CIRCUIT SIMULATION PROJECT

https://esim.fossee.in/circuit-simulation-project

Name of Participant: Altaf Pathan

Project Guide: Dr. Maheswari. R

Title of the Project: -

Design of BCD to Decimal code converter in eSIM.

Theory/Description: -

Binary Coded Decimal. [BCD] is a number system that only counts from 0 to 9 and then repeats. The table below shows the conversion between the different numbering systems and BCD code.
BCD is also called 8421 because the binary LSB counts as a 1, the next bit adds 2, than 4 and the final MSB bit adds 8 to the final

numbers. So a BCD 1001 is equal to 8 plus 1 or decimal 9 [as the table shows].

The table below provides the conversion between Binary [Base 2], Decimal [Base 10], Hexa-decimal [Base 16], Octal [Base 8], BCD Code, and Gray Code.

Binary Base-2	Decimal Base-10	Hexa-Decimal Base-16	Octal Base-8	BCD Code	Gray Code
0000	0	0	0	0	0000
0001	1	1	1	1	0001
0010	2	2	2	2	0011
0011	3	3	3	3	0010
0100	4	4	4	4	0110
0101	5	5	5	5	0111
0110	6	6	6	6	0101
0111	7	7	7	7	0100
1000	8	8	10	8	1100
1001	9	9	11	9	1101
1010	10	A	12	---	1111
1011	11	B	13	---	1110
1100	12	C	14	---	1010
1101	13	D	15	---	1011
1110	14	E	16	---	1001
1111	15	F	17	---	1000

Conversion Table

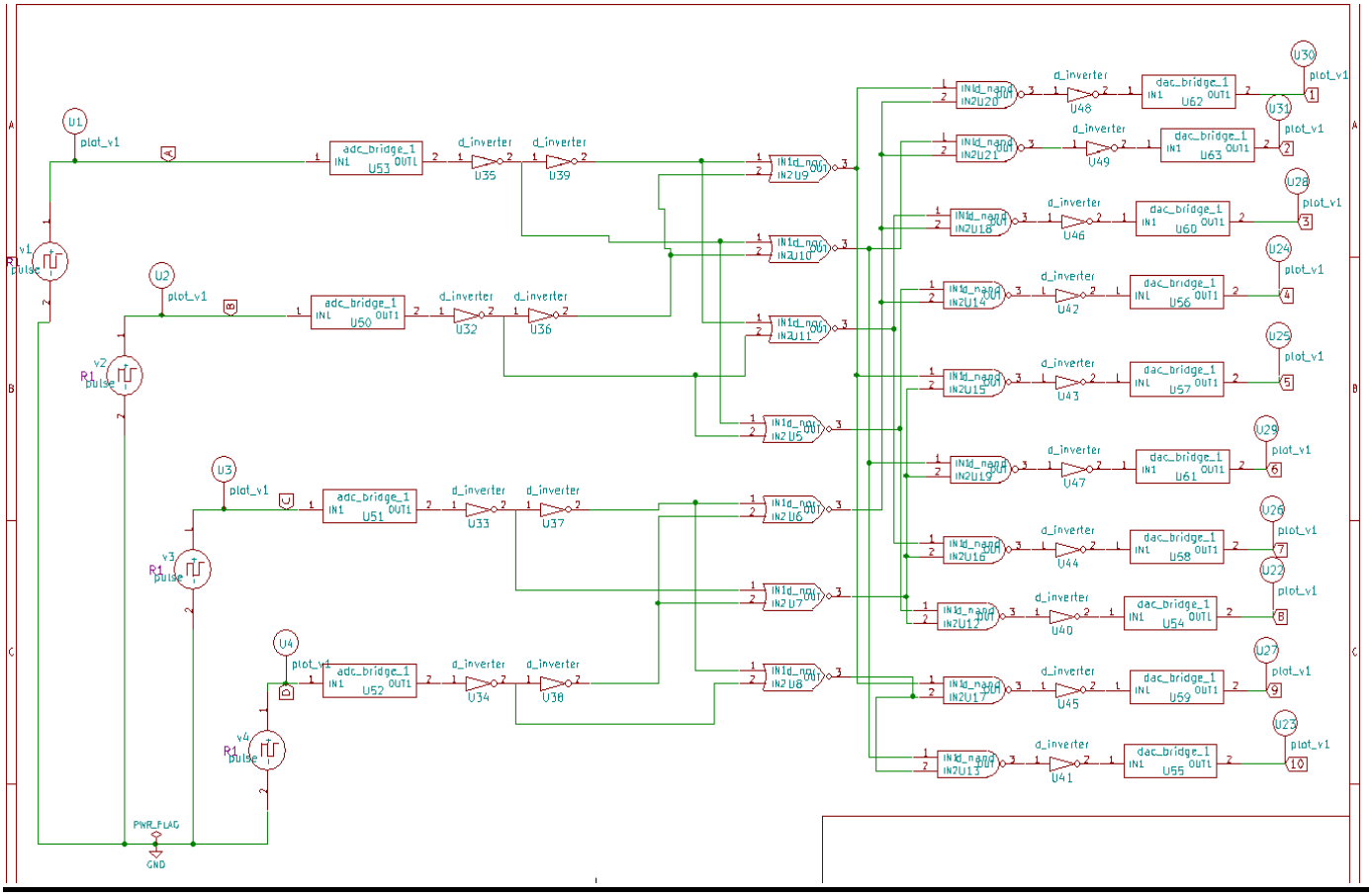
Circuit to convert Binary coded decimal to decimal. Using standard glue logic ICs; note the circuit works regardless of the particular logic standard used, as long as those families can communicate with each other over the same voltage levels. Manufacturers of Standard Glue logic

INPUTS				OUTPUTS									
D	C	B	A	0	1	2	3	4	5	6	7	8	9
L	L	L	L	L	H	H	H	H	H	H	H	H	H
L	L	L	H	H	L	H	H	H	H	H	H	H	H
L	L	H	L	H	H	L	H	H	H	H	H	H	H
L	L	H	H	H	H	H	L	H	H	H	H	H	H
L	H	L	L	H	H	H	H	L	H	H	H	H	H
L	H	L	H	H	H	H	H	H	L	H	H	H	H
L	H	H	L	H	H	H	H	H	H	L	H	H	H
L	H	H	H	H	H	H	H	H	H	H	L	H	H
H	L	L	L	H	H	H	H	H	H	H	H	L	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L
H	L	H	L	H	H	H	H	H	H	H	H	H	H
H	L	H	H	H	H	H	H	H	H	H	H	H	H
H	H	L	L	H	H	H	H	H	H	H	H	H	H
H	H	L	H	H	H	H	H	H	H	H	H	H	H
H	H	H	L	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	H	H	H	H	H	H	H	H	H

BCD To Decimal Code Converter Truth Table

The truth table for the BCD to Decimal Code Converter is shown above. The output is active low and counts from 0 to 9 decimal. When all BCD inputs are low '0', output 0 is low and so on. Note that this circuit only counts to 9, so any input higher than '9' results in all the outputs going high. So even as the inputs continue to change the output remains unchanged in the last six entries.

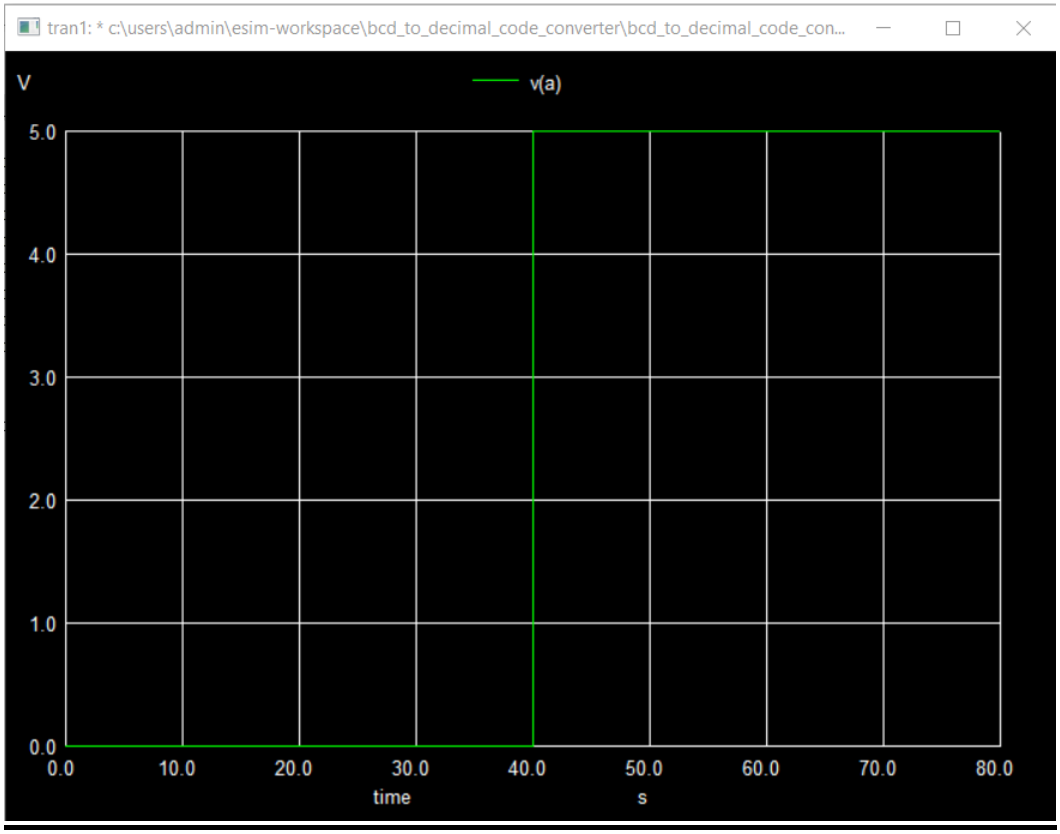
CIRCUIT DIAGRAM: -



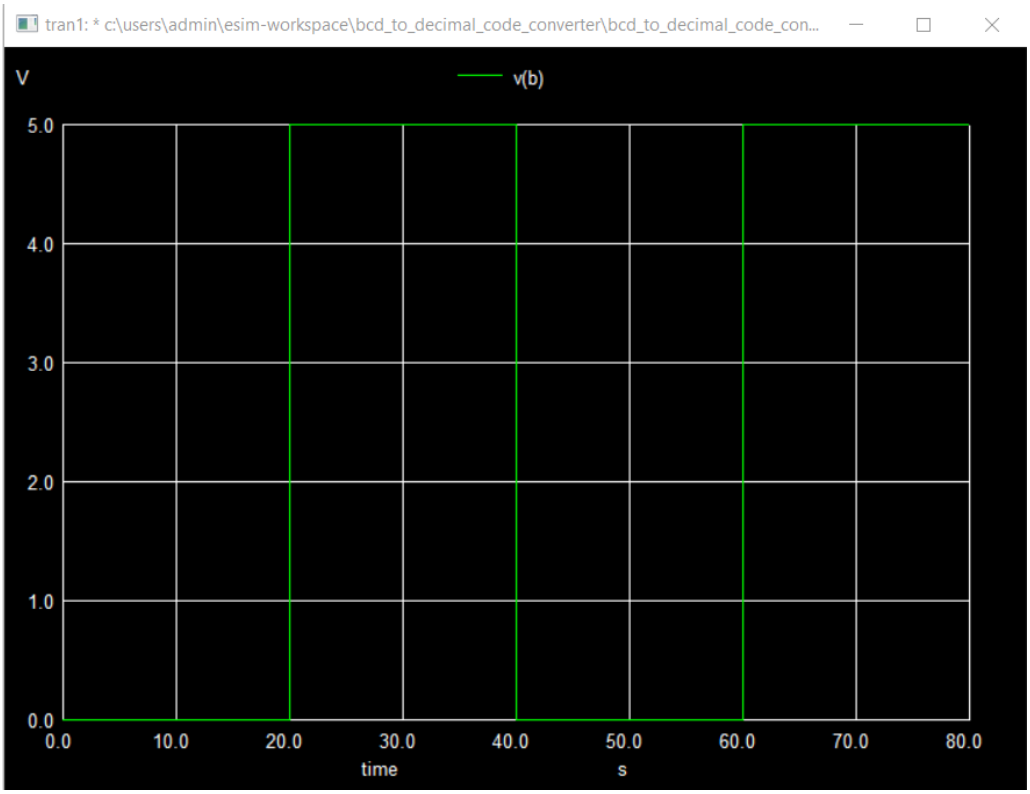
RESULT/OUTPUT: -

Ngspice Plots:

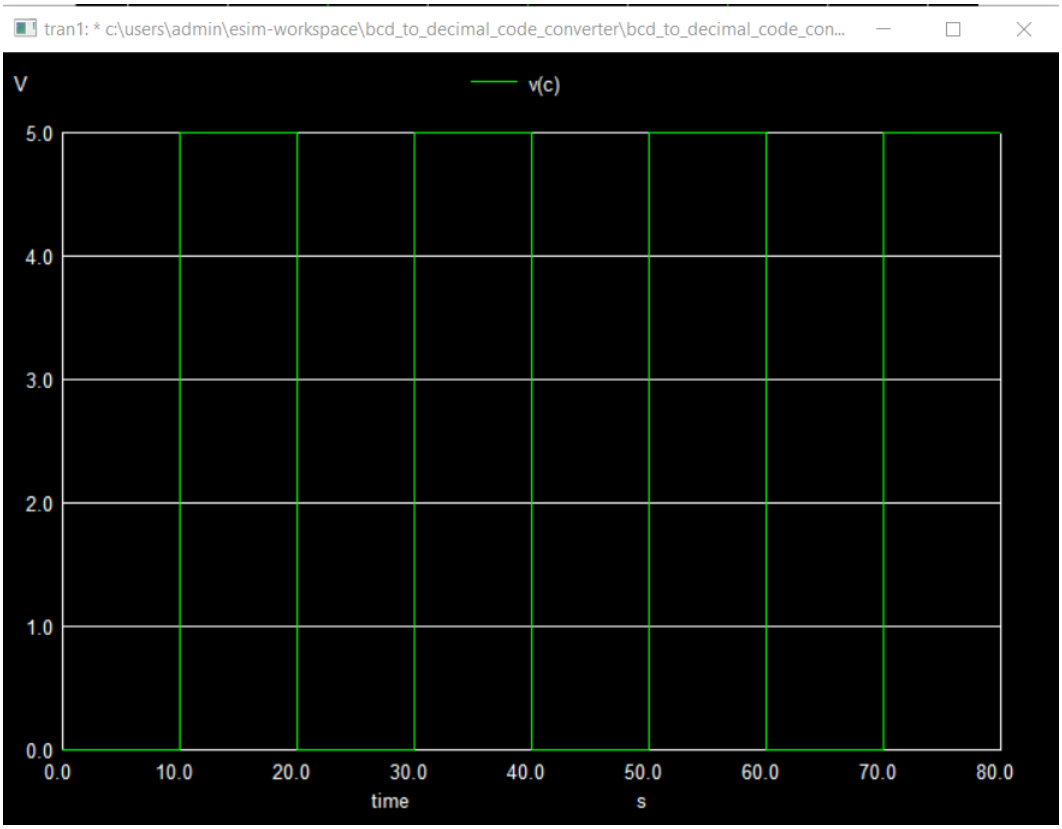
Inputs:



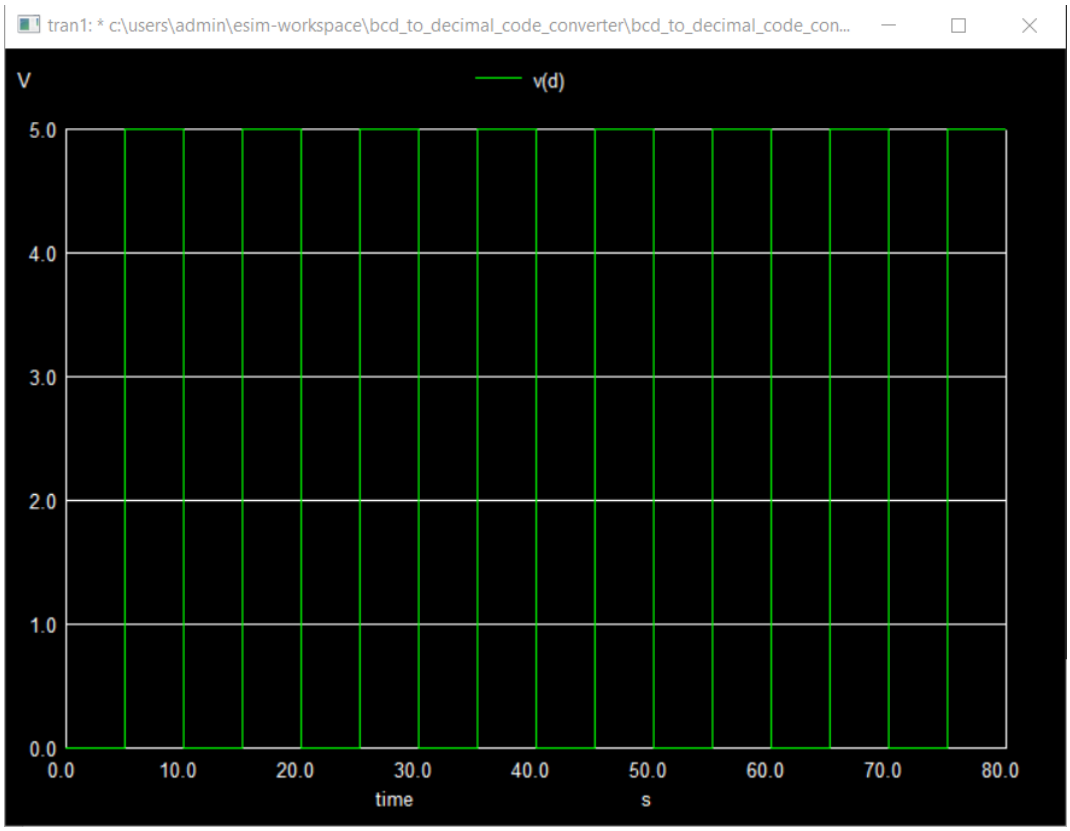
A


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(b)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

B

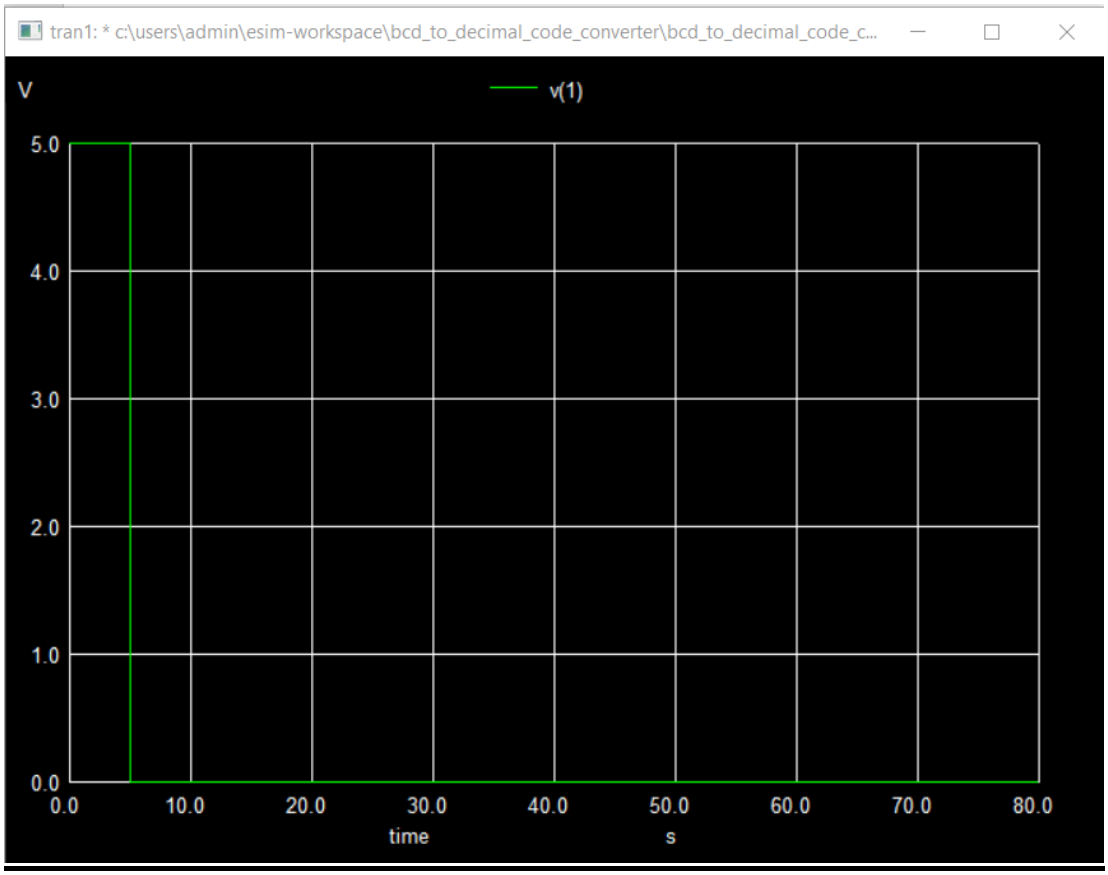

tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(c)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

C

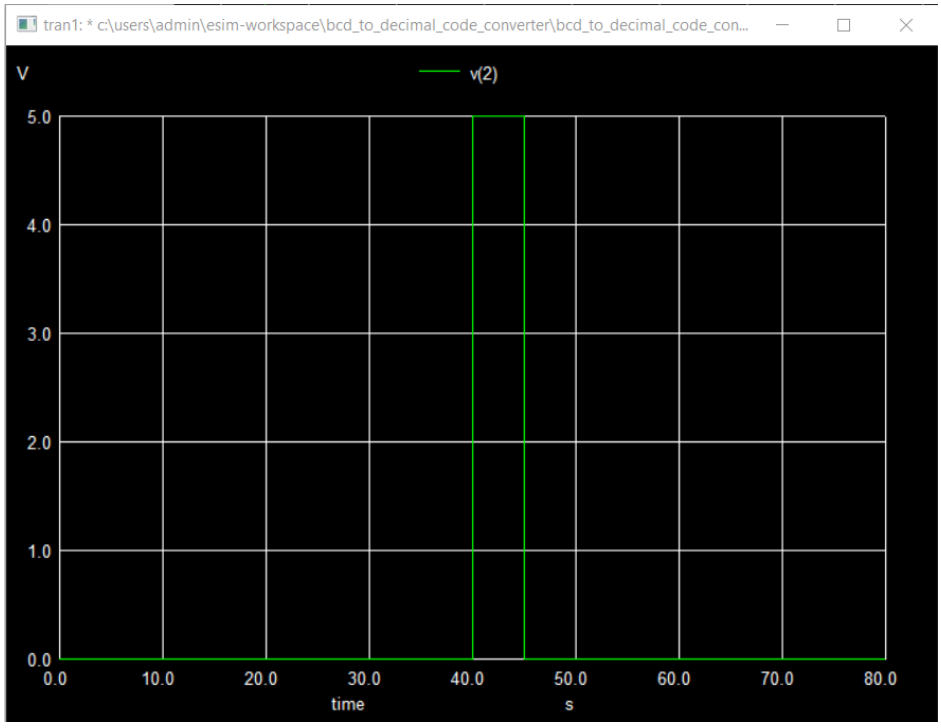

tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(d)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

D

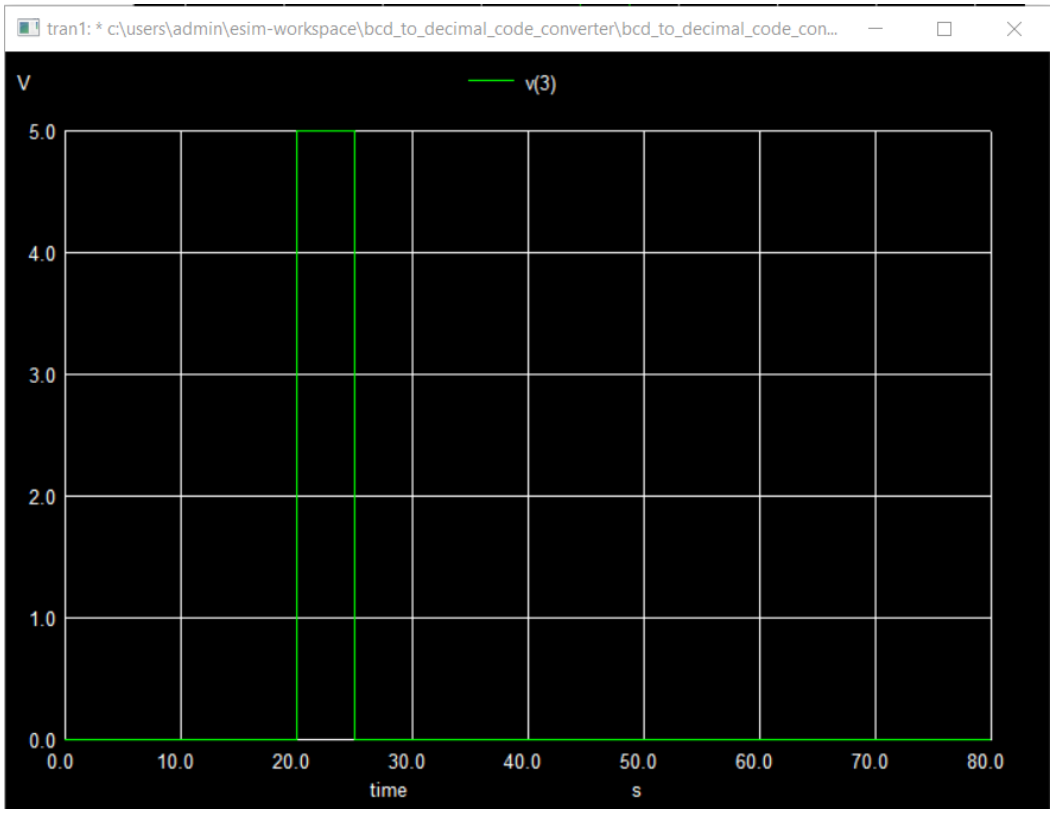
OUTPUTS:


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_c...
V
v(1)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

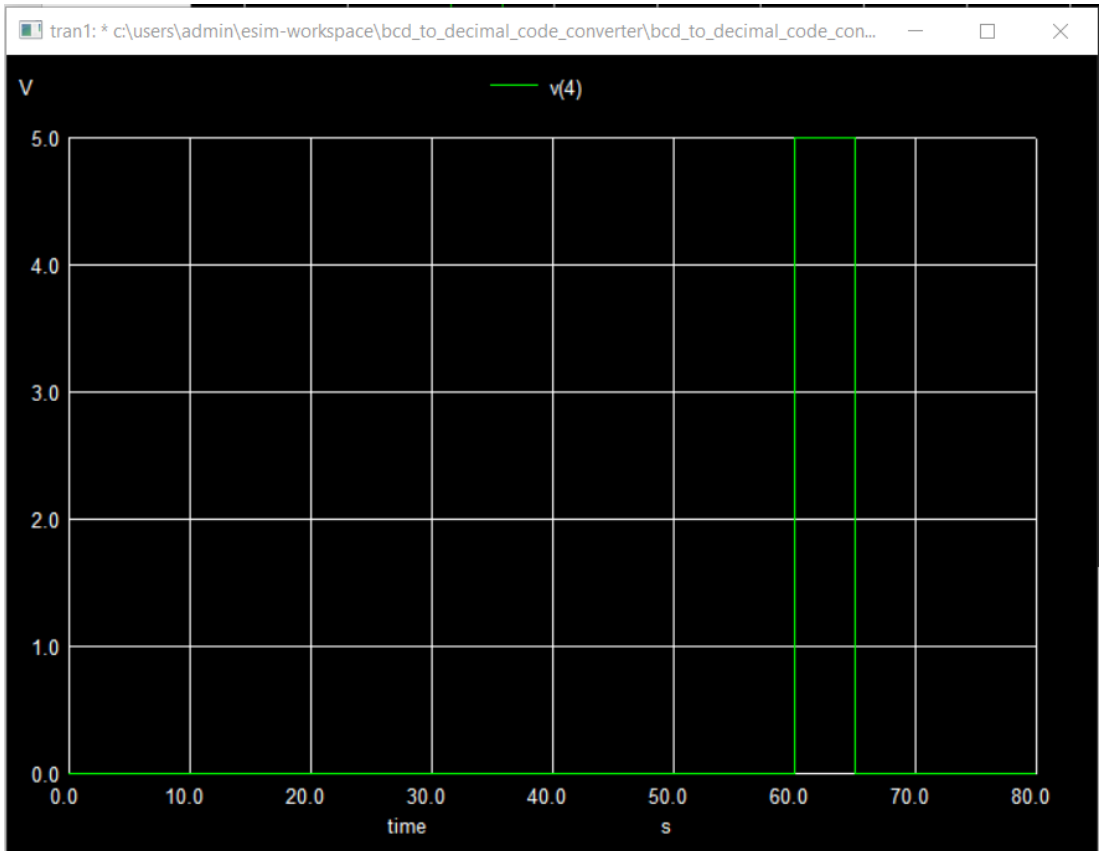
1


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(2)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

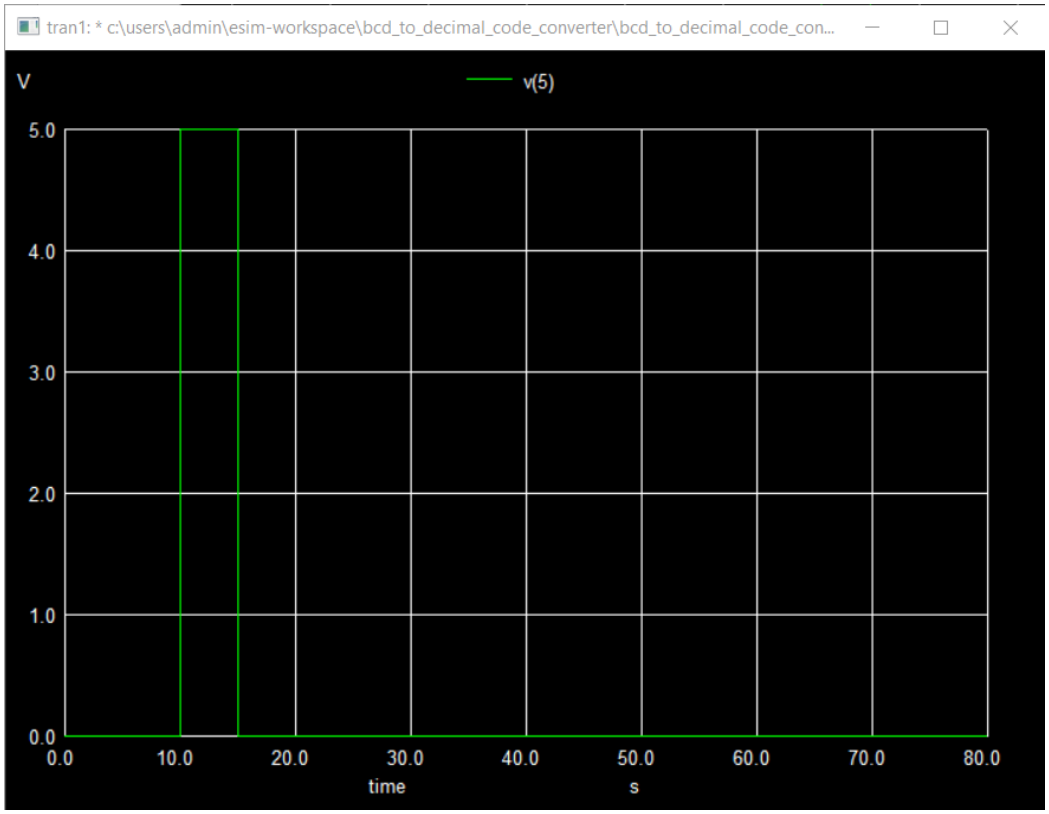
2


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(3)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

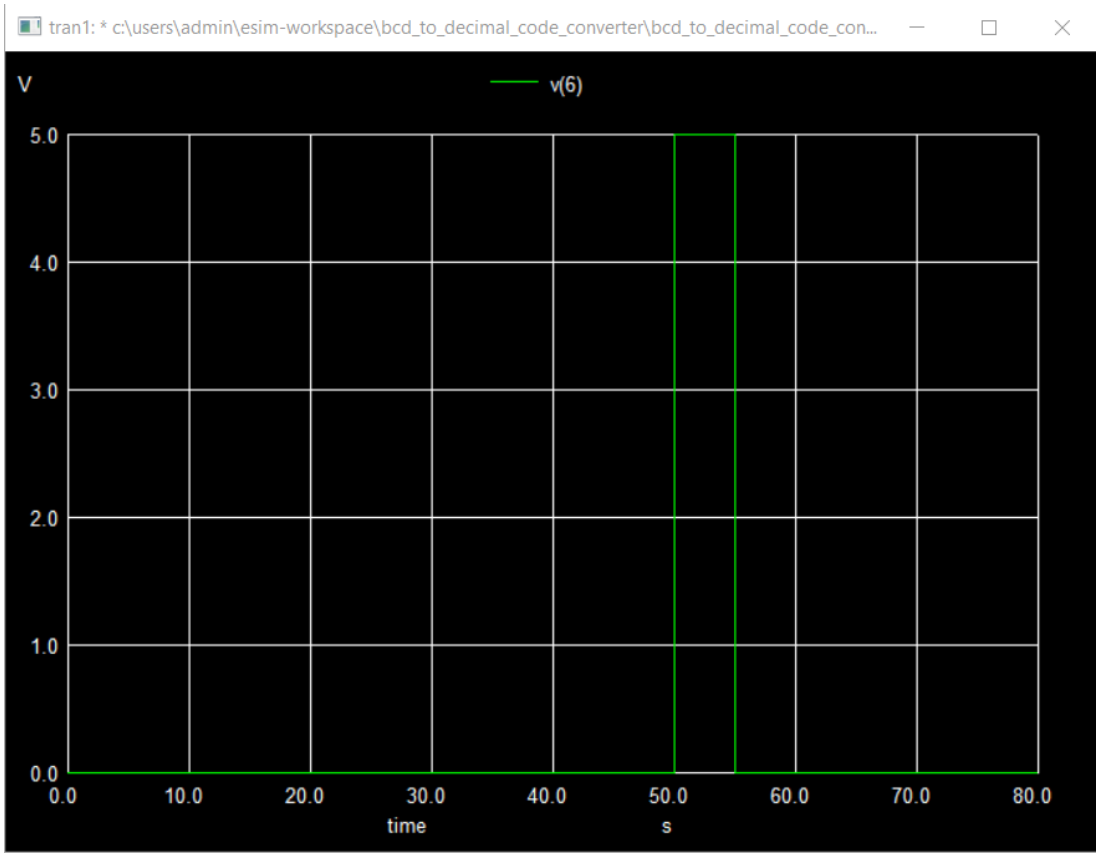
3


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(4)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

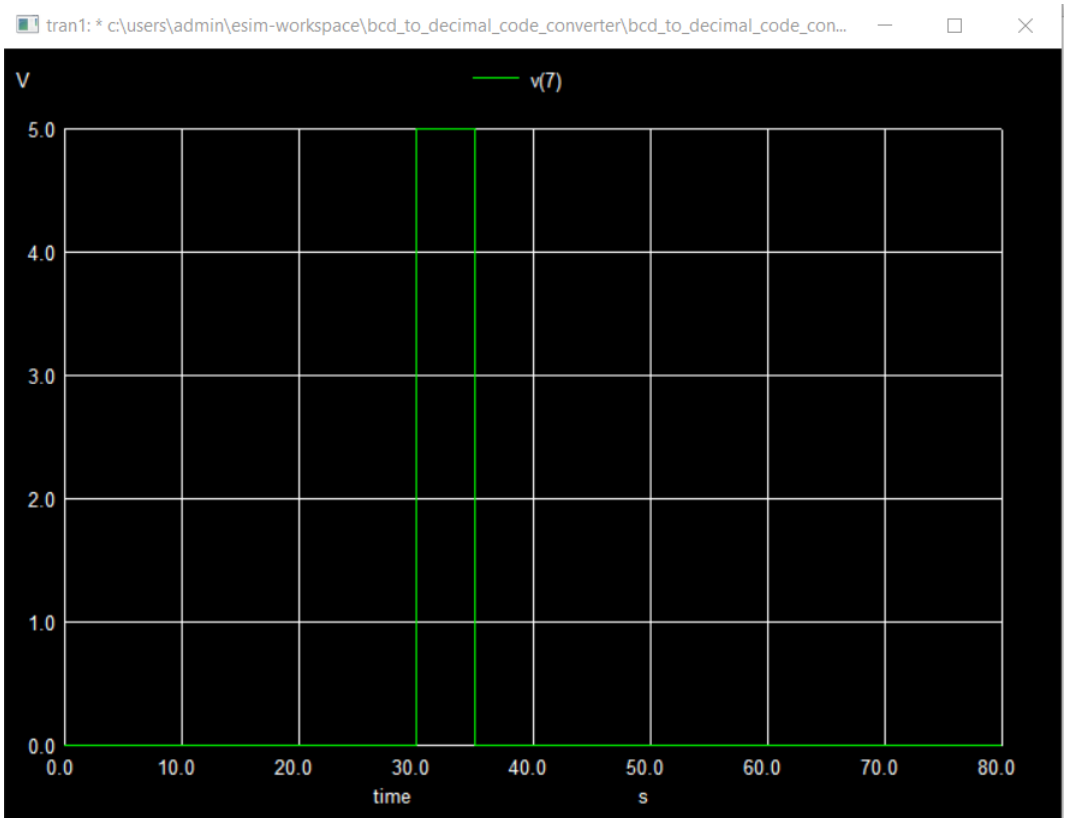
4


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(5)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

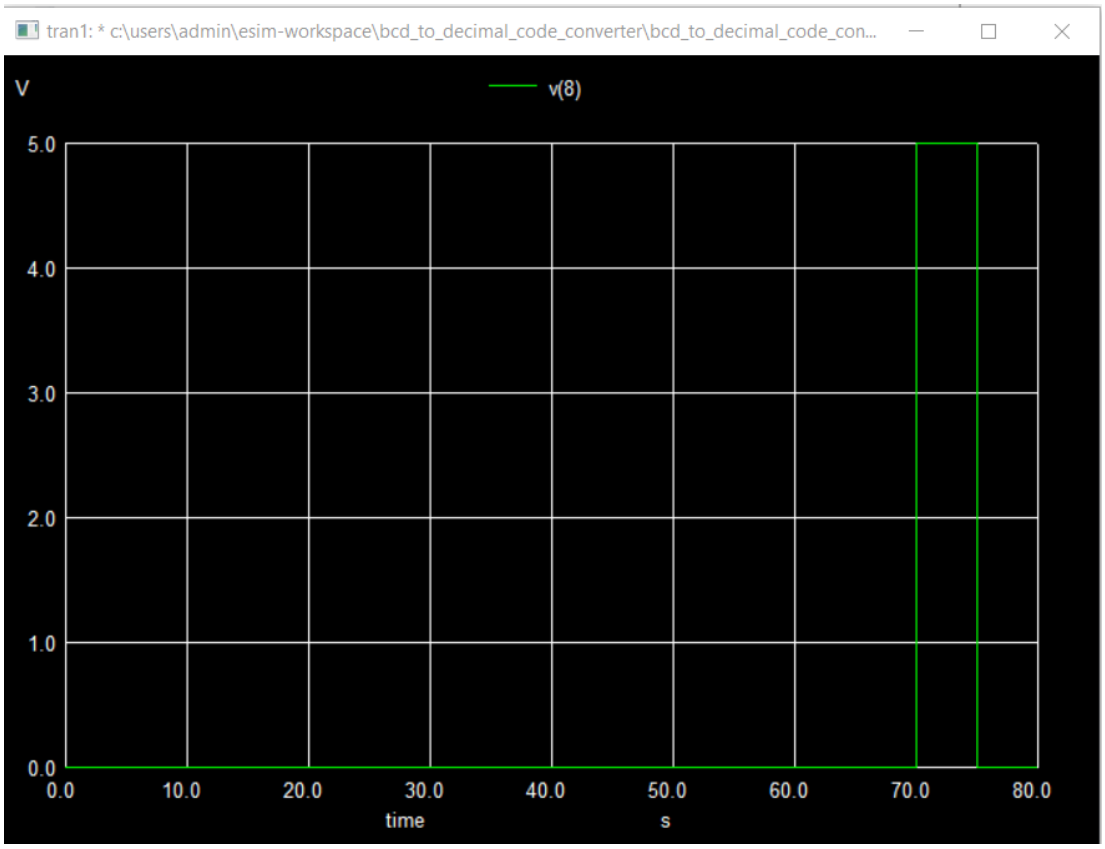
5


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(6)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

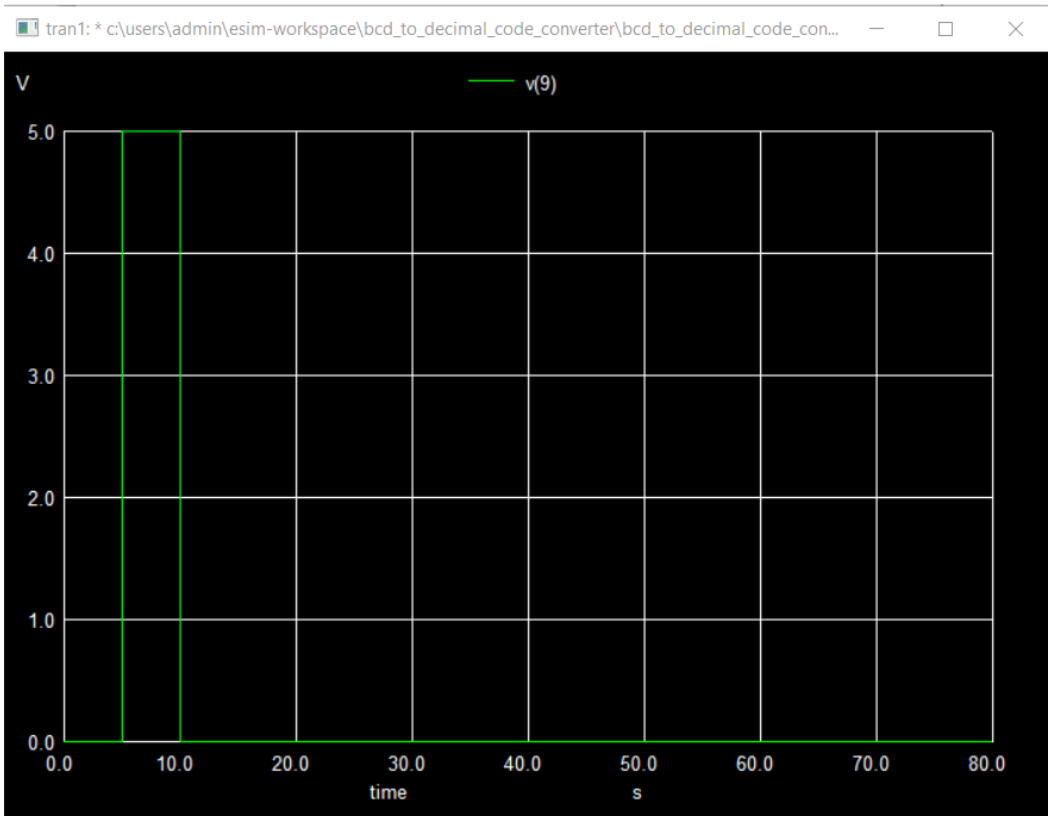
6


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(7)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

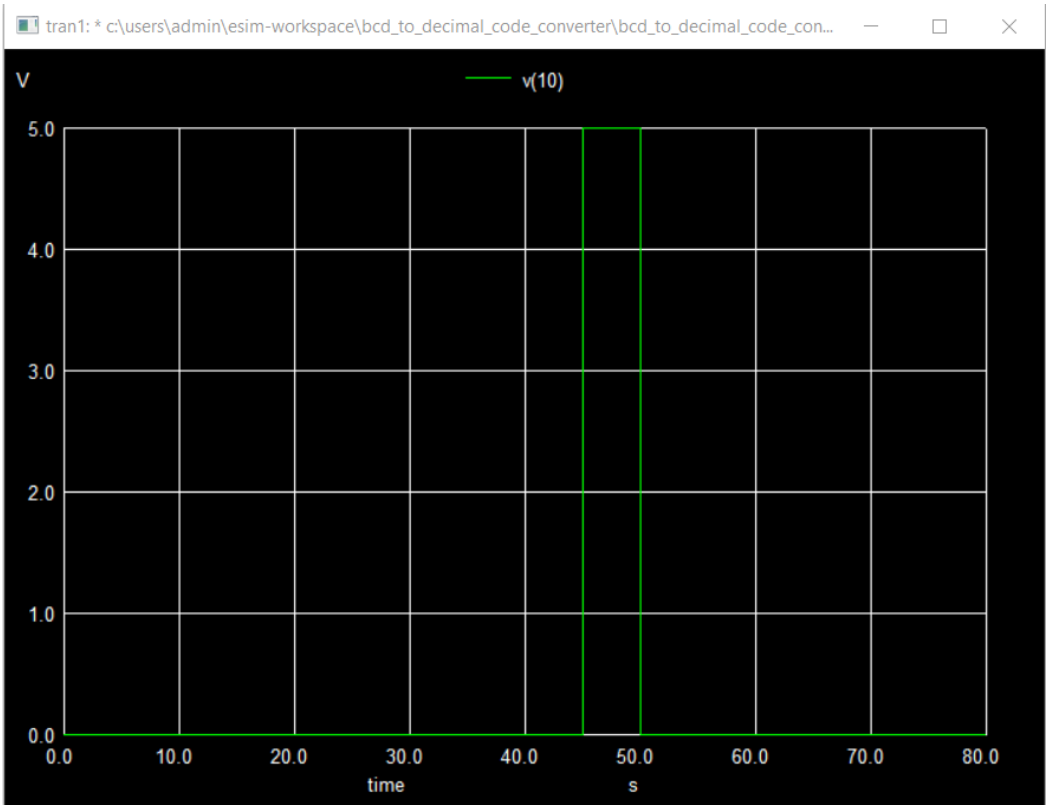
7


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(8)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

8


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(9)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

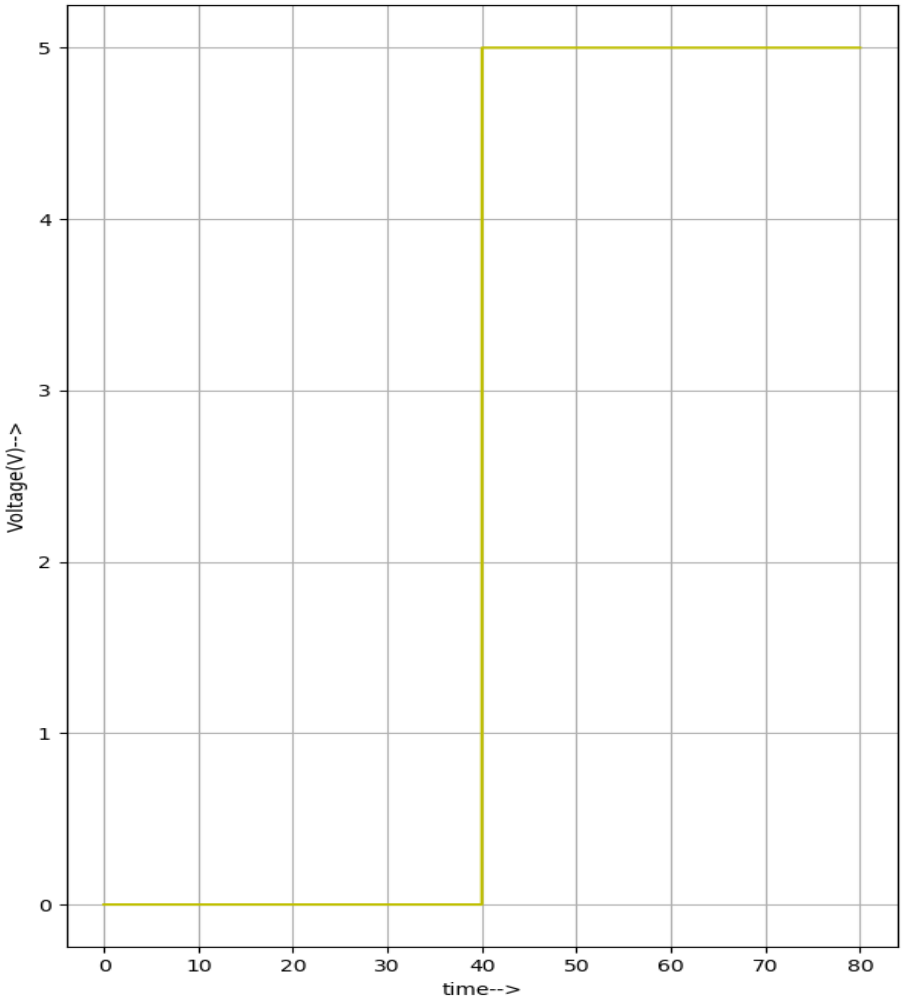
9


tran1: * c:\users\admin\esim-workspace\bcd_to_decimal_code_converter\bcd_to_decimal_code_con...
V
v(10)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
time
s

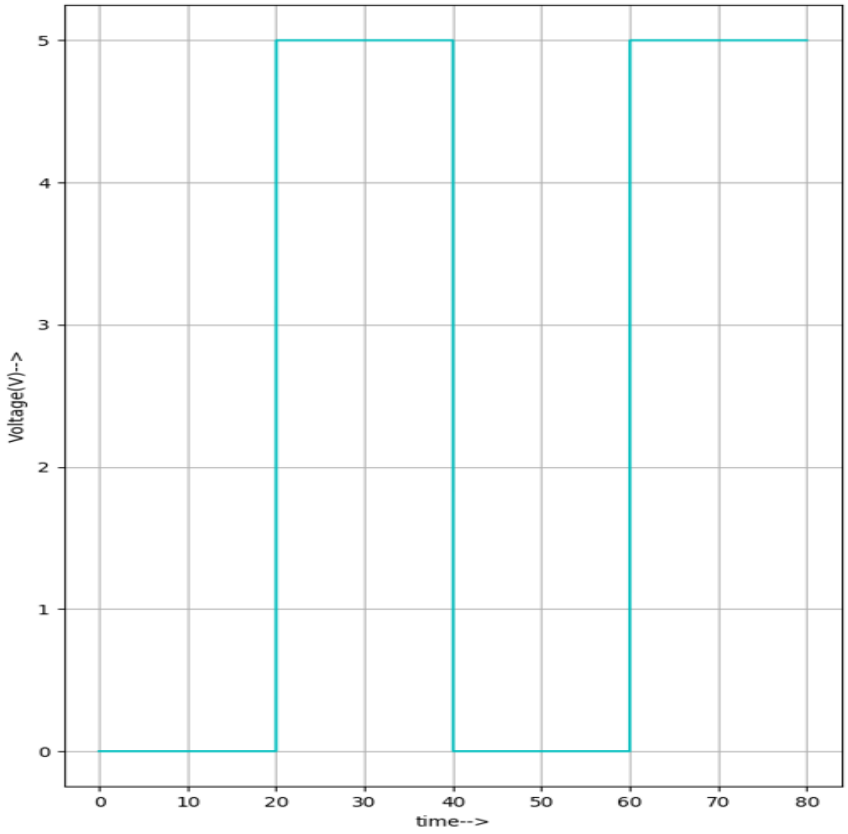
10

Python Plots: -

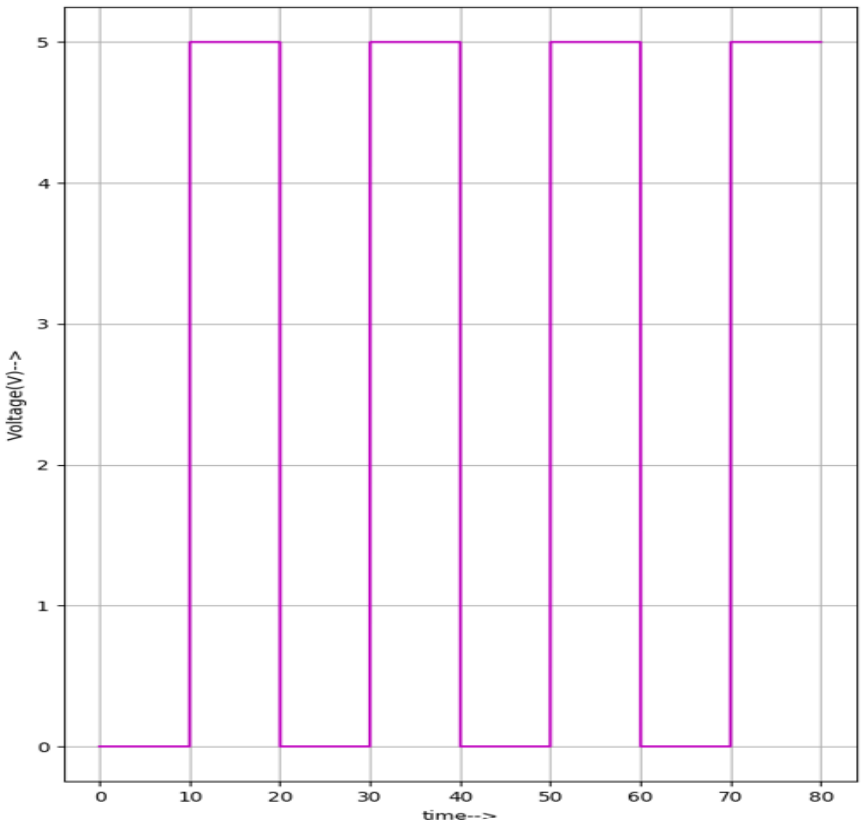
Inputs:



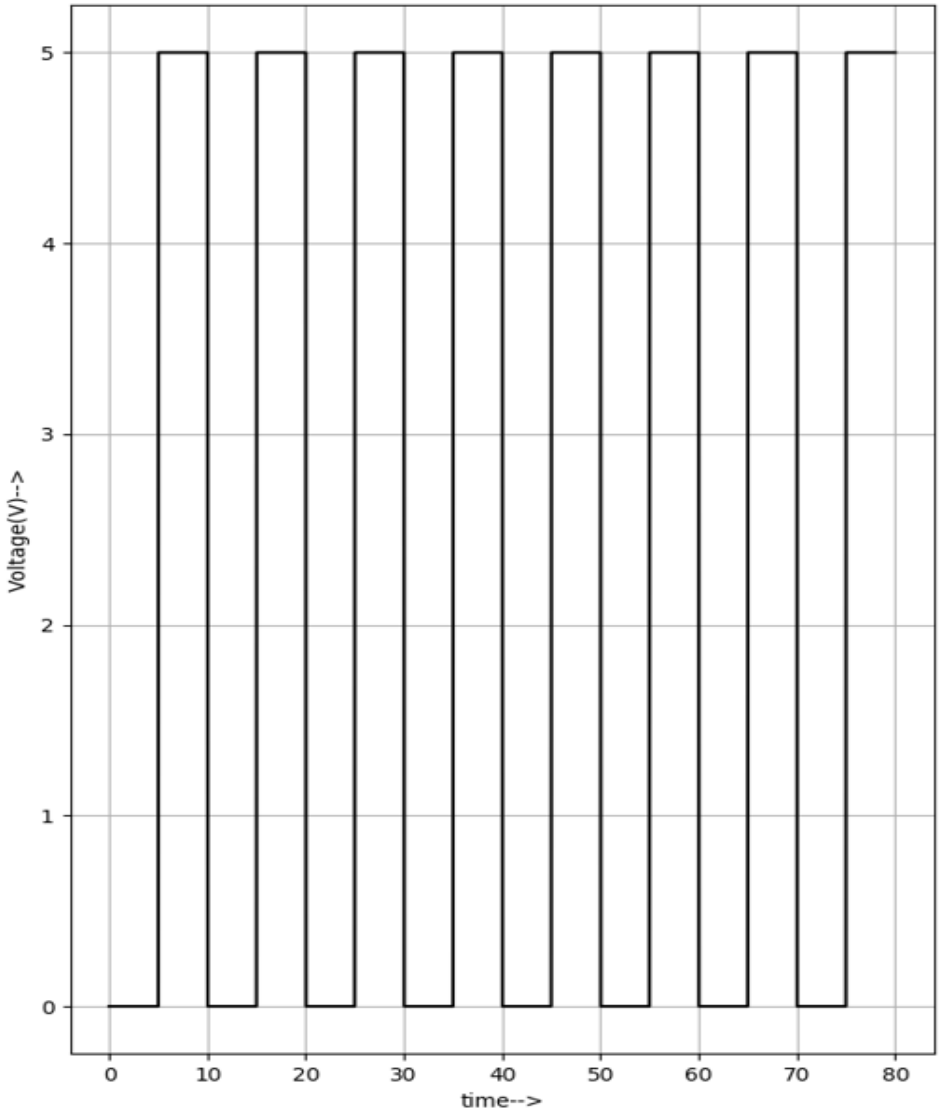
A


Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

B

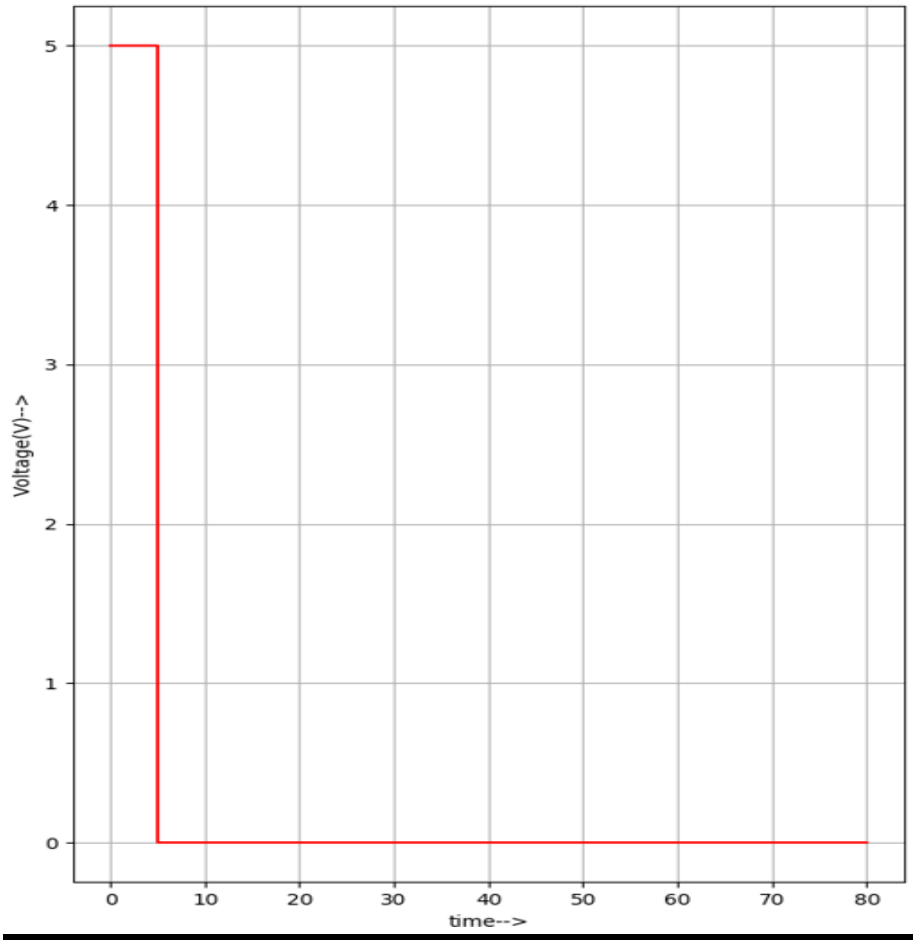

Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

C

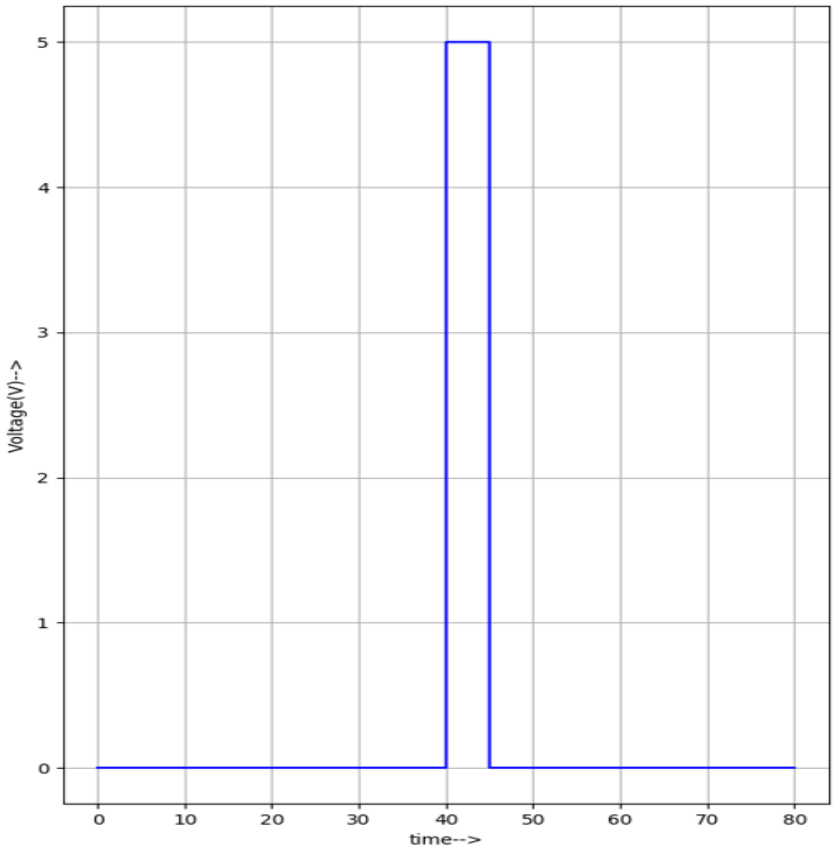


D

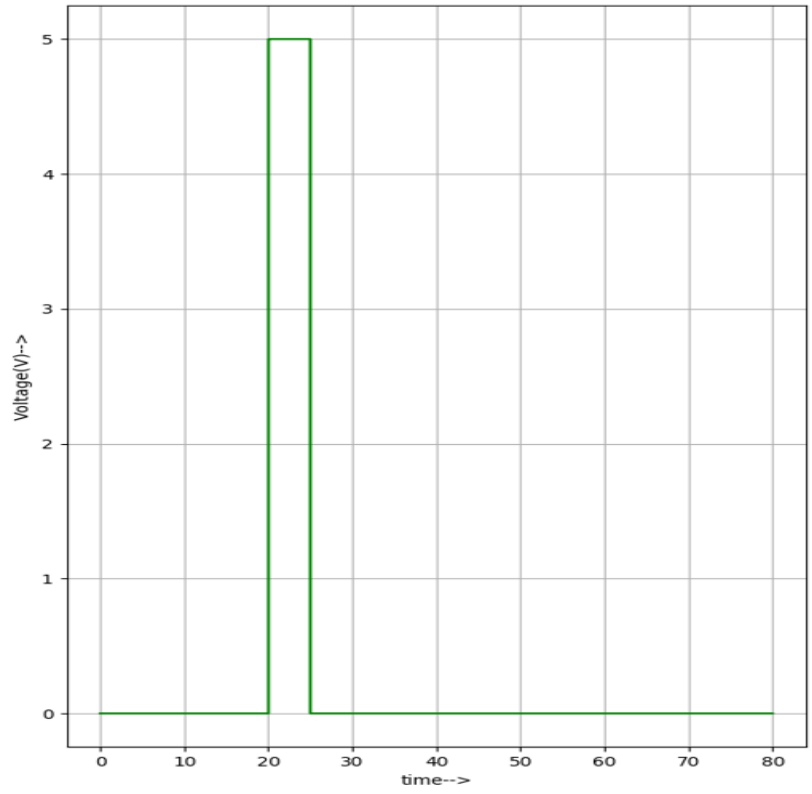
Outputs: -



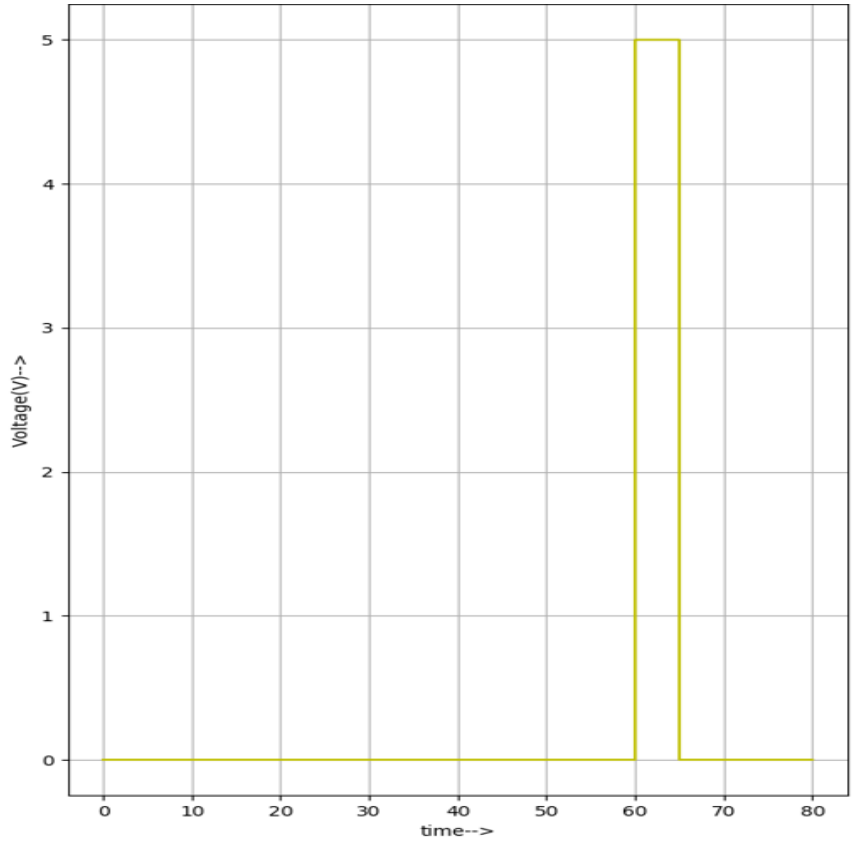
1


Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

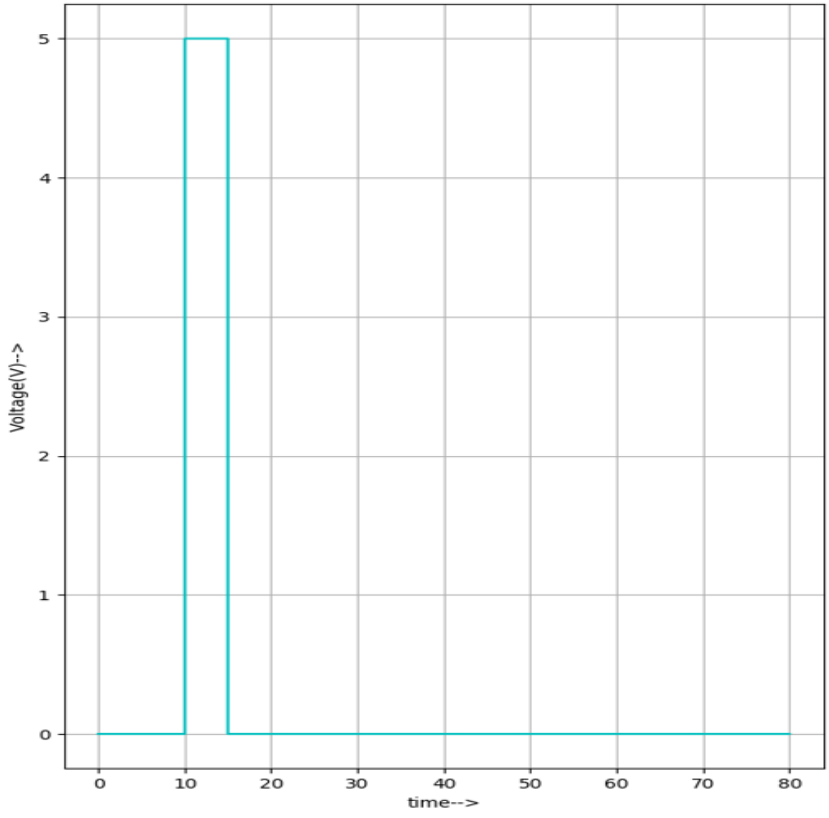
2


Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

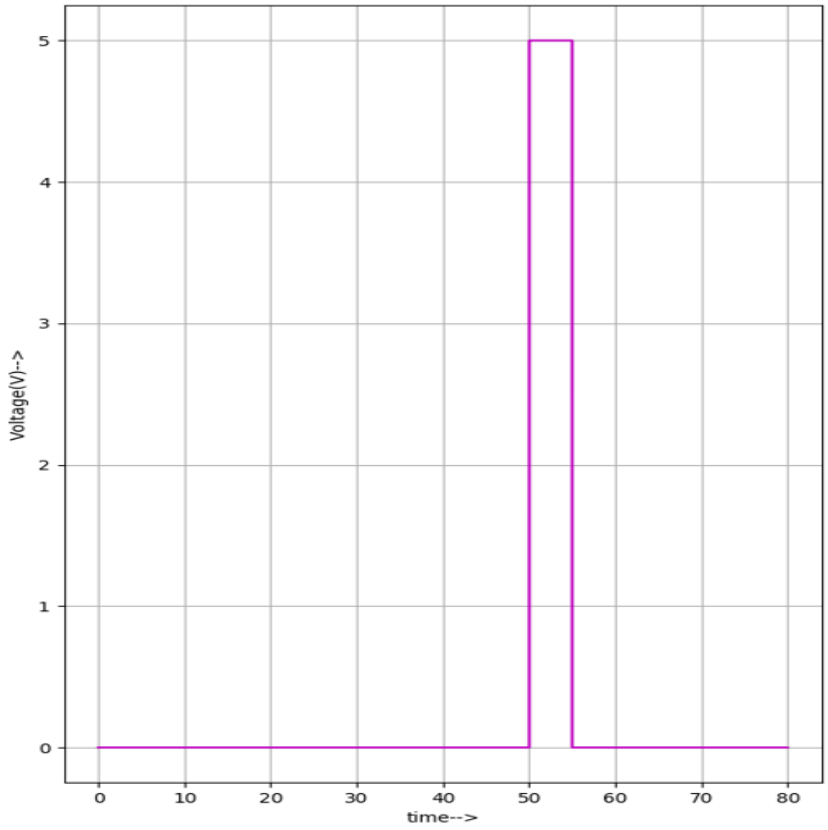
3


Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

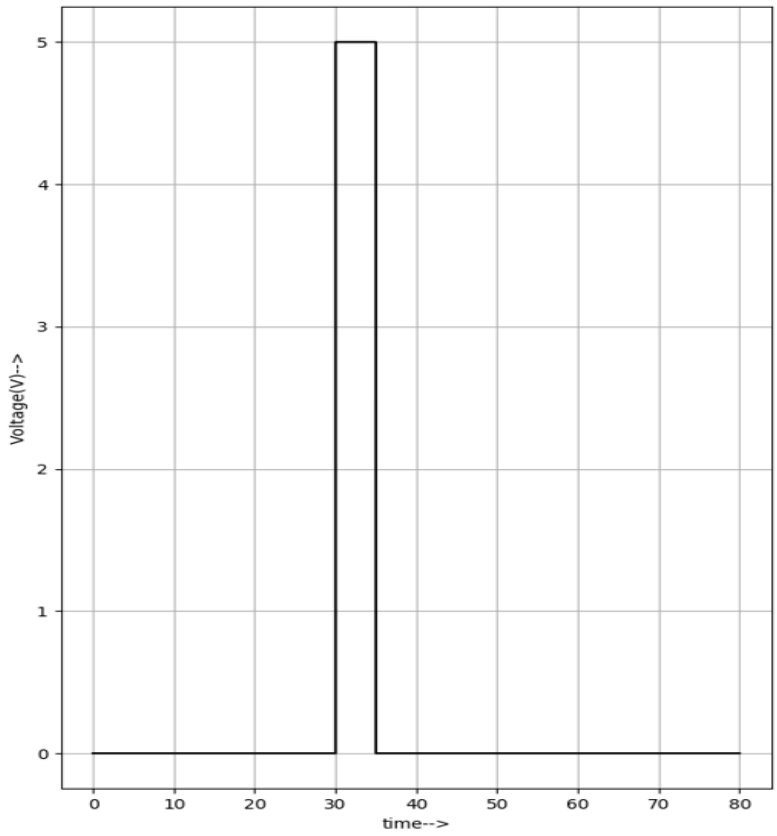
4


Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

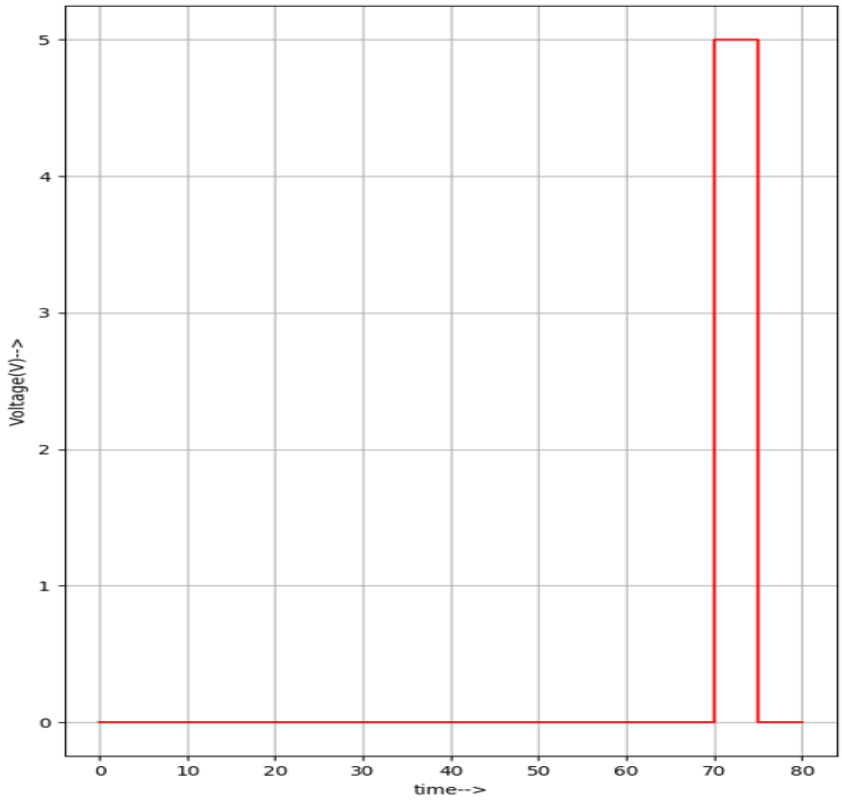
5


Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

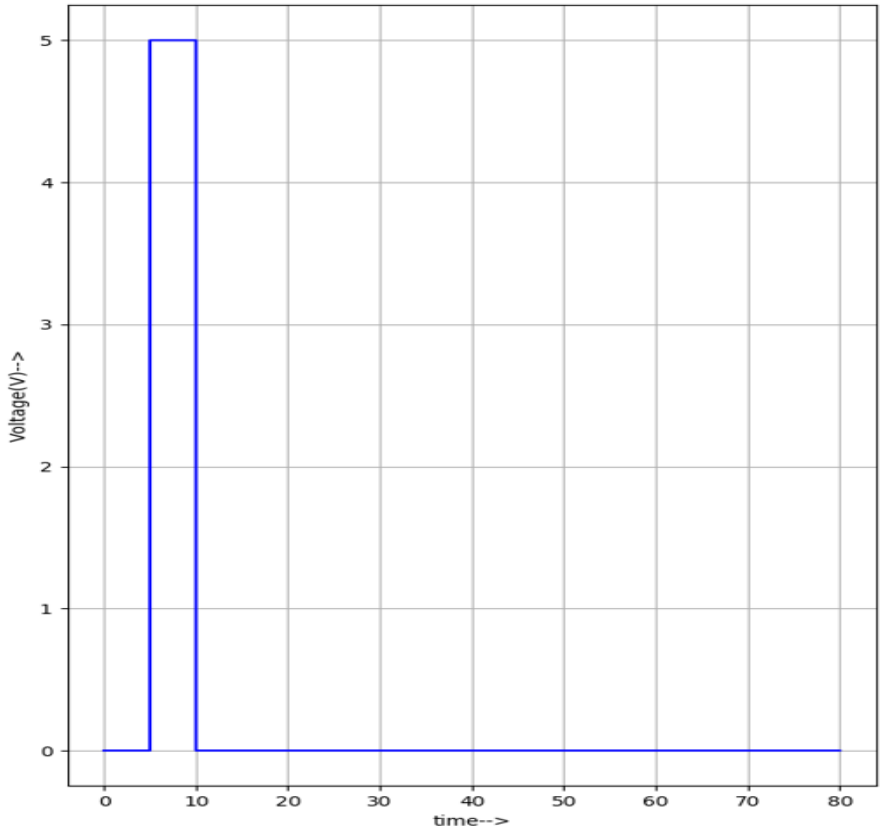
6


Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

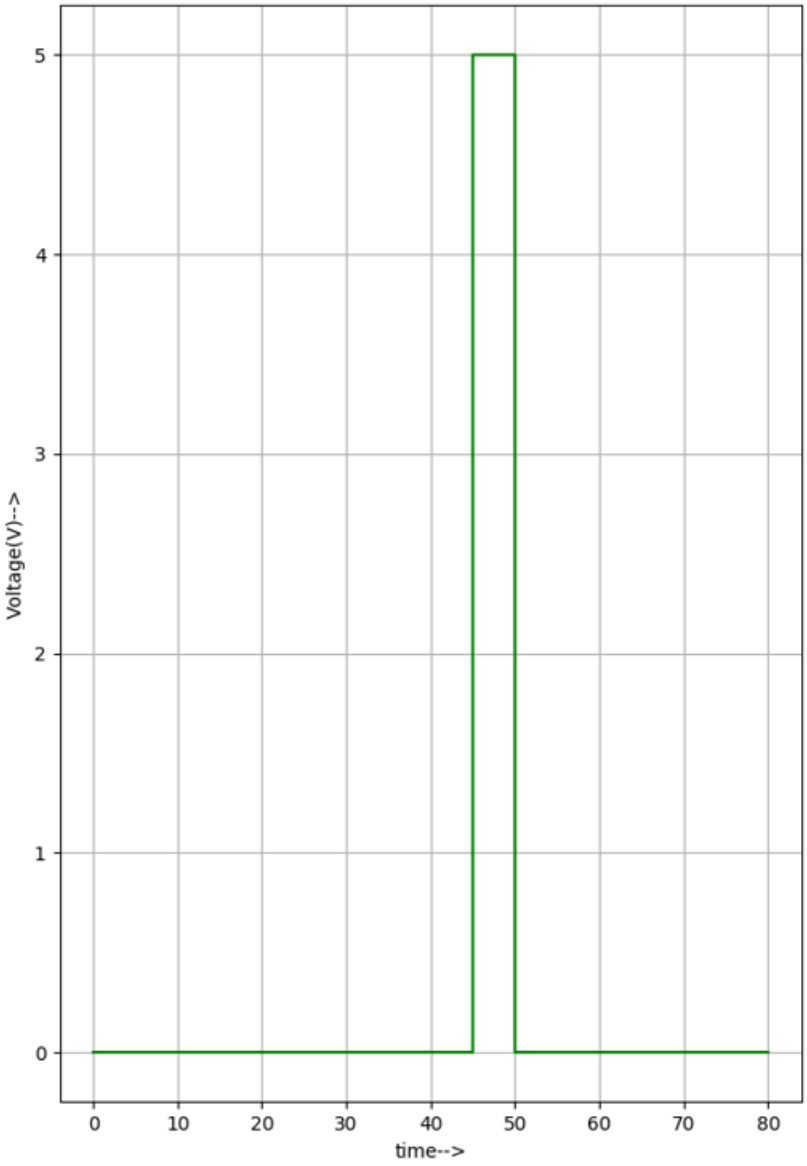
7


Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

8


Voltage(V)-->
time-->
0
1
2
3
4
5
0
10
20
30
40
50
60
70
80

9



10

References: -

http://www.interfacebus.com/Glossary-of-Terms-bcd-decimal-decoder.html

https://www.electronics-tutorials.ws/binary/binary-coded-decimal.html