Circuit Simulation Project

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Title of the circuit : DECIMAL TO BCD ENCODER

Theory/Description :

The Decimal to BCD Converter is used to convert a decimal (Base-10) integer to a BCD (Binary-coded decimal). In computing and electronic systems, a binary-coded decimal (BCD) is a digital encoding method for decimal numbers in which each digit is represented by its own binary sequence.

The decimal to binary encoder usually consists of **10 input lines** and **4 output lines**. Each input line corresponds to the each decimal digit and 4 outputs correspond to the BCD code. This encoder accepts the decoded decimal data as an input and encodes it to the BCD output which is available on the output lines. The inputs represent the 10 decimal numbers from 0 to 9, where only one input can be active. The outputs indicate the BCD code that represents the active input. Here we use OR gates to obtain derived logic from <u>TRUTH TABLE</u> as follows:

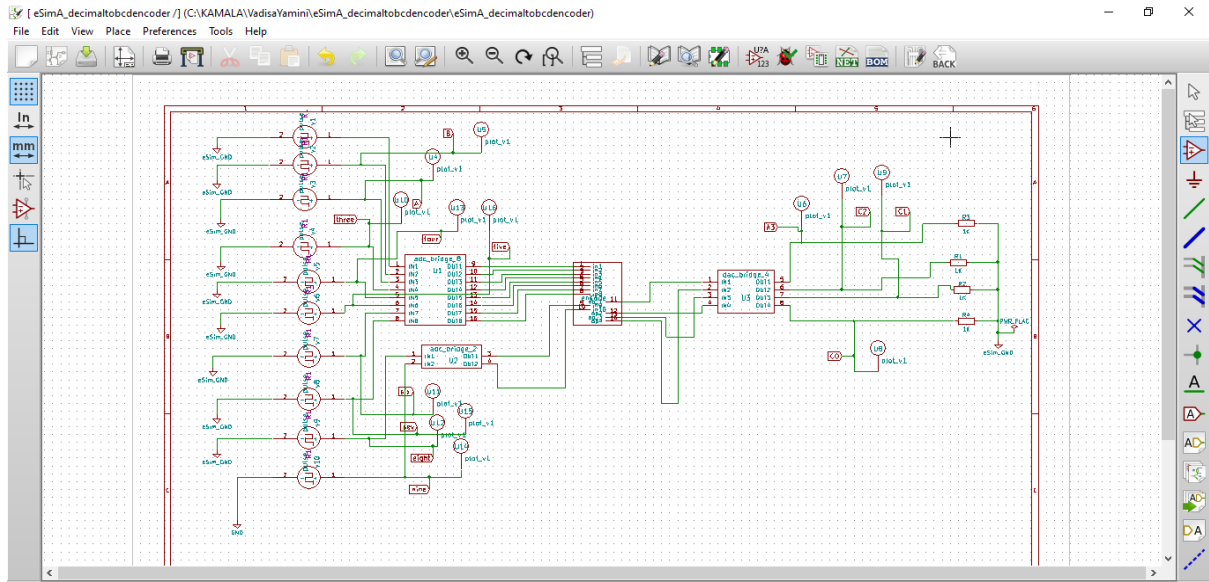| INPUTS										OUTPUTS			
Y9	Y8	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0	A3	A2	A1	A0
0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	0	0	1
0	0	0	0	0	0	0	1	0	0	0	0	1	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	1	0	0	0	0	0	1	0	0
0	0	0	0	1	0	0	0	0	0	0	1	0	1
0	0	0	1	0	0	0	0	0	0	0	1	1	0
0	0	1	0	0	0	0	0	0	0	0	1	1	1
0	1	0	0	0	0	0	0	0	0	1	0	0	0
1	0	0	0	0	0	0	0	0	0	1	0	0	1

$$A3 = Y9 + Y8$$
$$A2 = Y7 + Y6 + Y5 + Y4$$

A1 = Y7 + Y6 + Y3 +Y2

A0 = Y9 + Y7 +Y5 +Y3 + Y1

Circuit Diagram(s) :

The main circuit:

The subcircuit used:
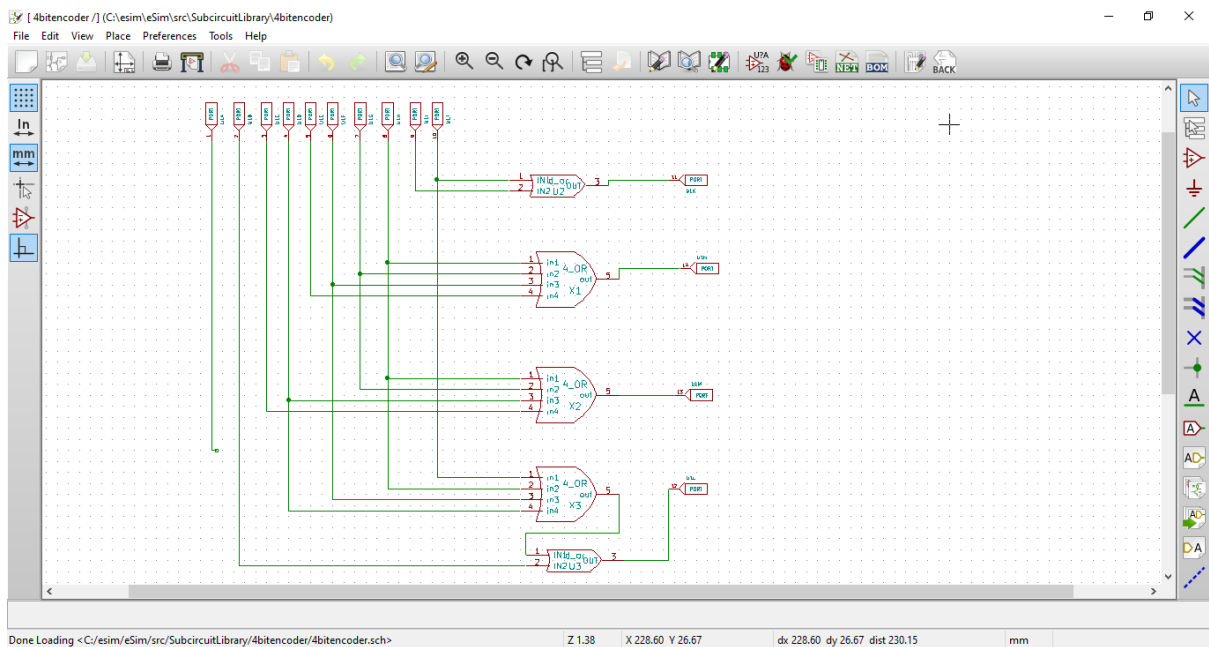
Results (Input, Output waveforms and/or Multimeter readings) :
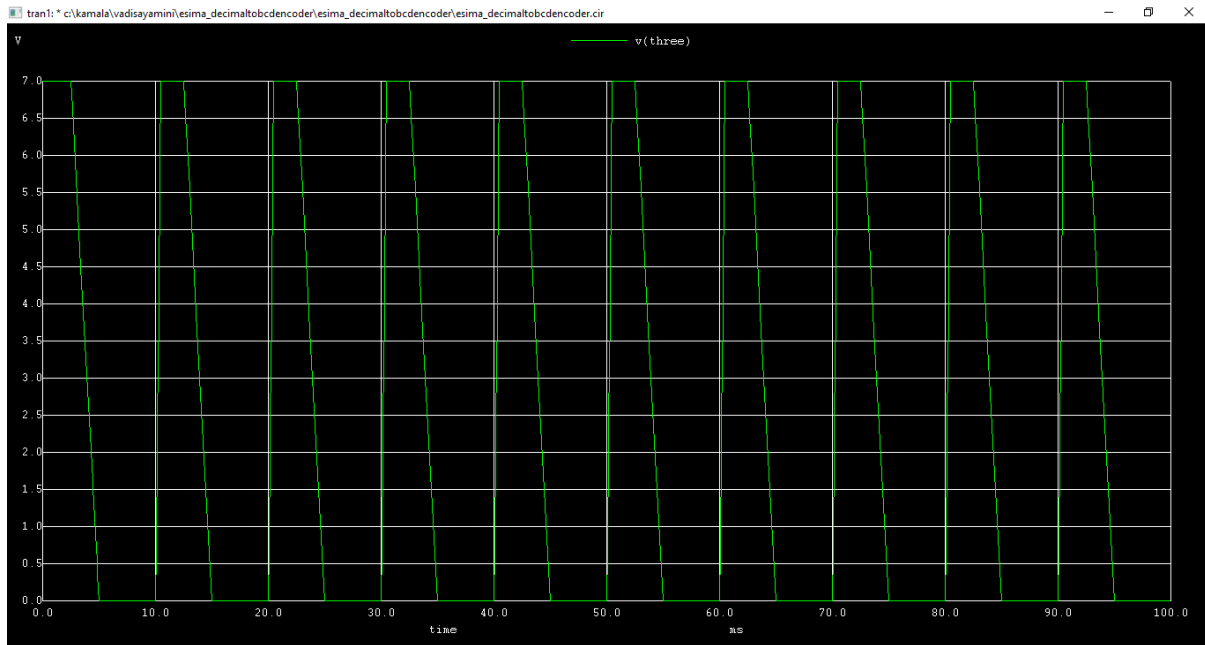
1.Ngspice plots:

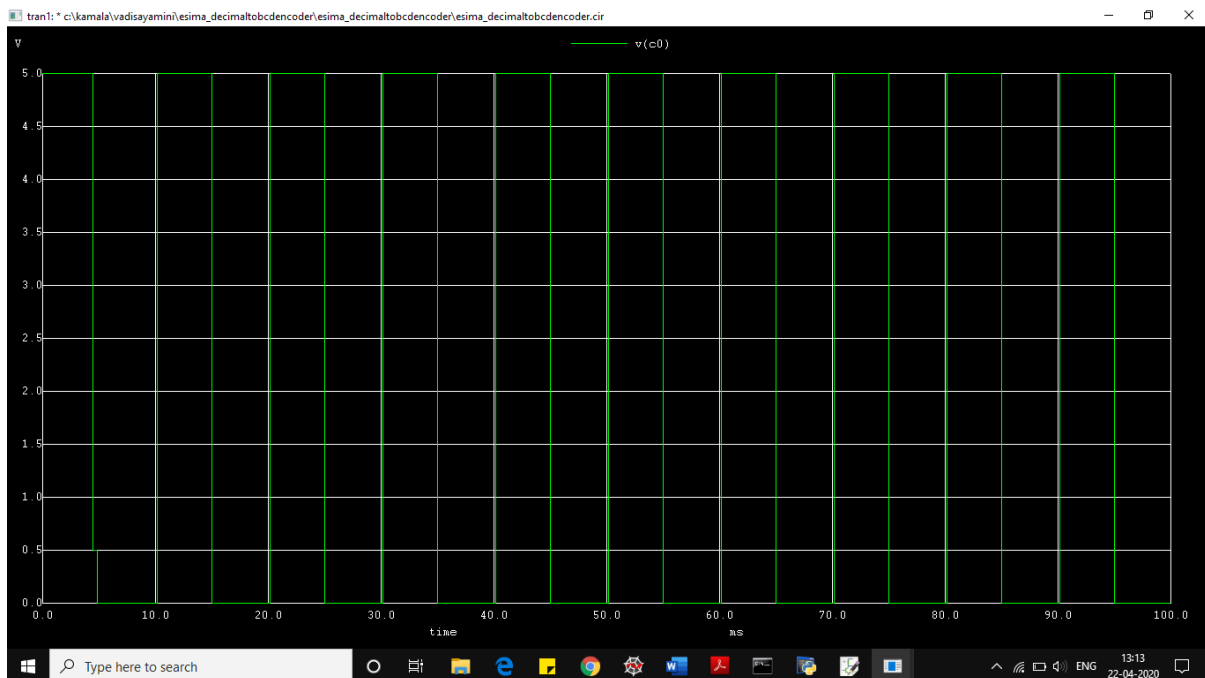Figure 3: input at 4rd pin of encoder

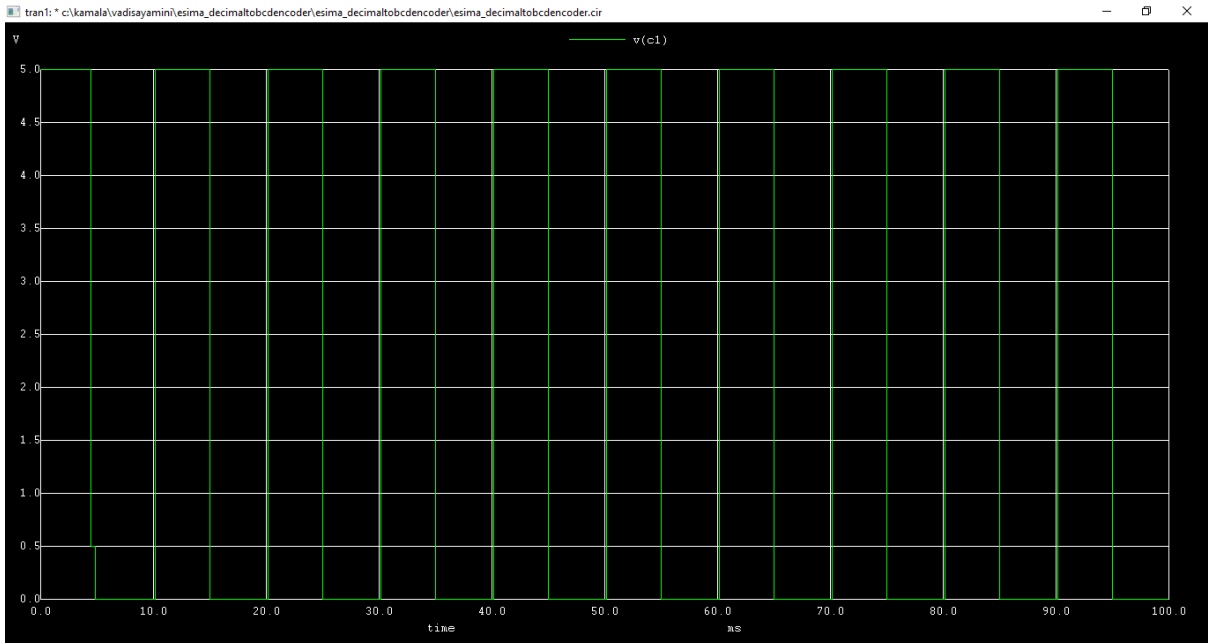

Figure 4: LSB of output(C0)
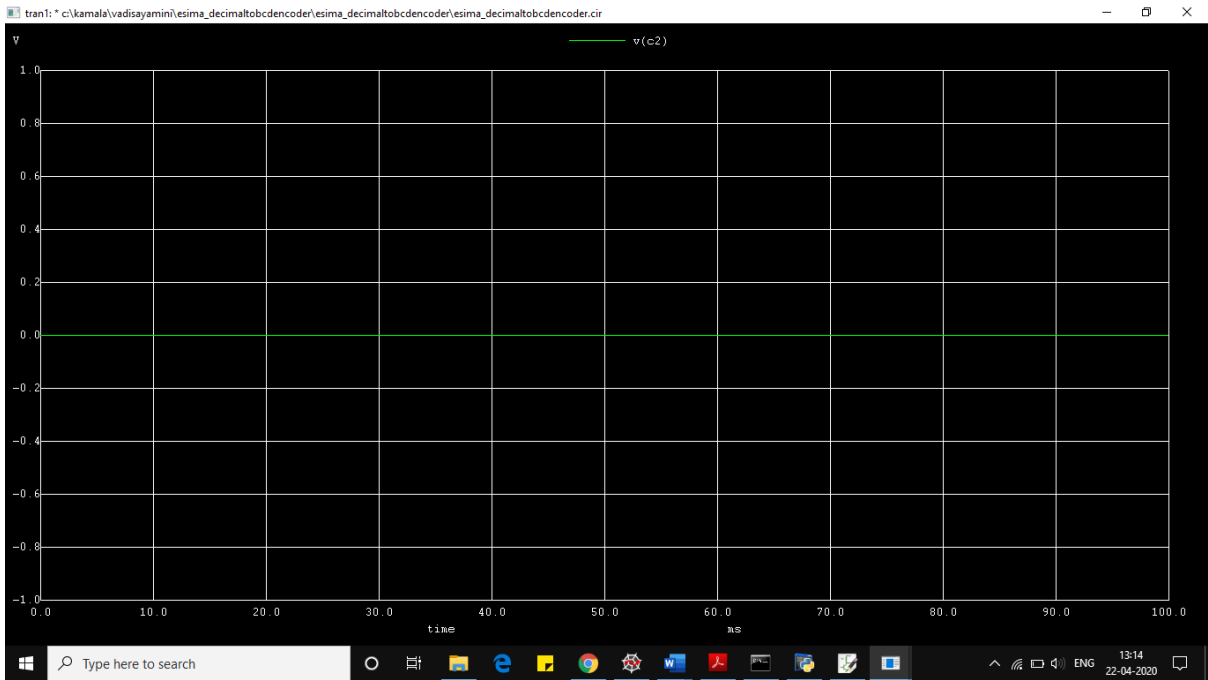
Figure 5 :2nd bit of BCD output(c1)
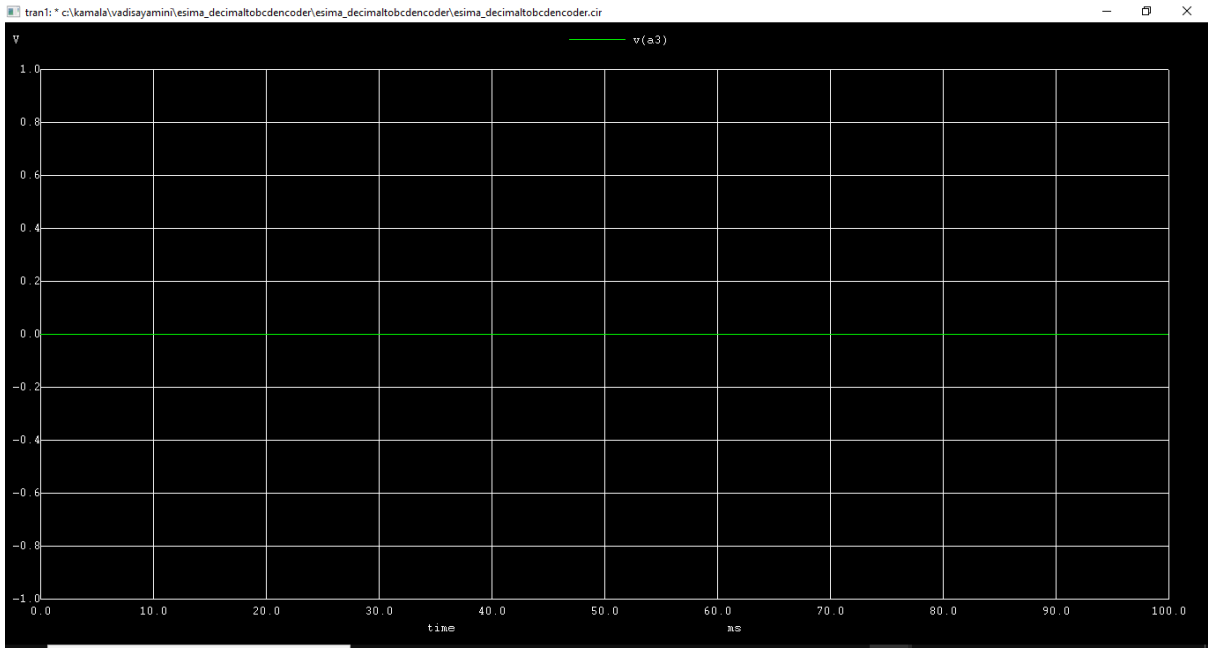

Figure 6: 3rd bit of BCD output(c2)

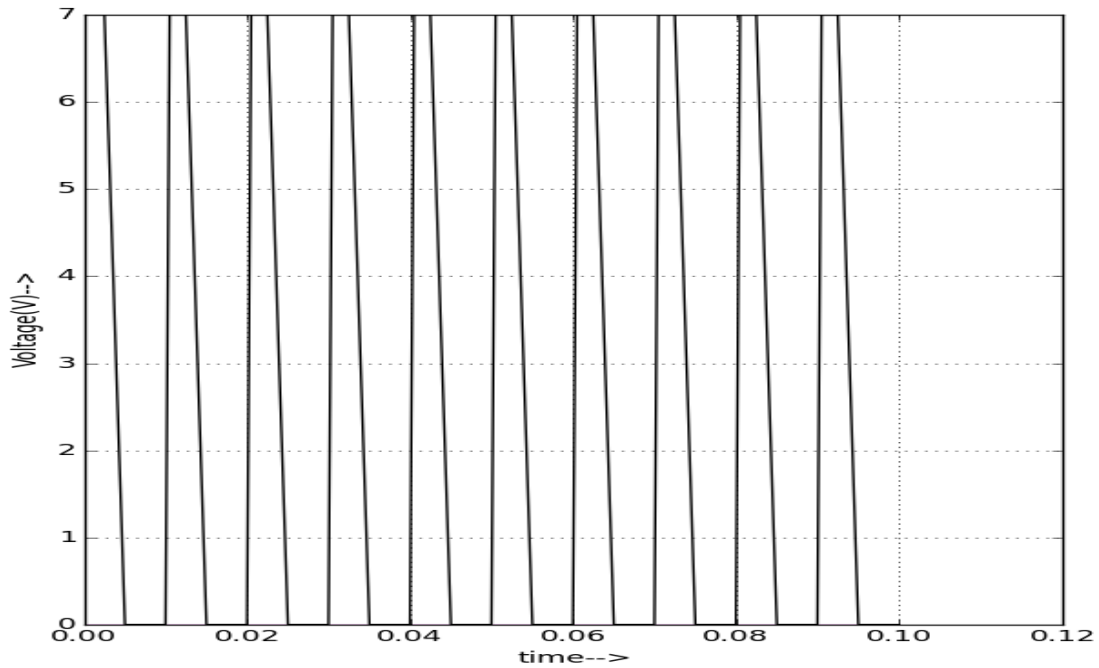Figure 7:MSB of output(a3)
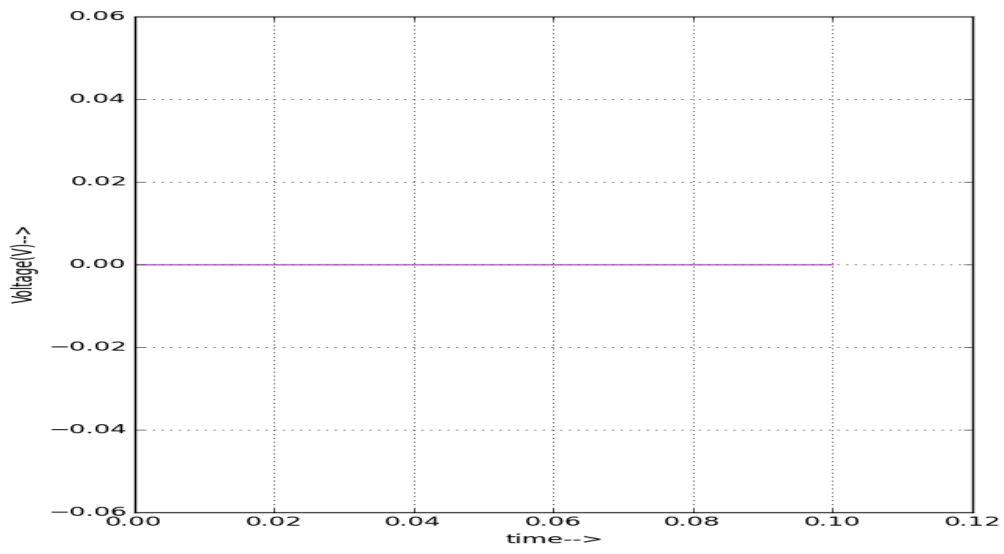
2.Python Plots:

Figure 8: Input

Figure 9: 3rd bit of BCD output(c2)
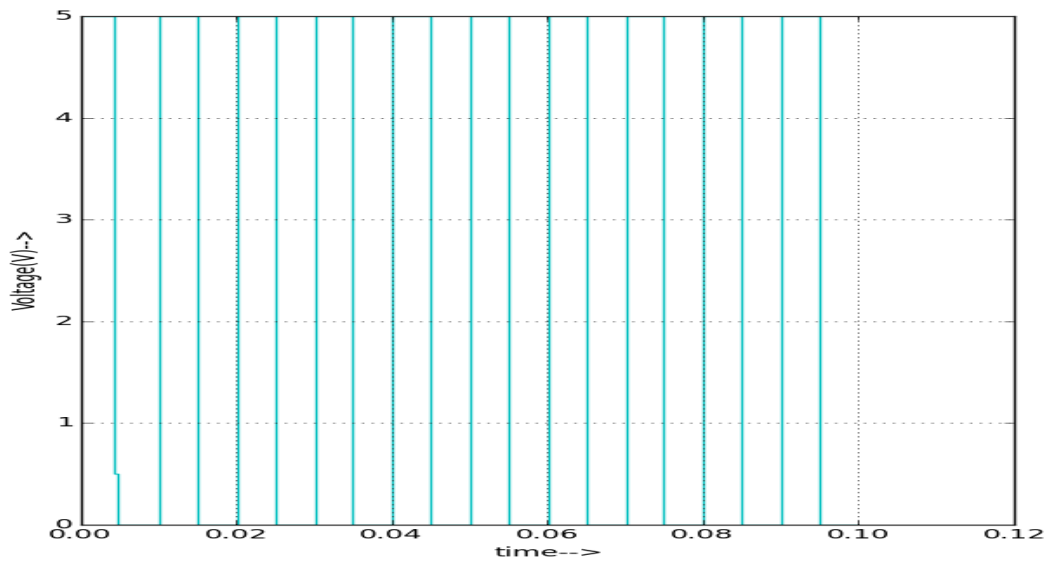

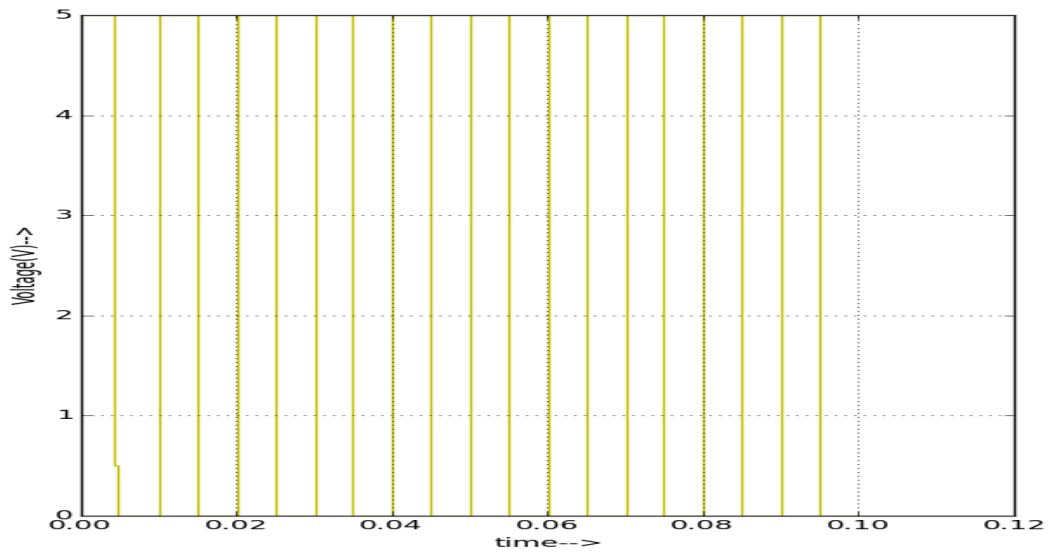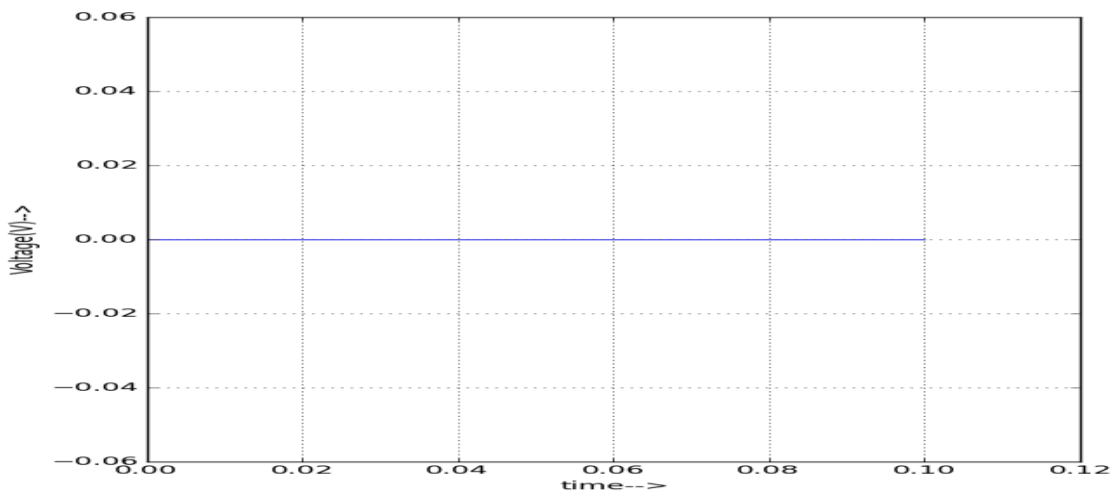Figure 10 :2nd bit of BCD output(c1)

Figure 11: LSB of output(C0)

Figure 12 :MSB of output(a3)

Source/Reference(s) :

https://www.geeksforgeeks.org/encoder-in-digital-logic/

http://verticalhorizons.in/decimal-to-bcd-encoder-in-digital-electronics/