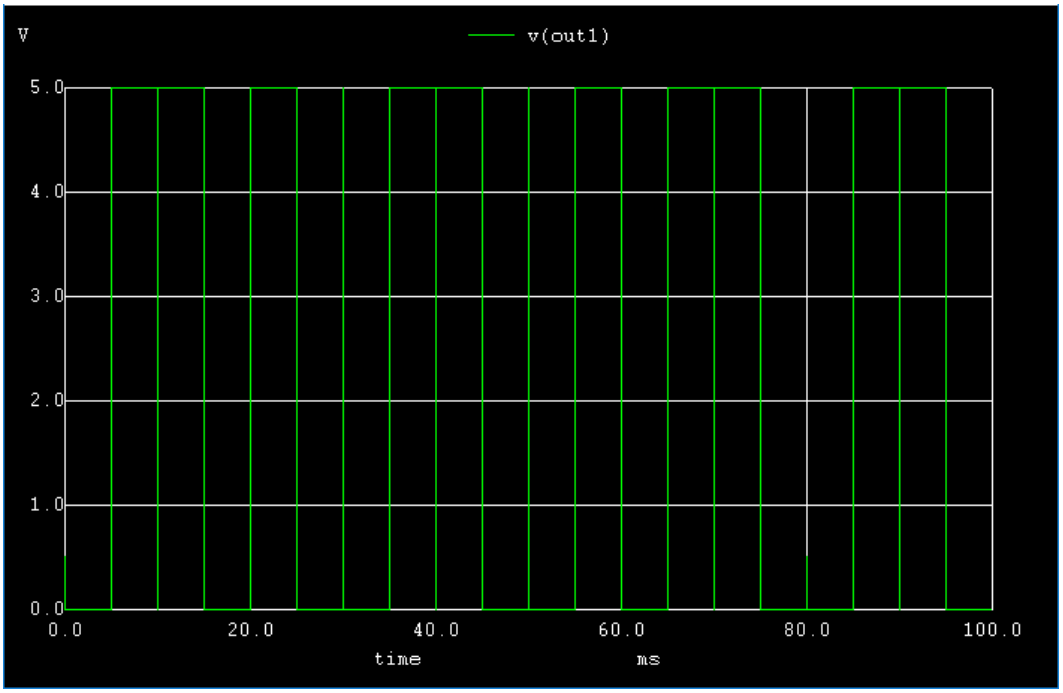


Figure 8:-Ngspice output plot 1

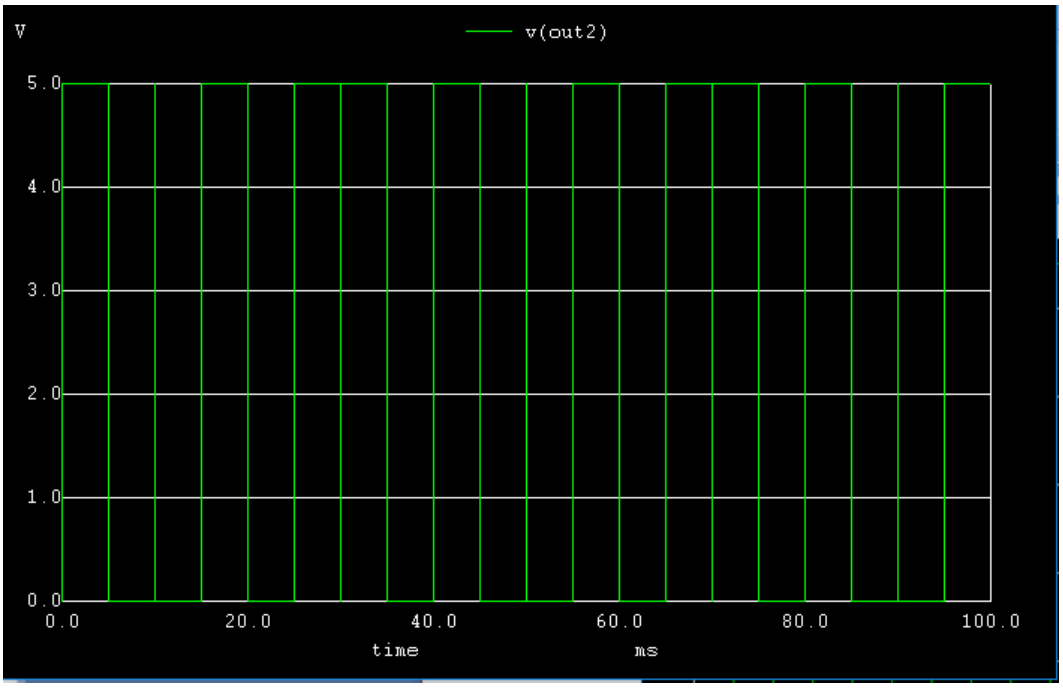


Figure 9: -Ngspice output plot 2

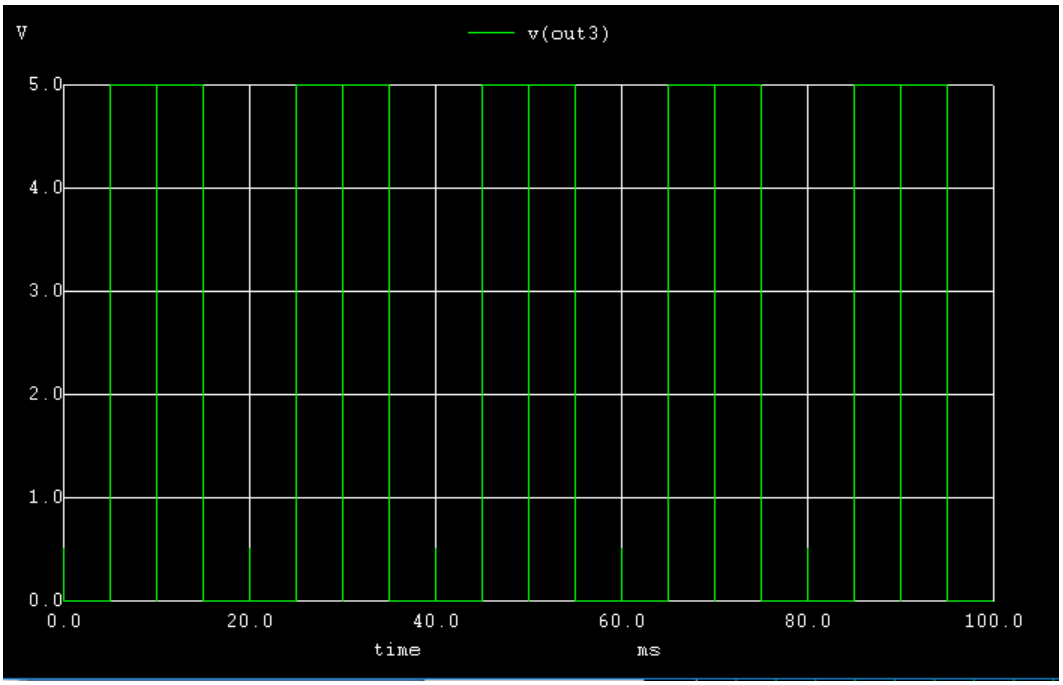


Figure 10:-Ngspice output plot 3

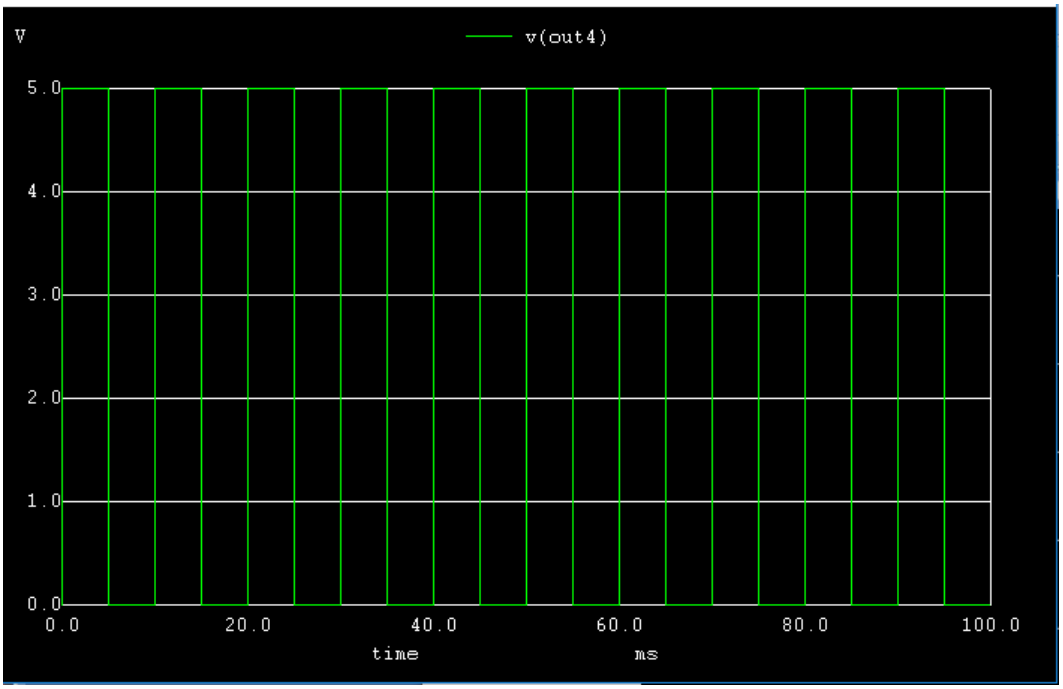


Figure 11:-Ngspice output plot 4

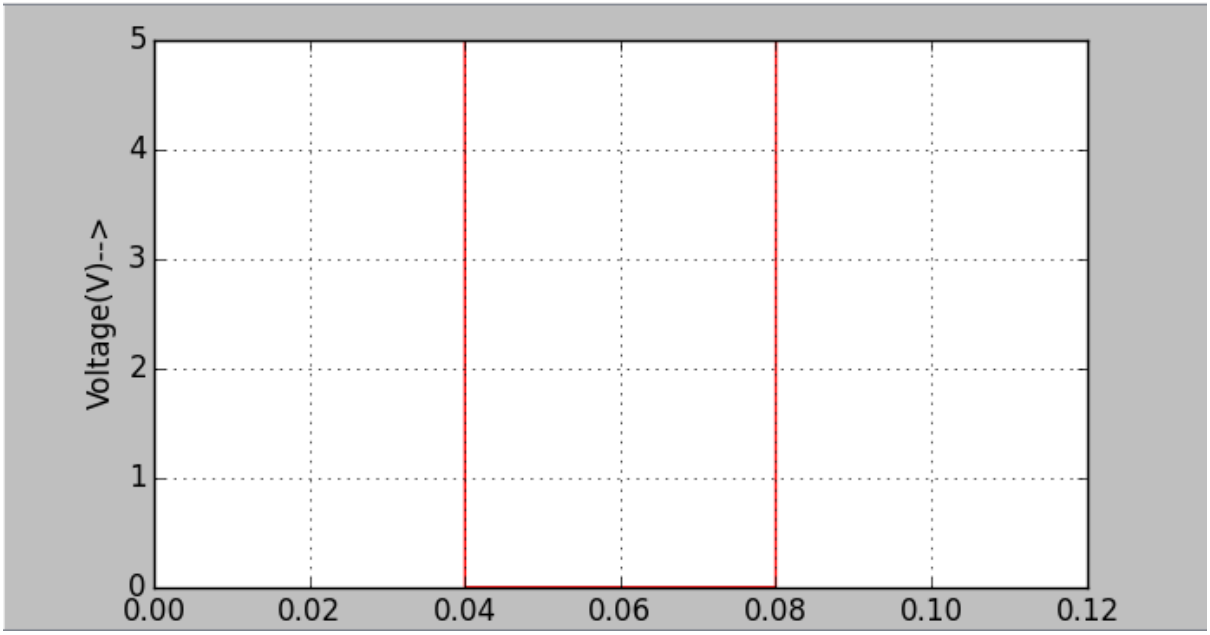


Figure 12:- Python input plot 1

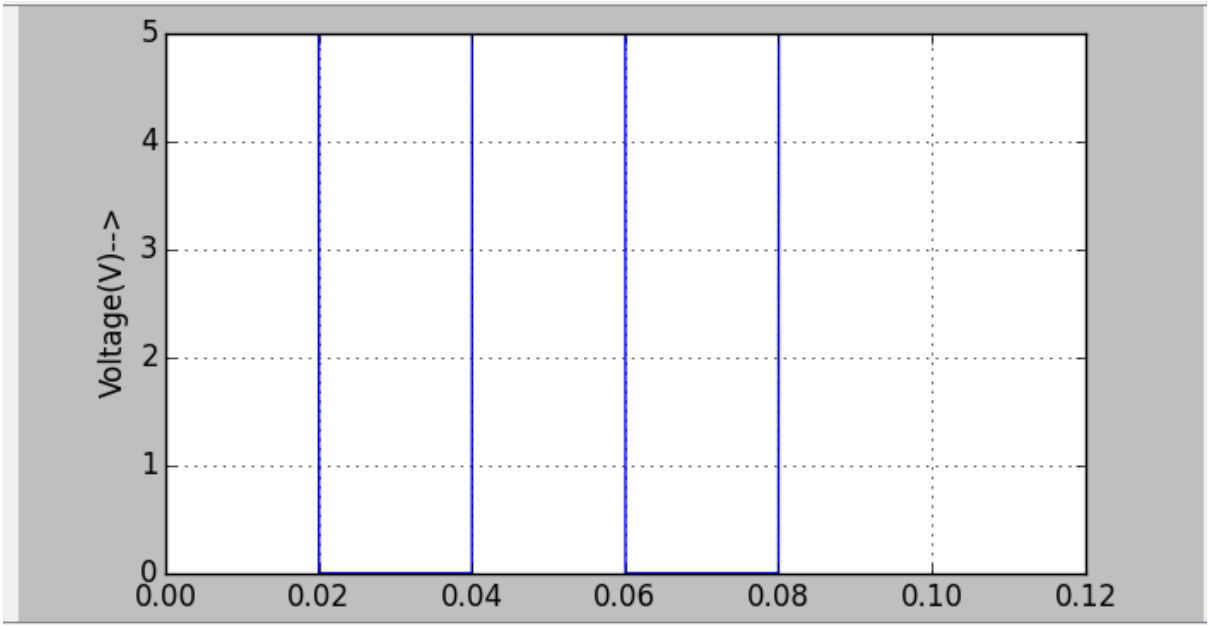


Figure 13:-Python input plot 2

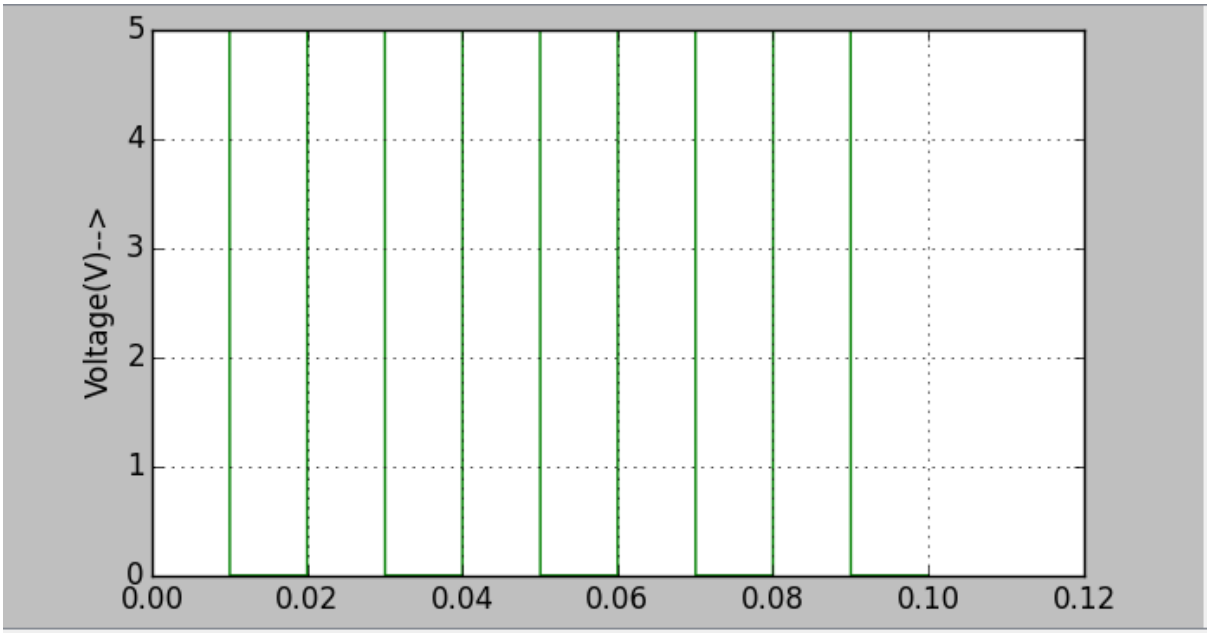


Figure 14:-Python input plot 3

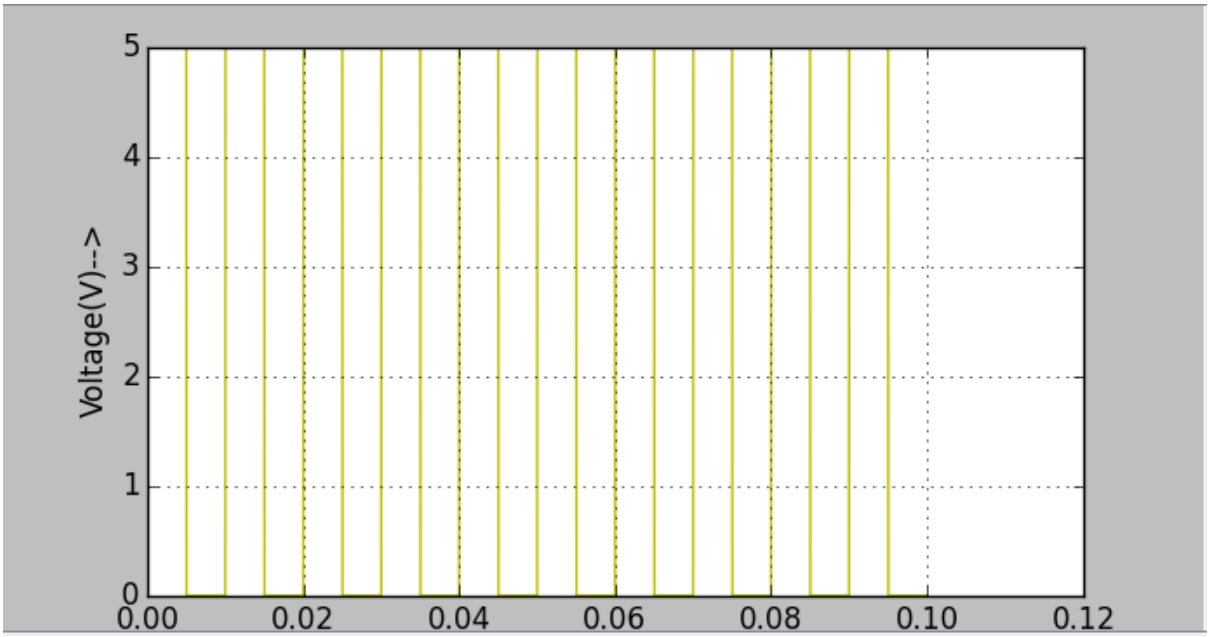


Figure 15:-Python input plot 4

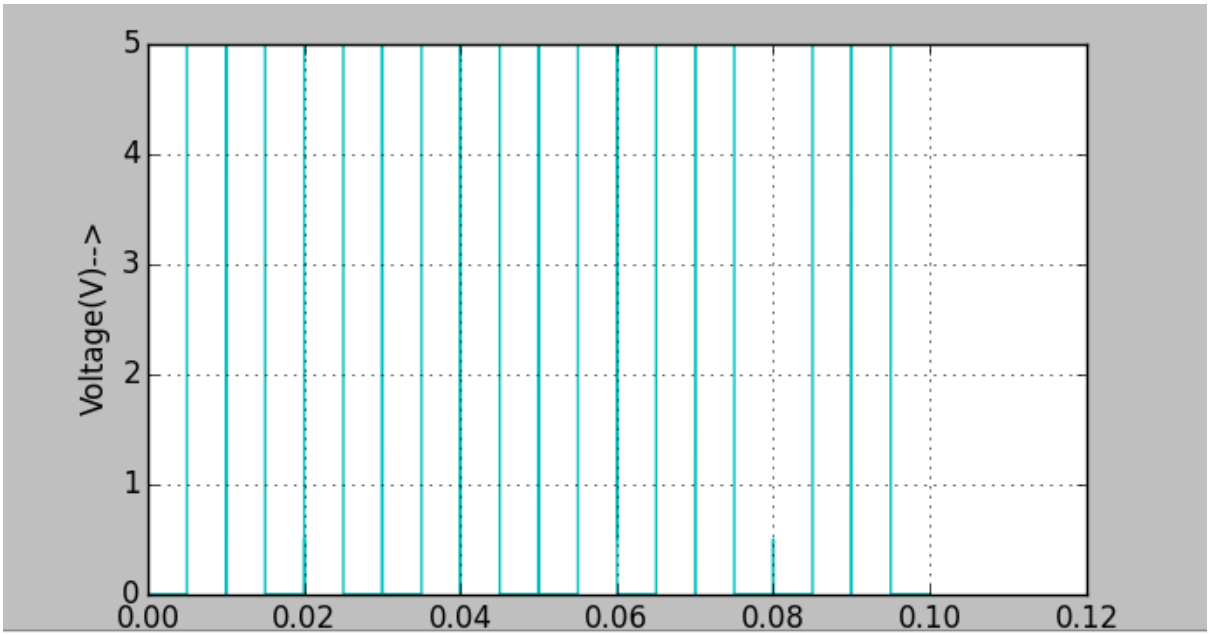


Figure 16:-Python output plot 1

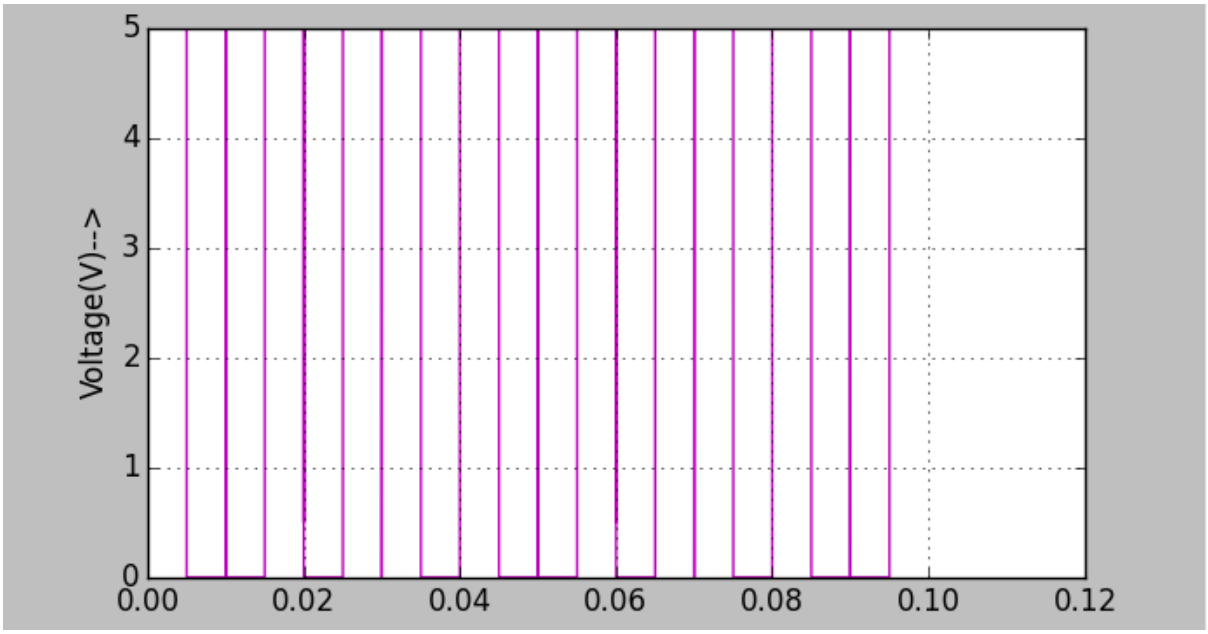


Figure 17:-Python output plot 2

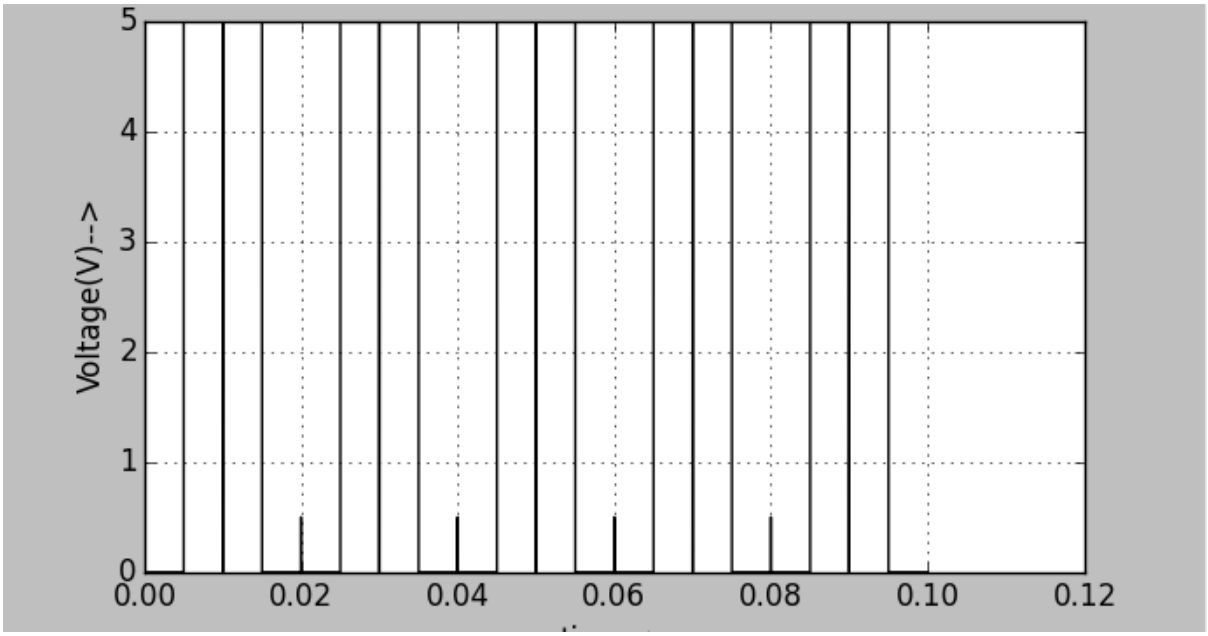


Figure 18:-Python output plot 3

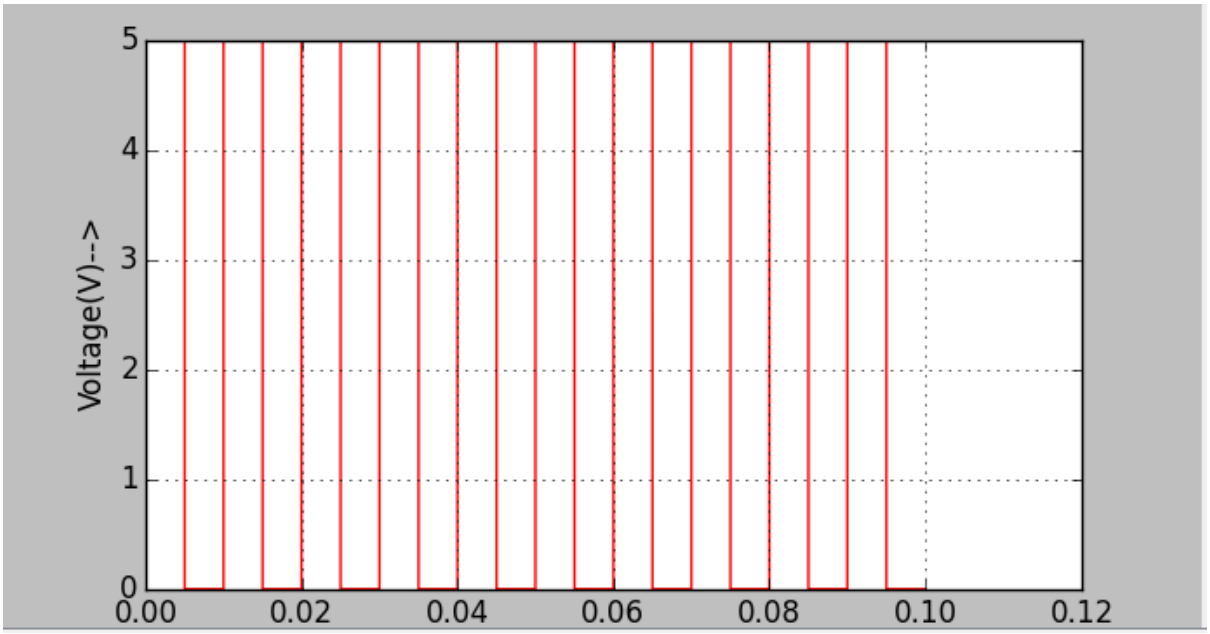


Figure 19:-Python output plot 4

4. Conclusion :- Thus we have simulated Gray to binary converter circuit using eSim and output wave form is observed.

5. Reference:-

http://www.ques10.com/p/17086/design-a-4-bit-grey-to-binary-code-converter/

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1. **Conclusion :-** Thus we have studied Gray to Binary Converter circuit using eSim and got the appropriate wave forms.

2. **Reference:-**

http://www.care4you.in/Tutorials/DE%20Lab/experiment-4.html.

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