Circuit Simulation Project

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

Name of the participant : Siddharth Bhuthapuri

Project Guide: Dr. R. Maheswari

Title of the circuit : Designing of 3 to 8 line Decoder

Theory/Description :

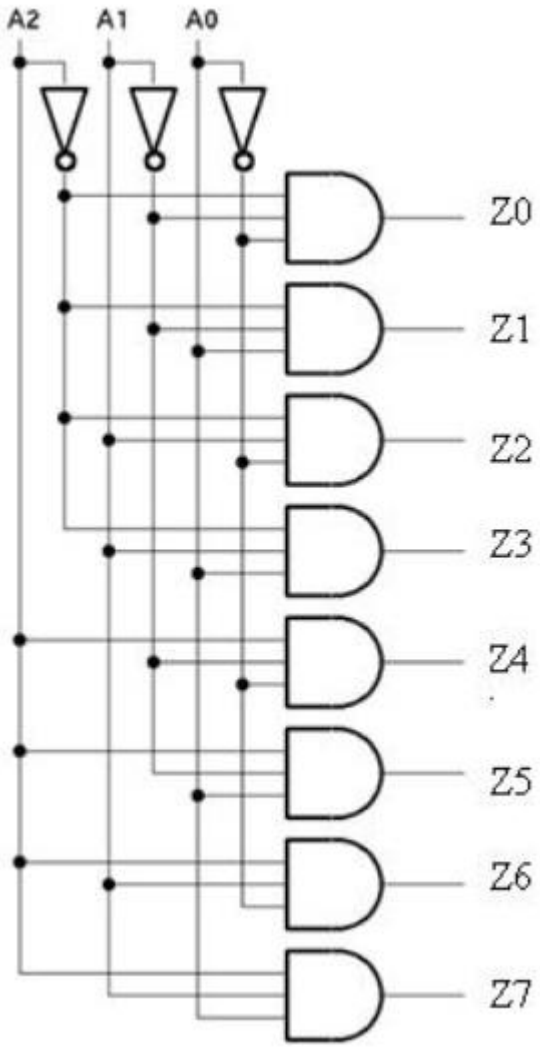
A decoder is a combinational logic circuit that is used to change the code into a set of signals. It is the reverse process of an encoder. A decoder circuit takes multiple inputs and gives multiple outputs. A decoder circuit takes binary data of ‘n’ inputs into ‘2^n’ unique output.

This decoder circuit gives 8 logic outputs for 3 inputs . The circuit is designed with AND and NAND logic gates. It takes 3 binary inputs and activates one of the eight outputs. 3 to 8 line decoder circuit is also called a binary to an octal decoder.

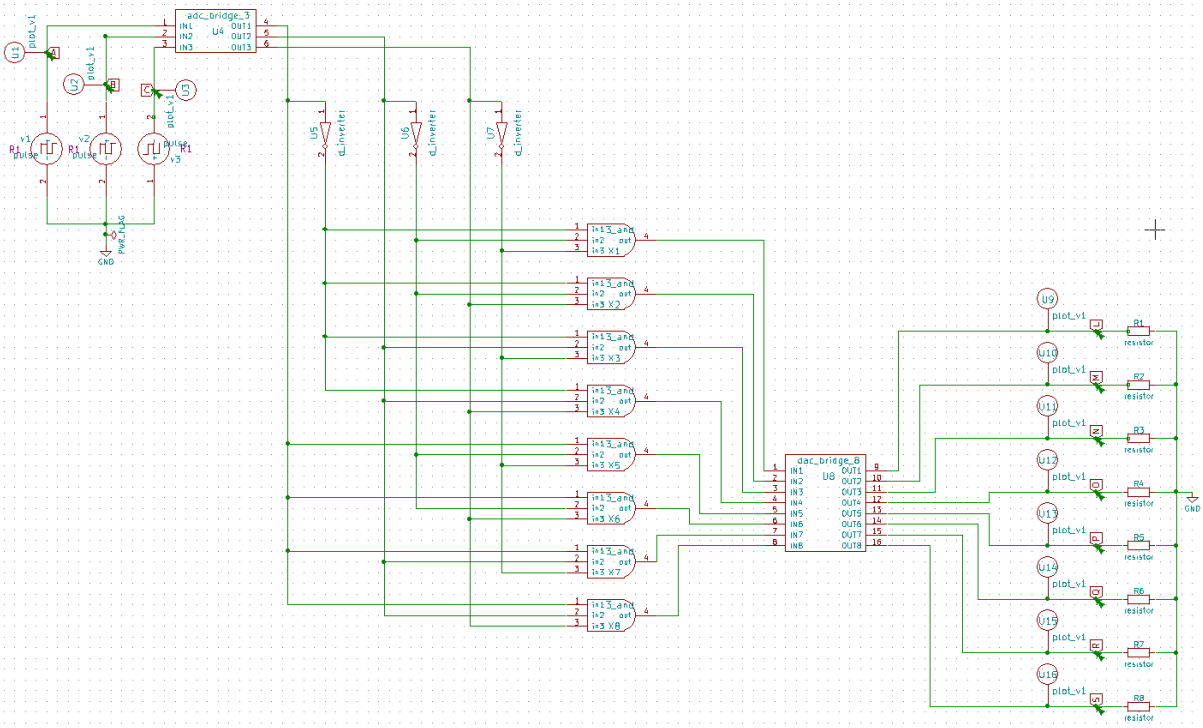
Truth Table:

A	B	C	D0	D1	D2	D3	D4	D5	D6	D7
0	0	0	1	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	0
0	1	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	1	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0
1	0	1	0	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	1	0
1	1	1	1	0	0	0	0	0	0	1

Logic Circuit:



Circuit Diagram:



Source Details:

Add parameters for pulse source v1

Enter initial value(Volts/Amps):	0
Enter pulsed value(Volts/Amps):	5
Enter delay time (seconds):	5
Enter rise time (seconds):	0
Enter fall time (seconds):	0
Enter pulse width (seconds):	5
Enter period (seconds):	10

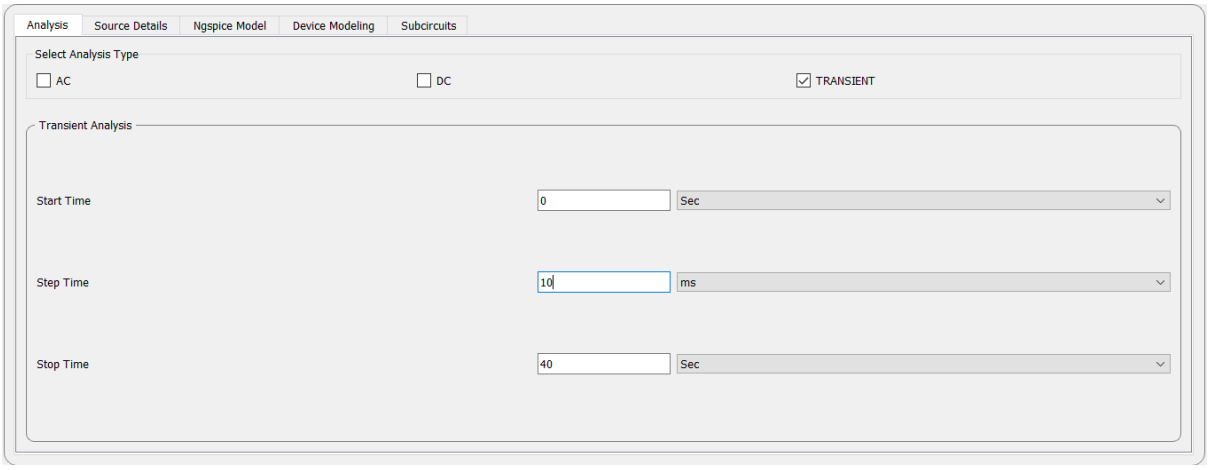
Add parameters for pulse source v2

Enter initial value(Volts/Amps):	0
Enter pulsed value(Volts/Amps):	5
Enter delay time (seconds):	10
Enter rise time (seconds):	0
Enter fall time (seconds):	0
Enter pulse width (seconds):	10
Enter period (seconds):	20

Add parameters for pulse source v3

Enter initial value(Volts/Amps):	0
Enter pulsed value(Volts/Amps):	5
Enter delay time (seconds):	20
Enter rise time (seconds):	0
Enter fall time (seconds):	0
Enter pulse width (seconds):	20
Enter period (seconds):	40

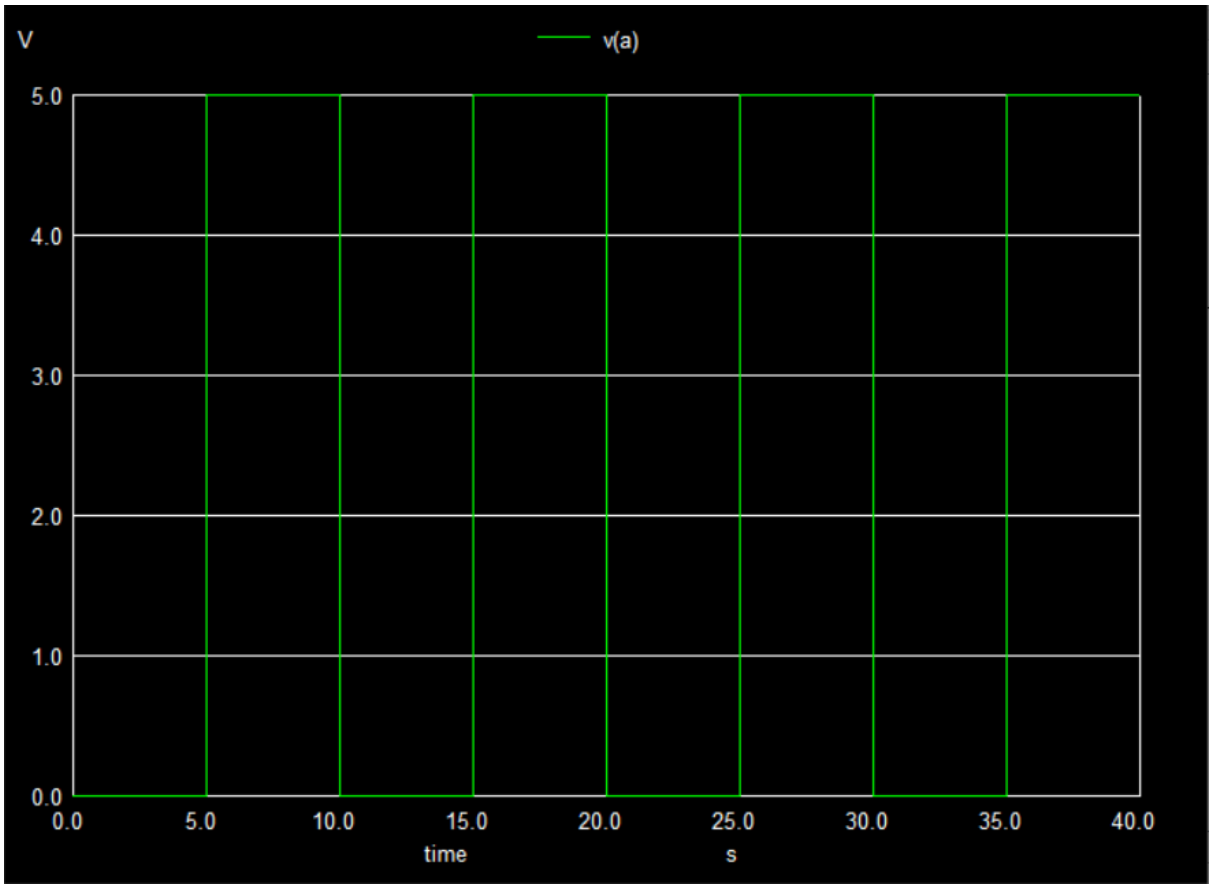
Analysis:


Analysis
Source Details
Ngspice Model
Device Modeling
Subcircuits
Select Analysis Type
AC
DC
TRANSIENT
Transient Analysis
Start Time
0
Sec
Step Time
10
ms
Stop Time
40
Sec

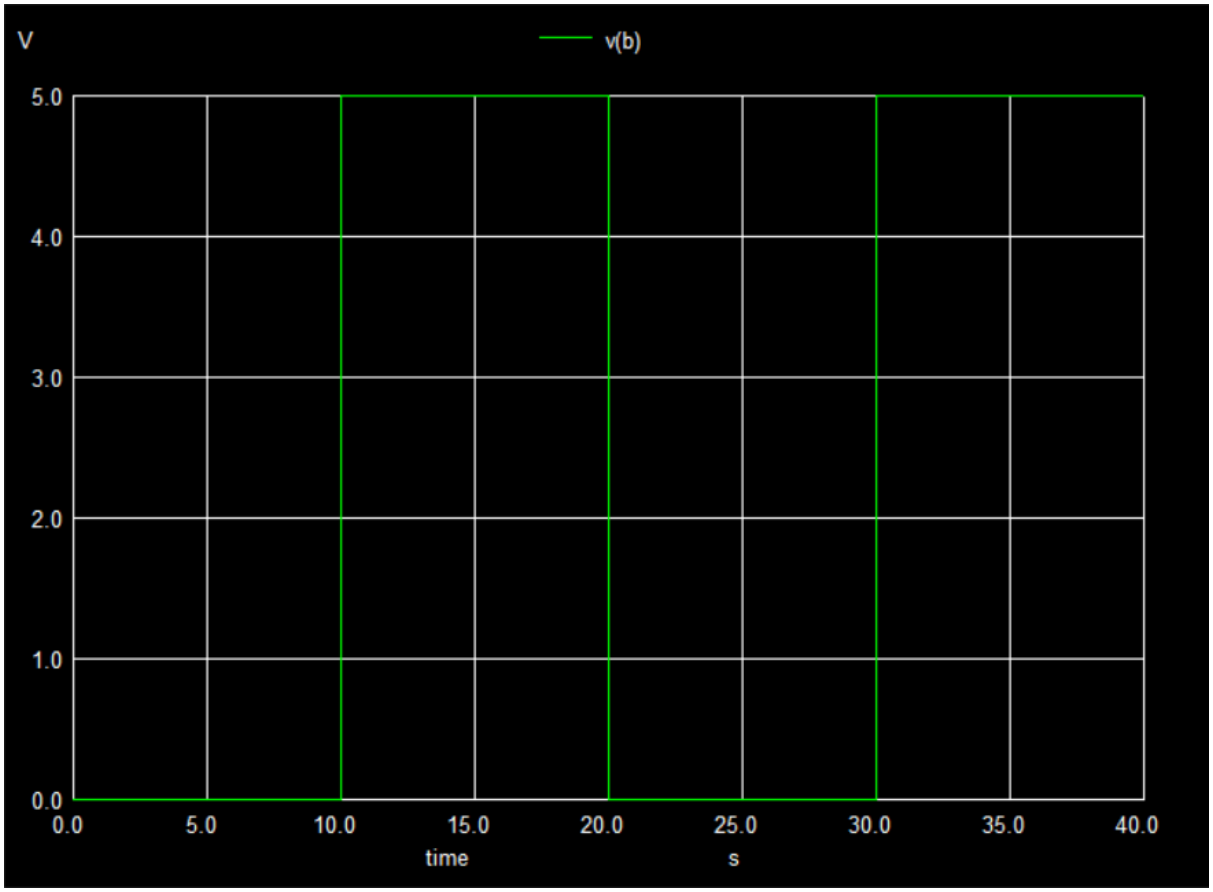
Results:

Ngspice plot-Input Waveforms:

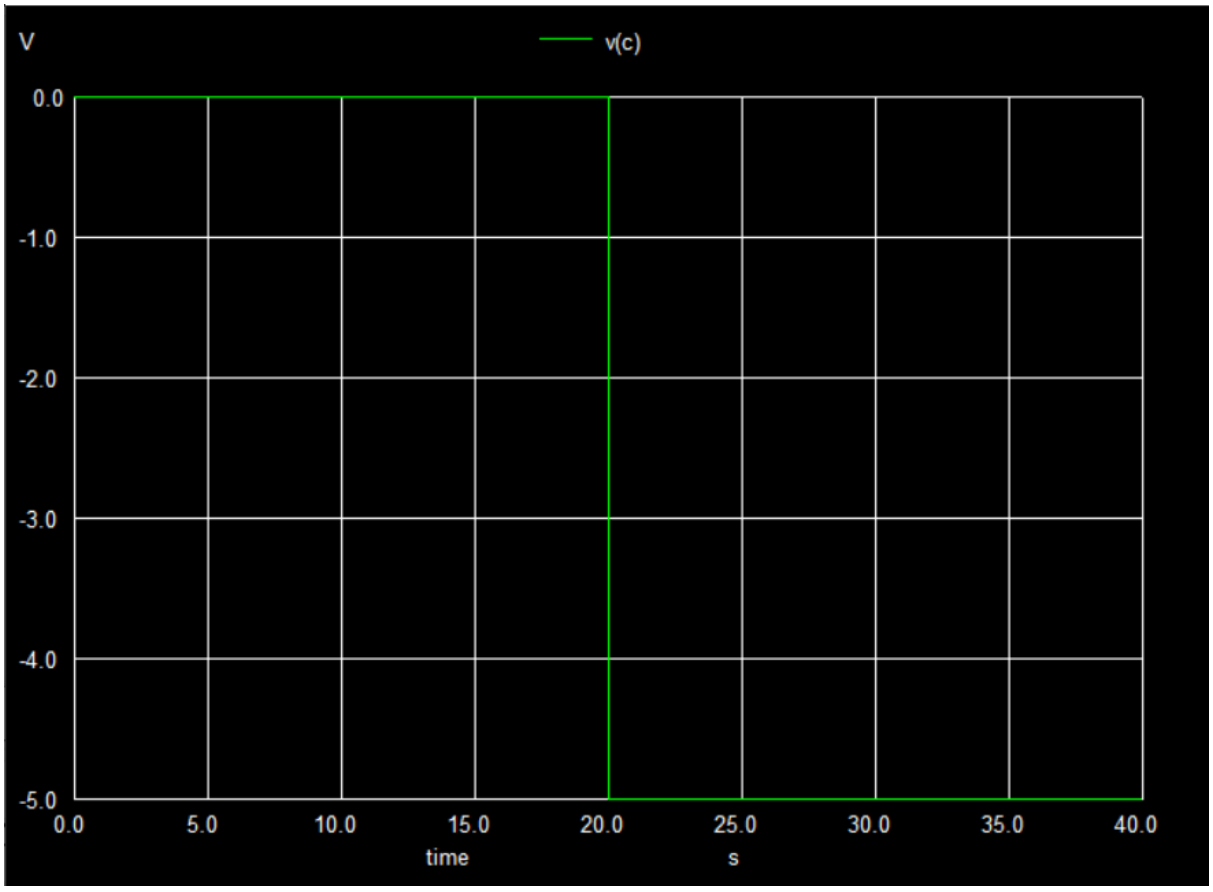
A:



B:

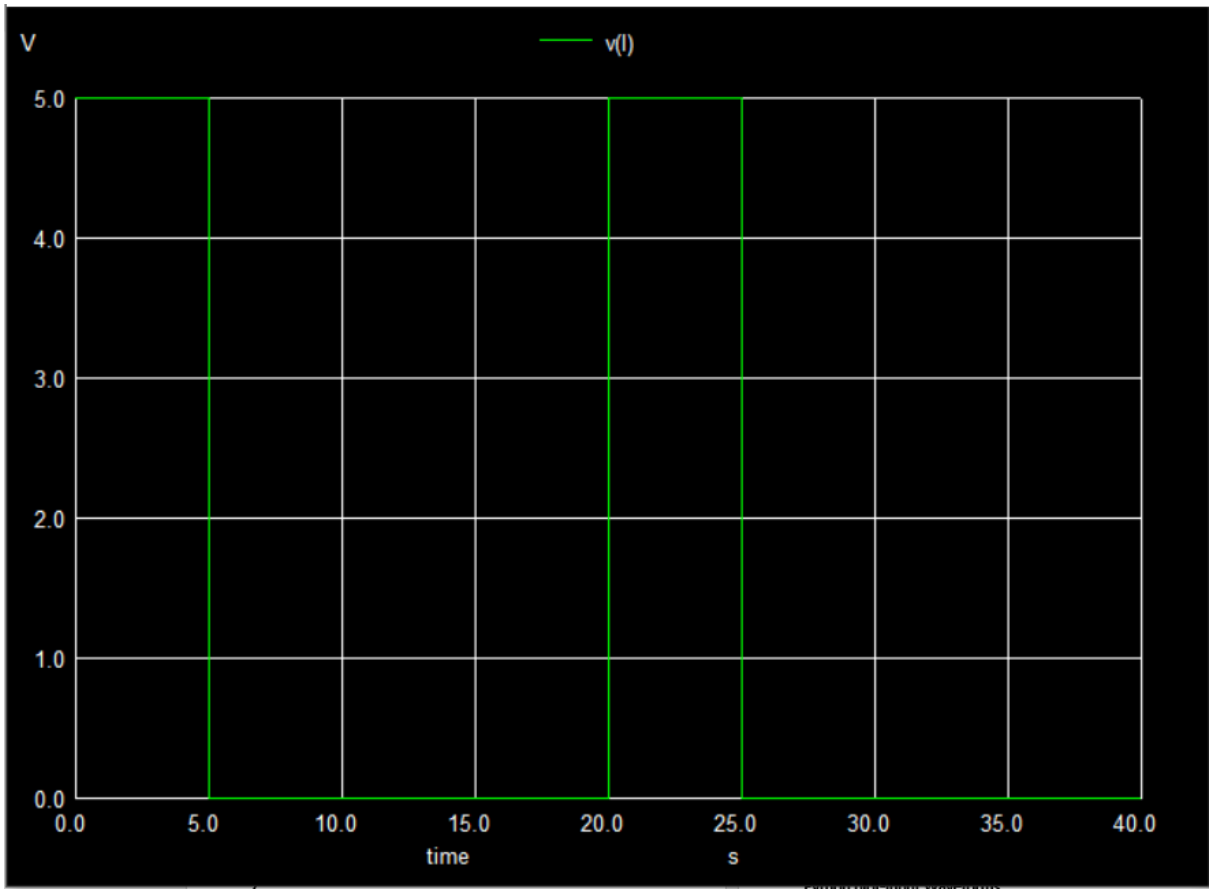

V
v(b)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
time
s

C:

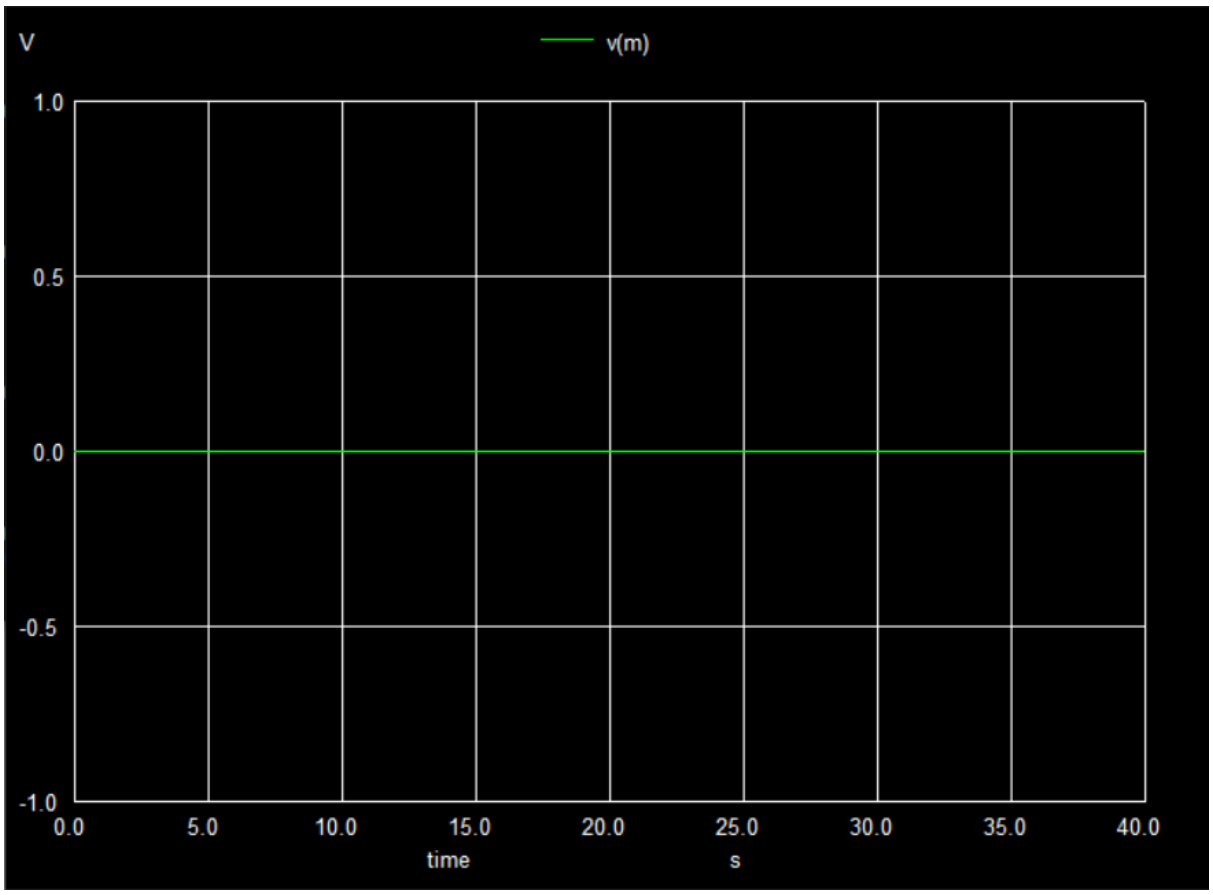

V
v(c)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
time
s

Ngspice plot-Output Waveforms:

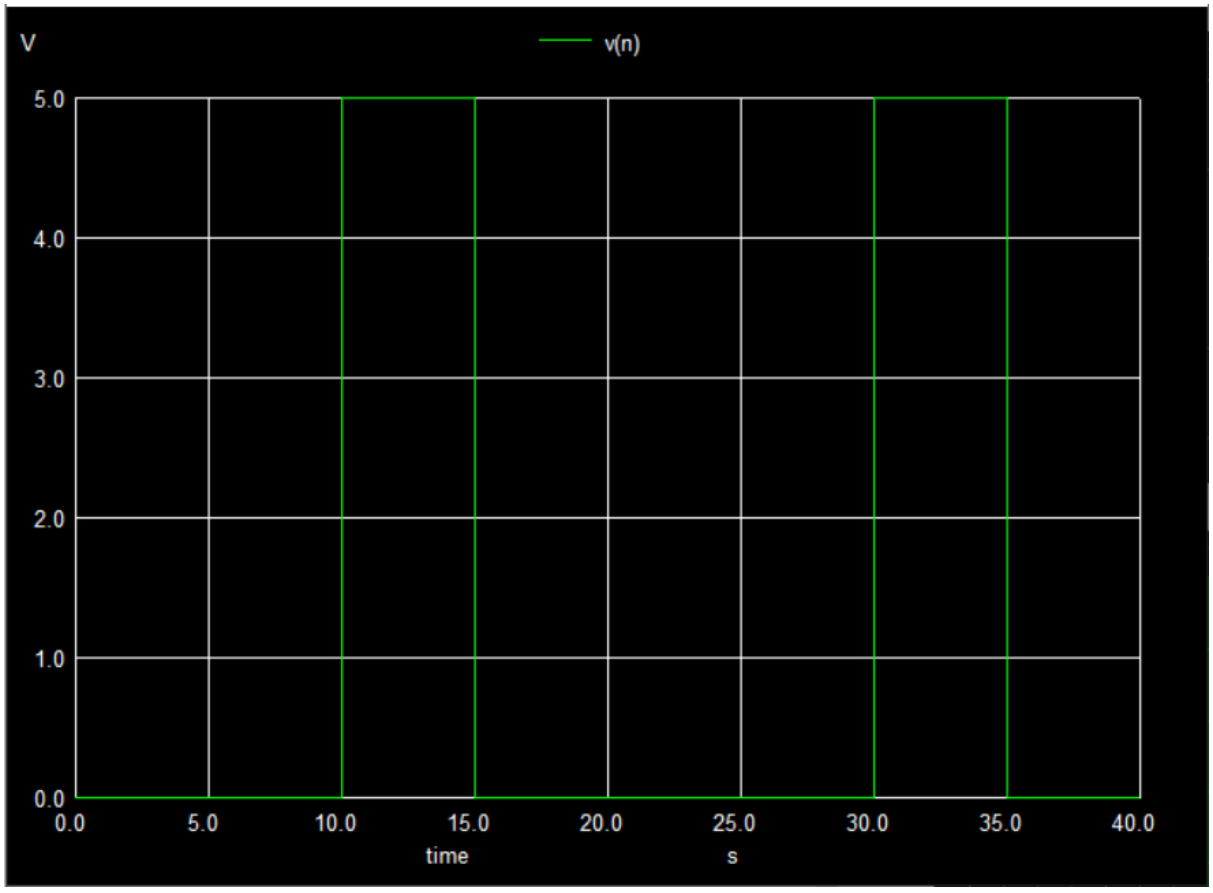
L:



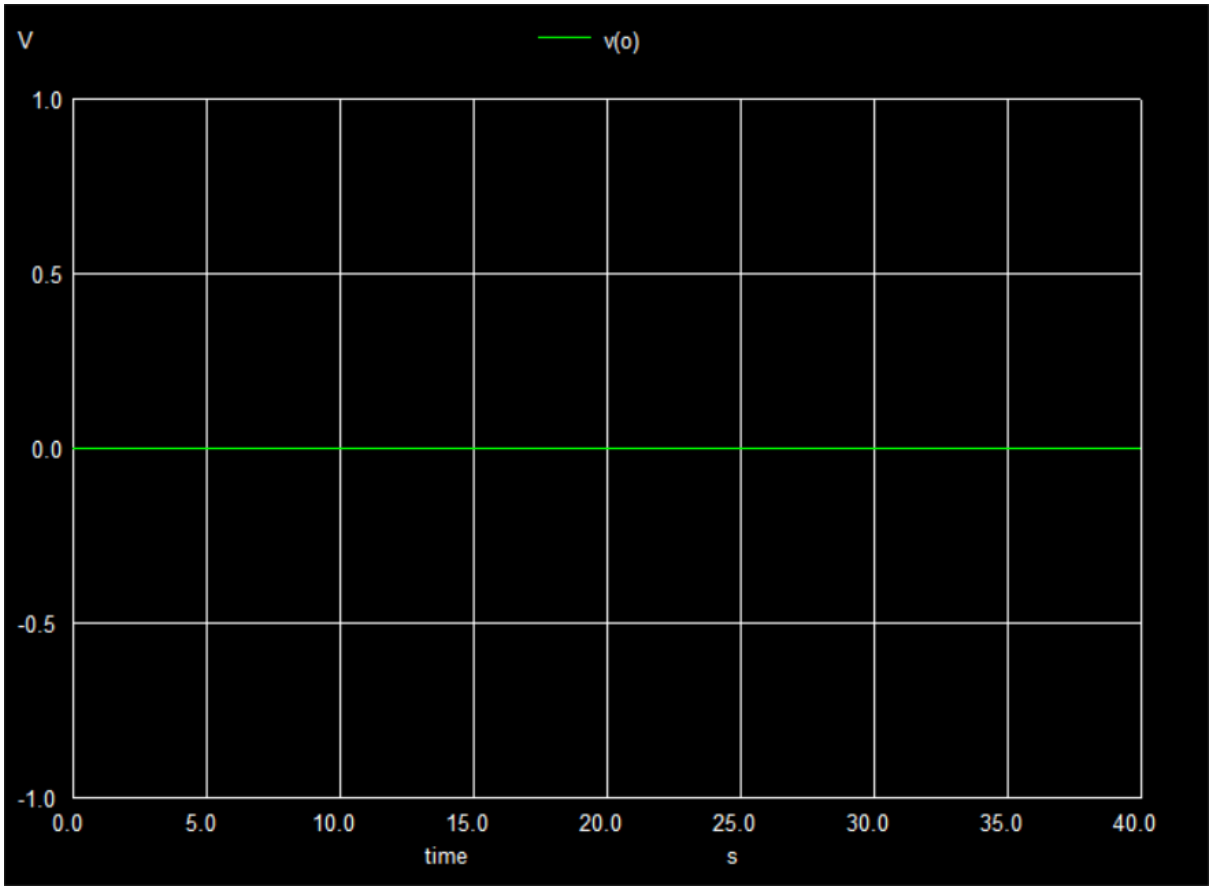
M:


V
v(m)
1.0
0.5
0.0
-0.5
-1.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
time
s

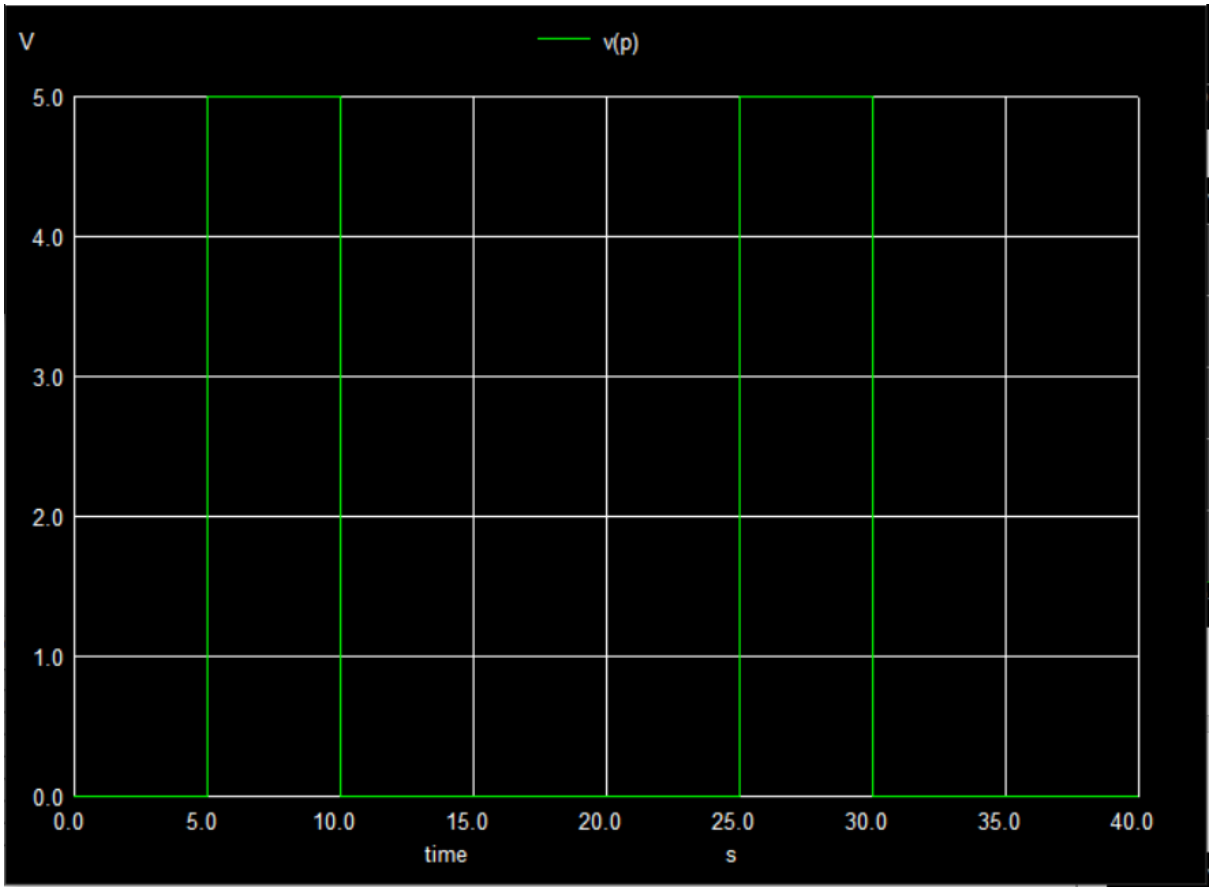
N:


V
v(n)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
time
s

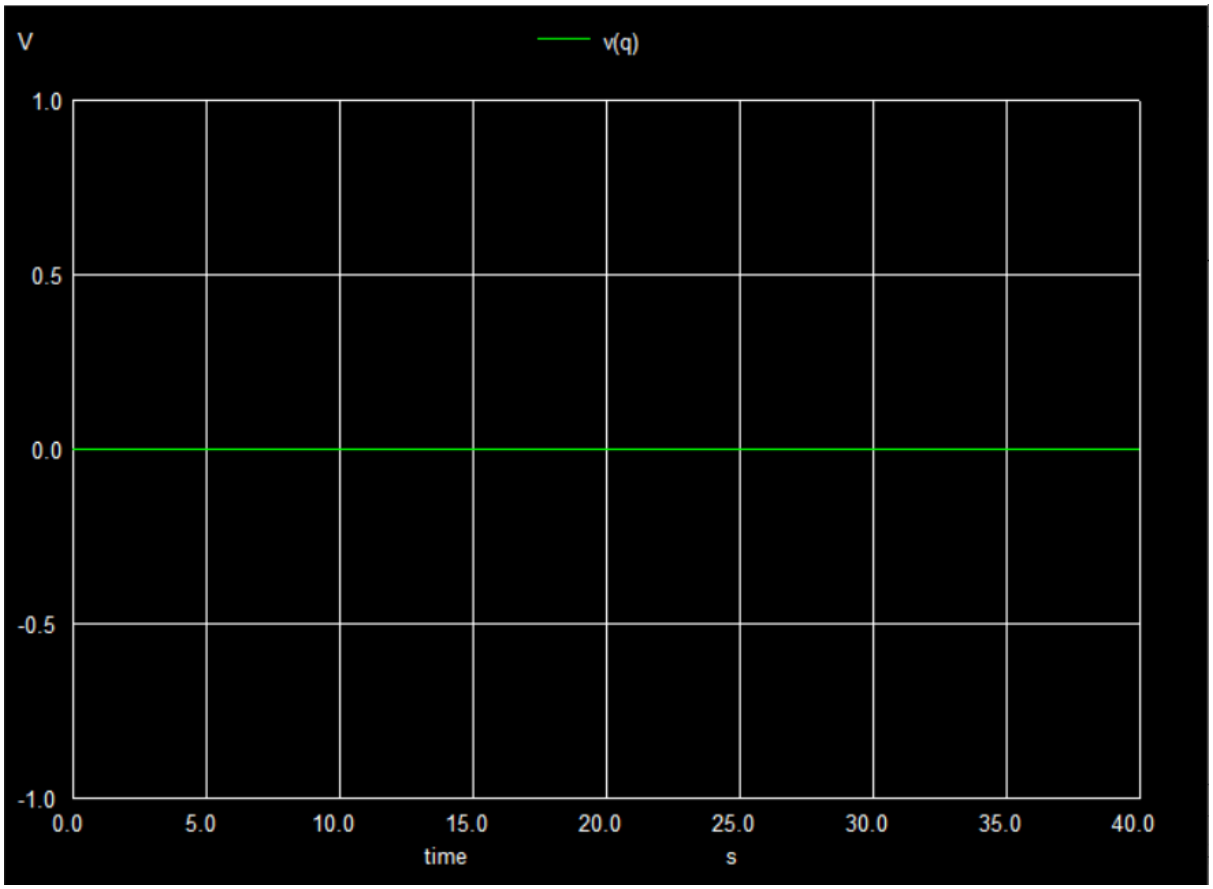
O:


V
v(o)
1.0
0.5
0.0
-0.5
-1.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
time
s

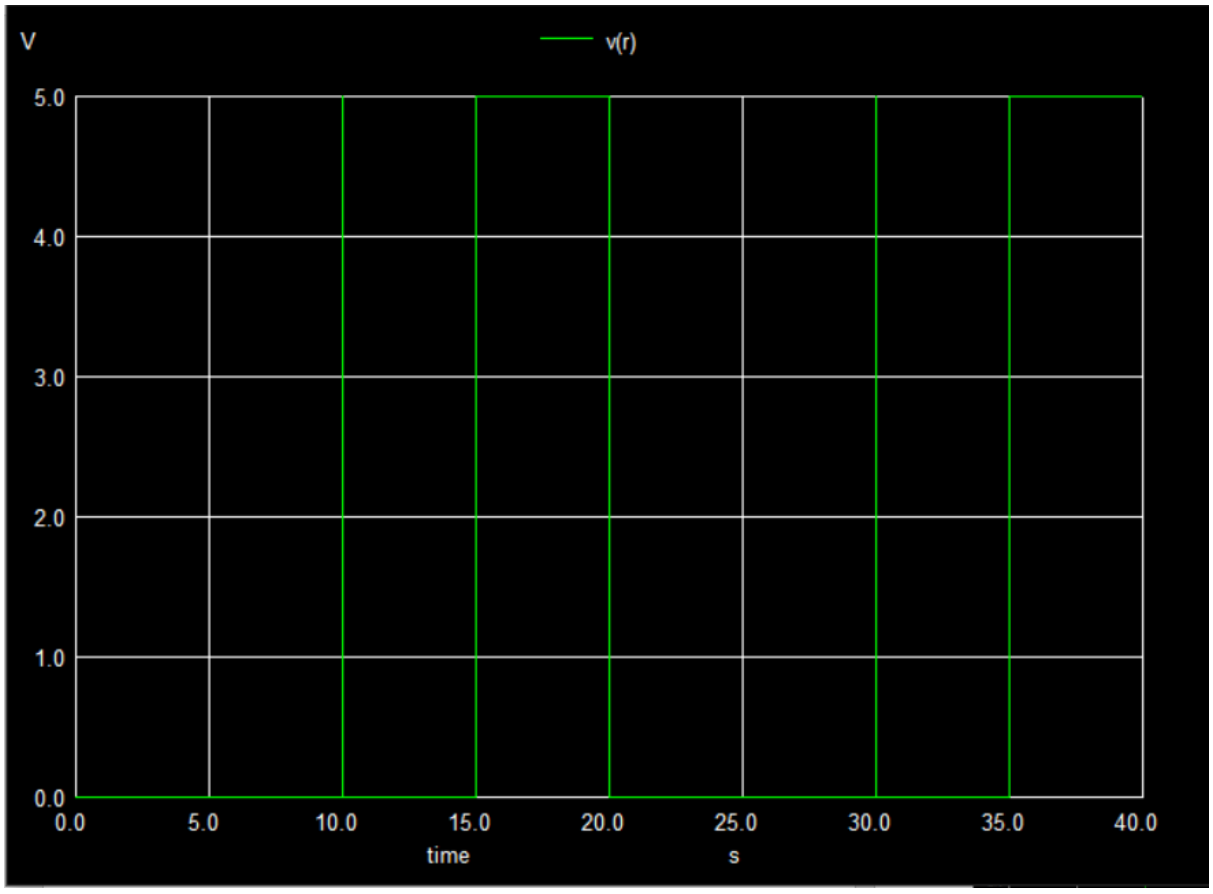
P:


V
v(p)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
time
s

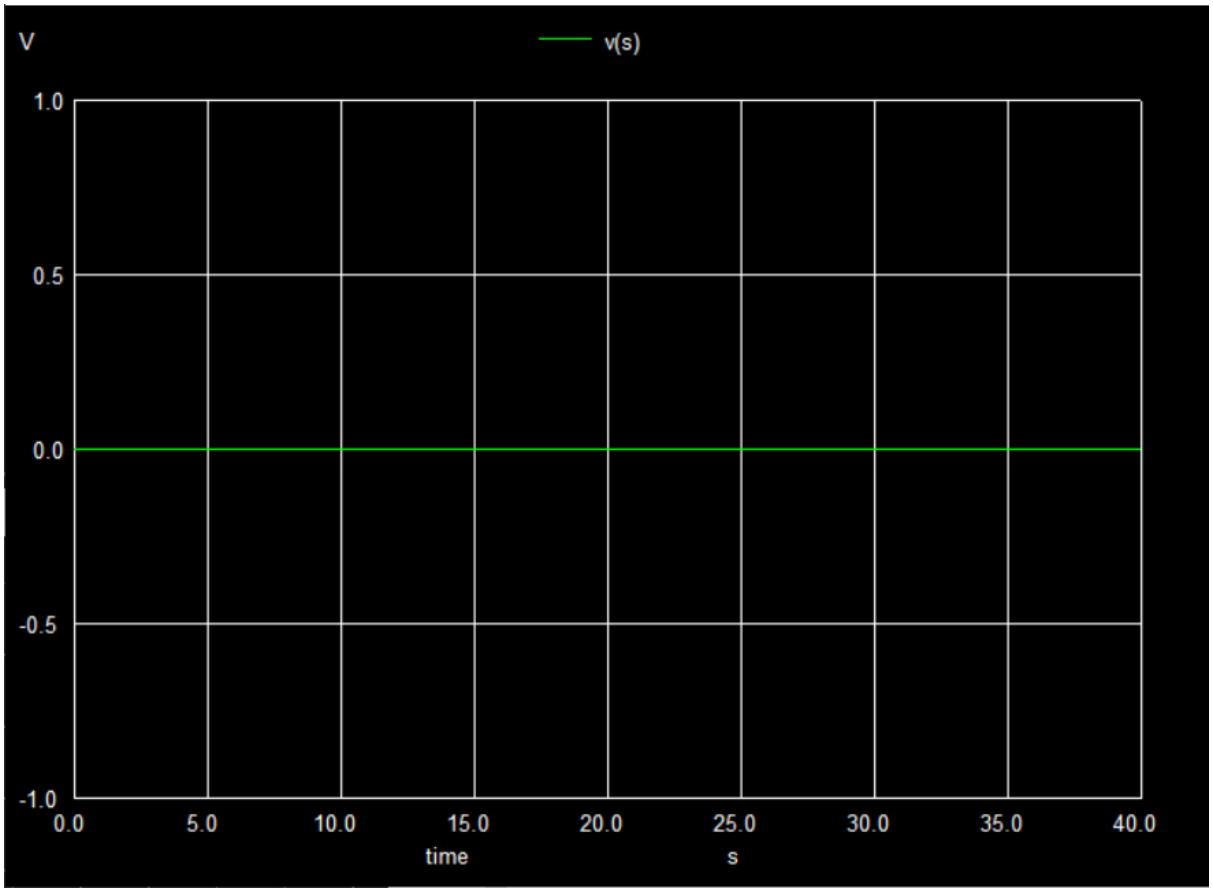
Q:


V
v(q)
1.0
0.5
0.0
-0.5
-1.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
time
s

R:

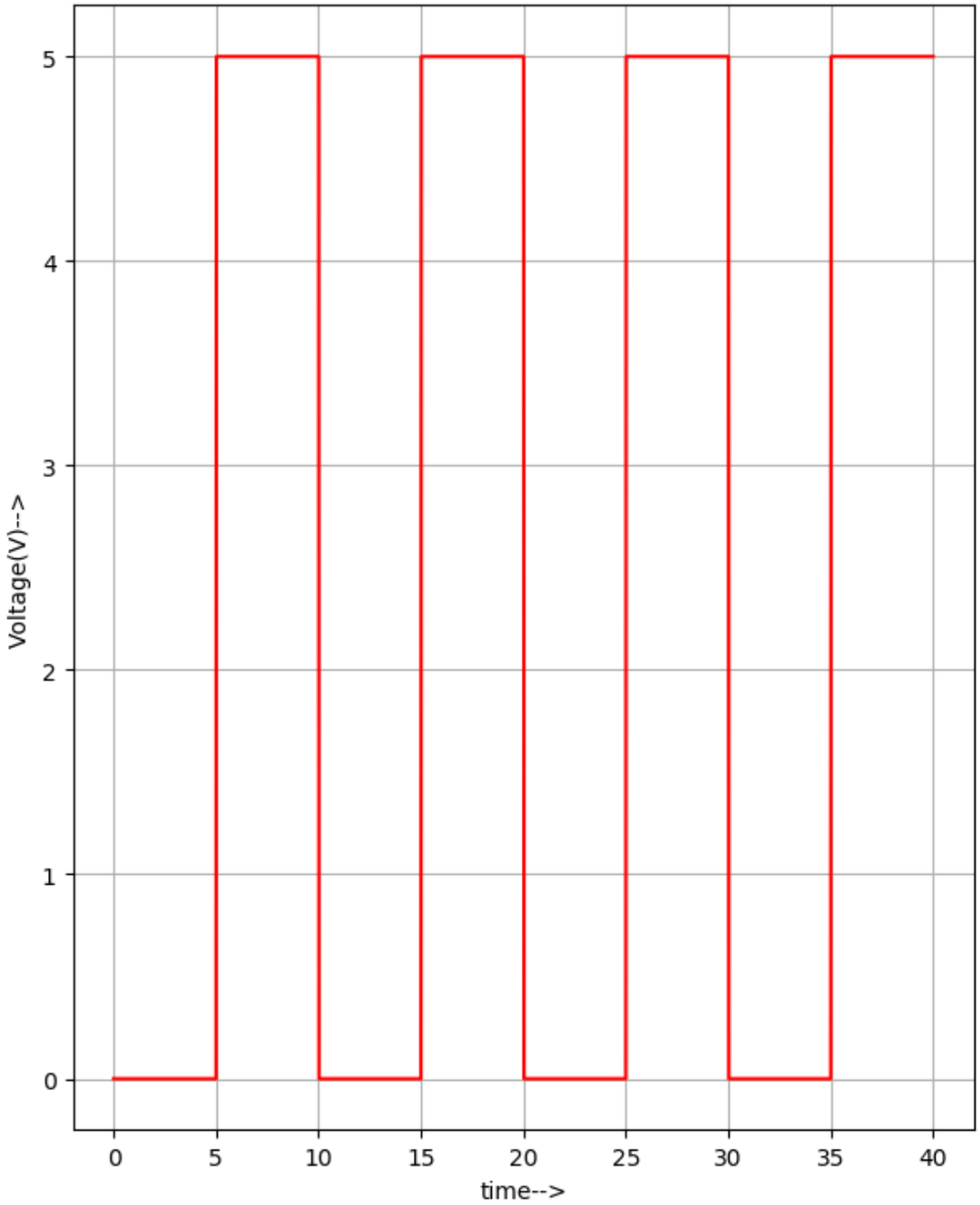

V
v(r)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
time
s

S:

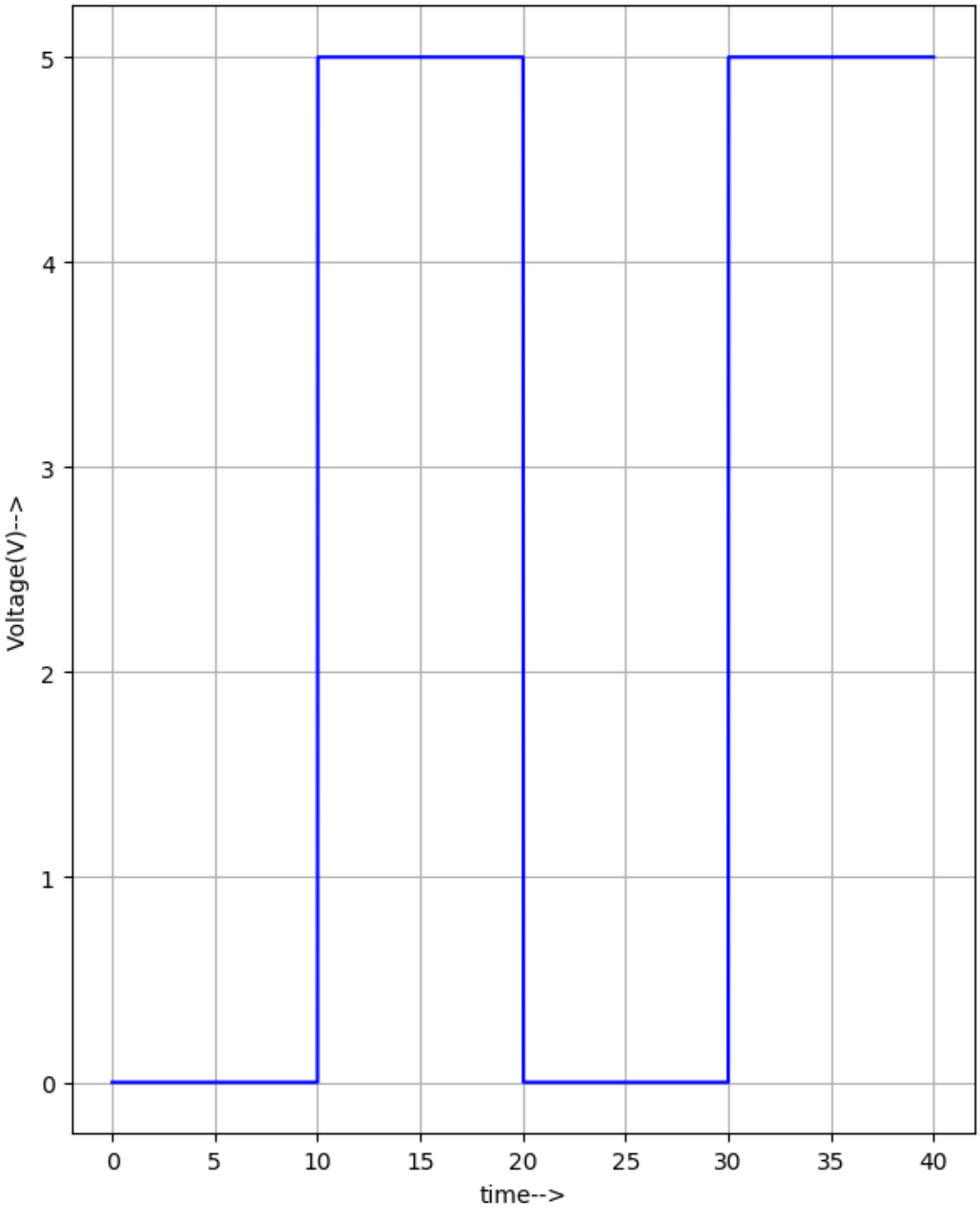


Python plot-Input Waveforms:

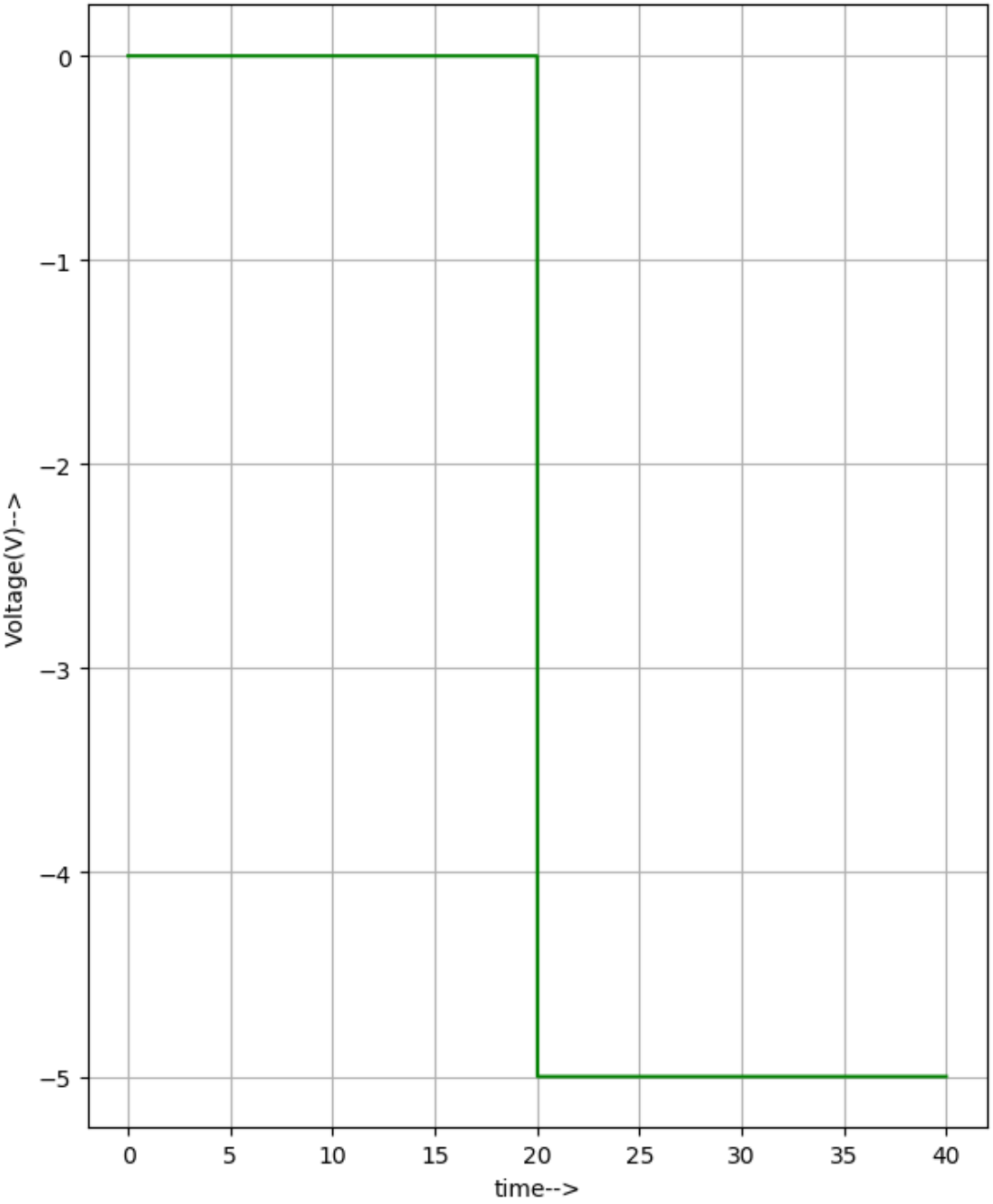
A:



B:

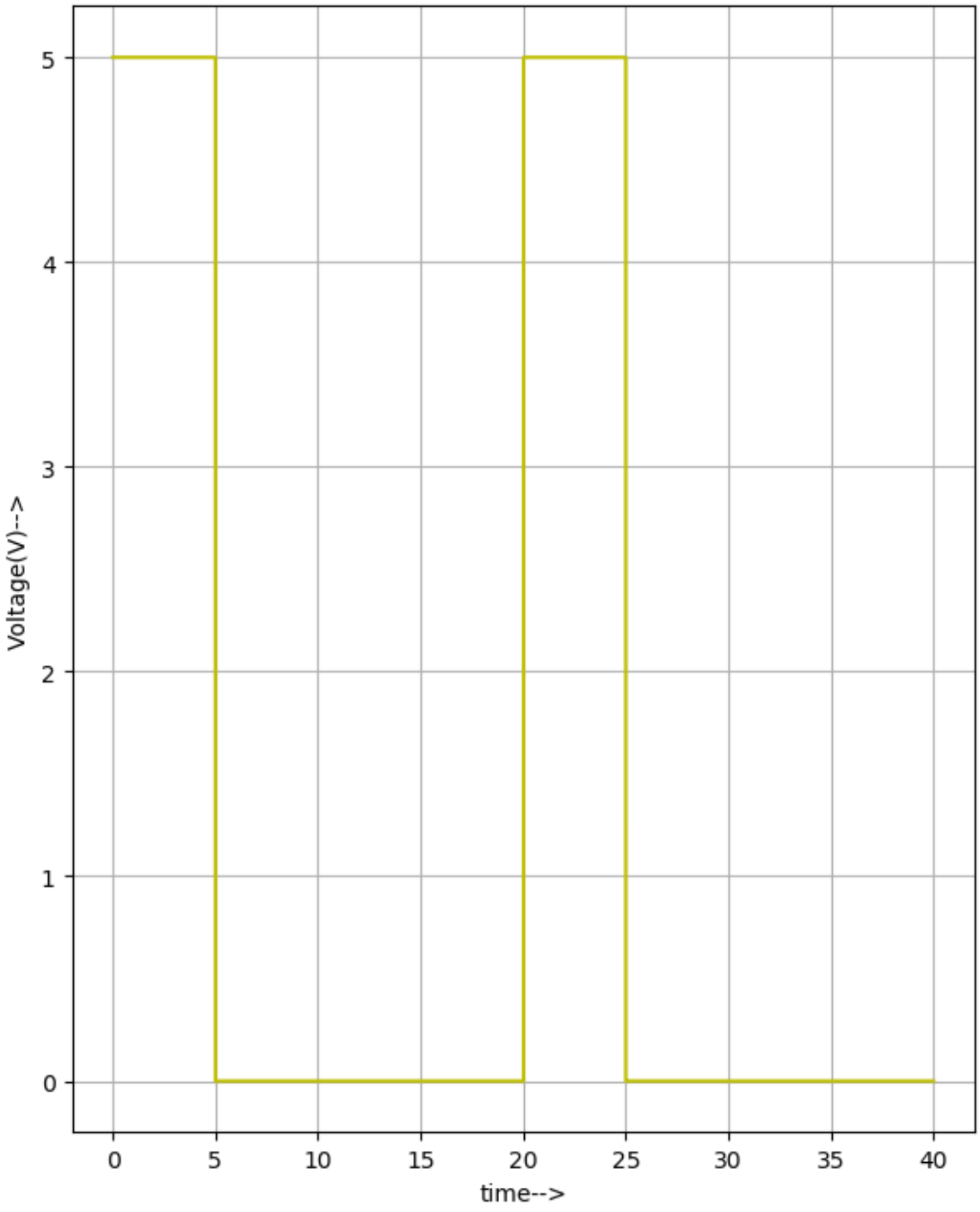


C:

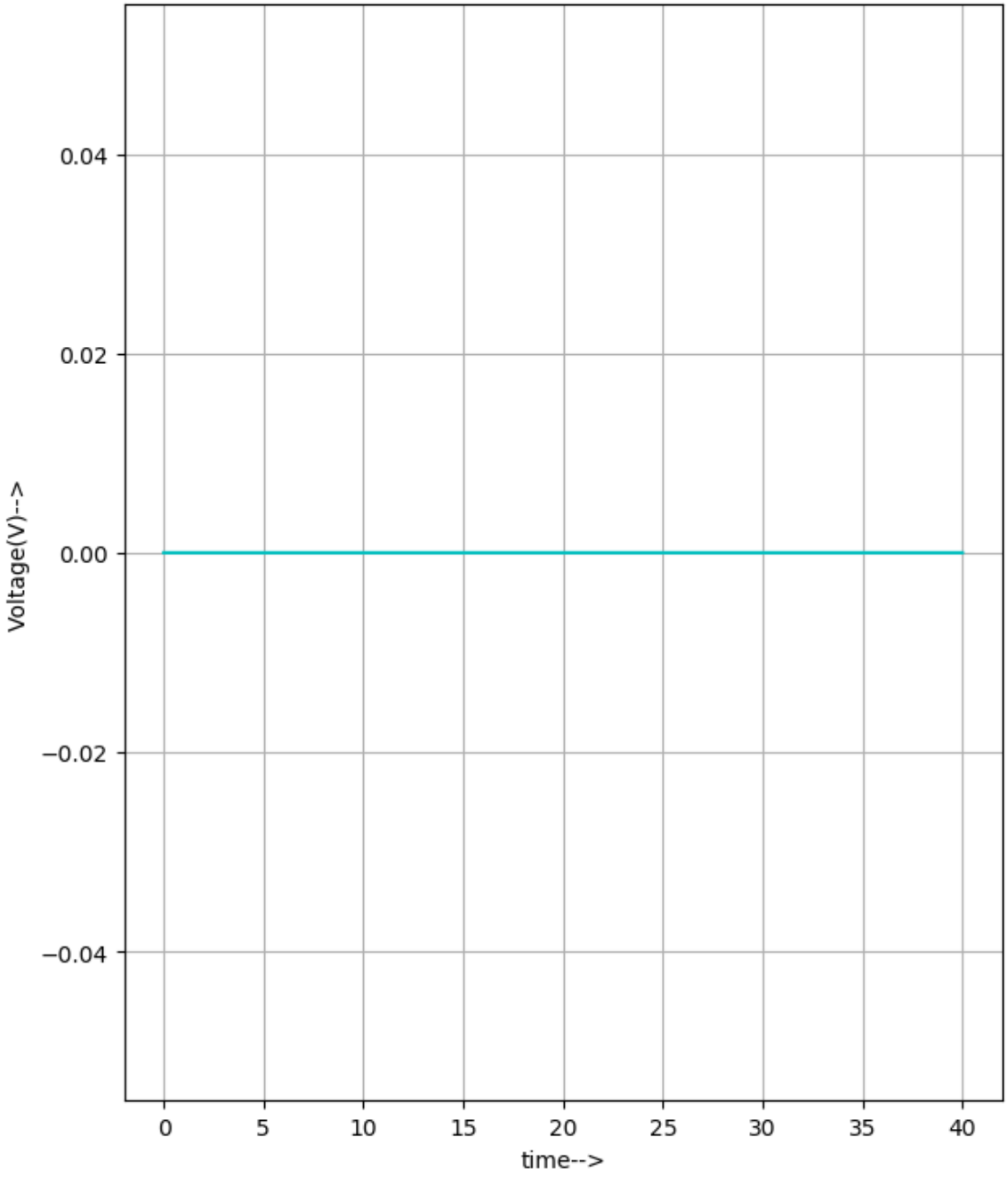


Python plot-Output Waveforms:

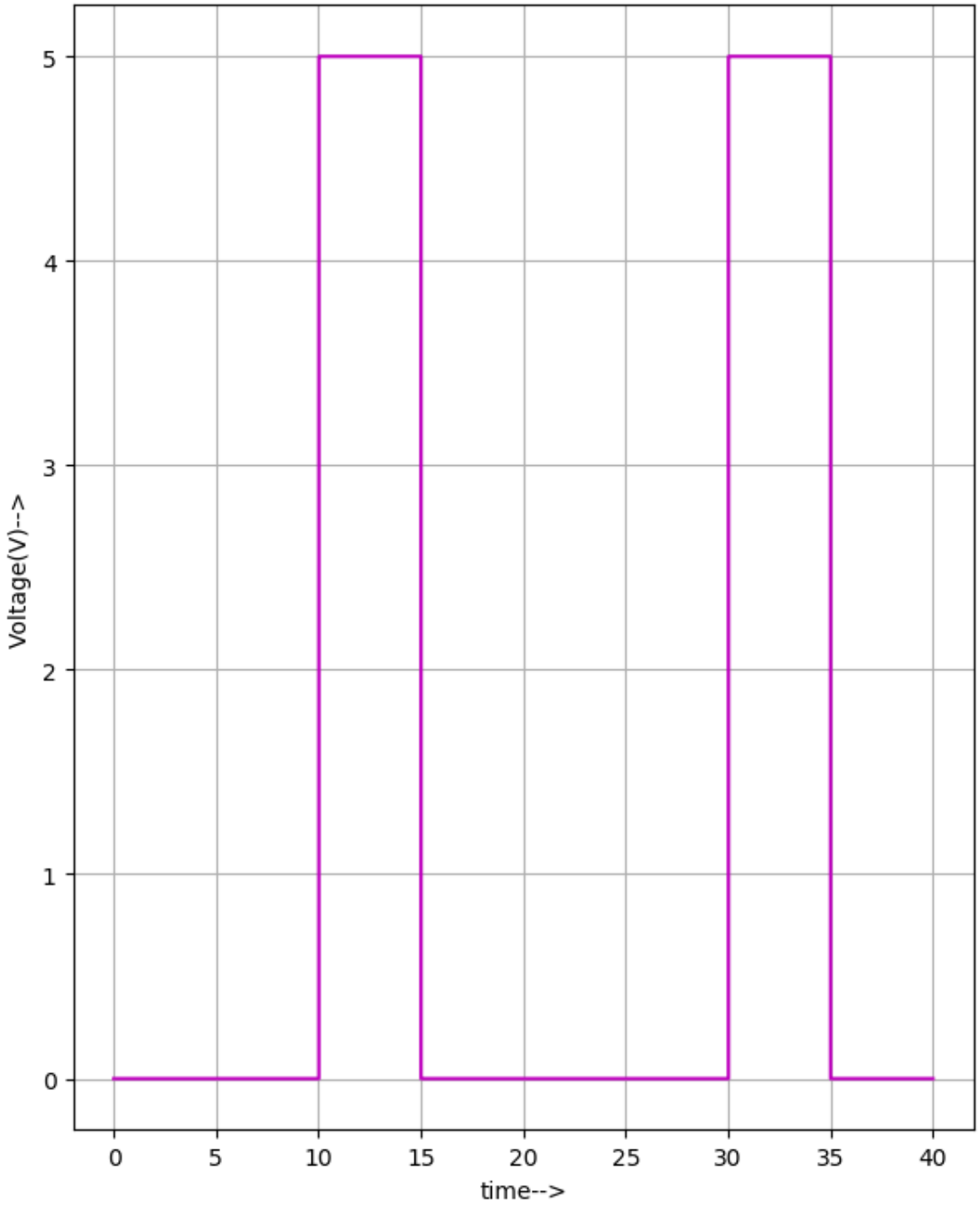
L:



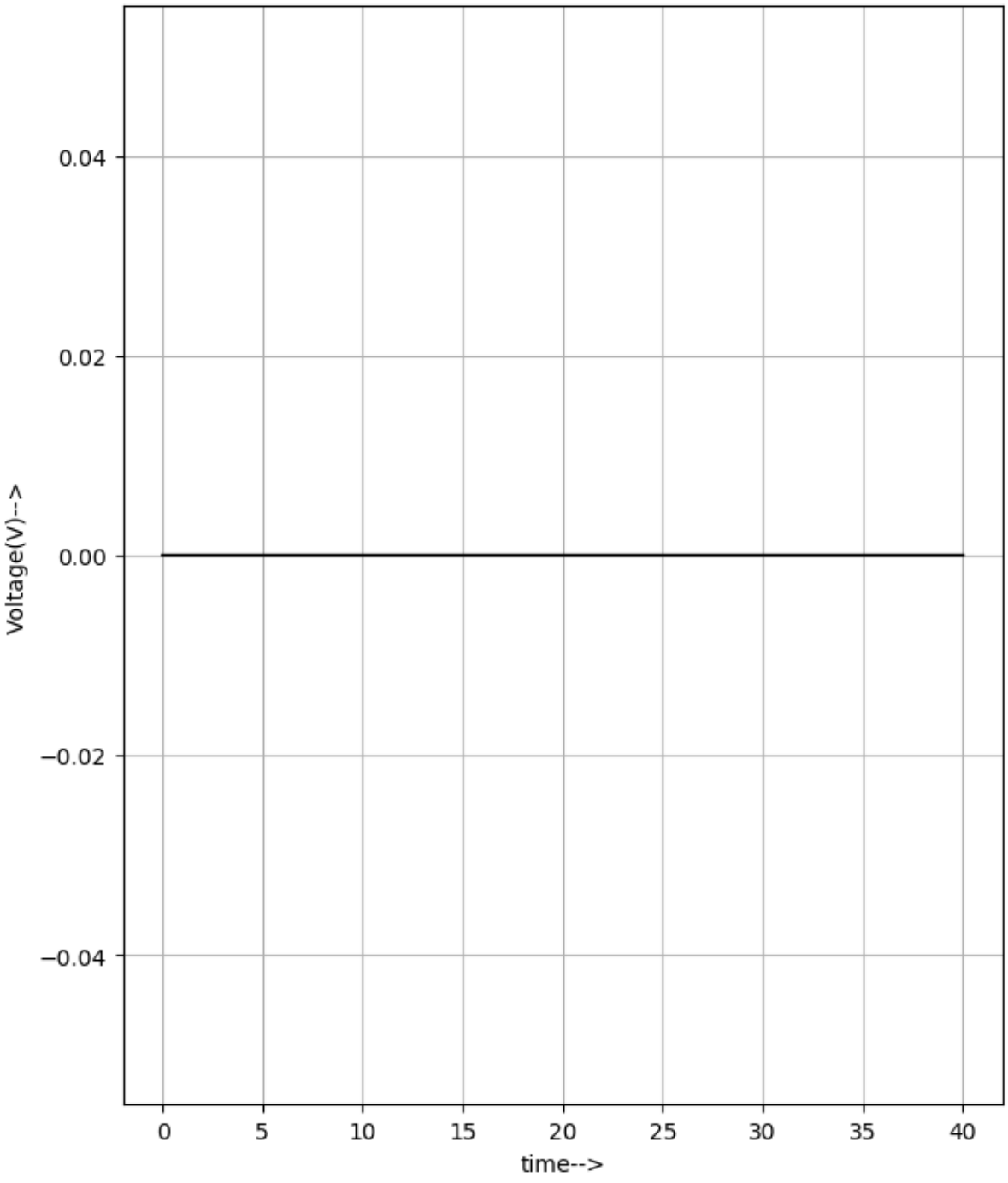
M:



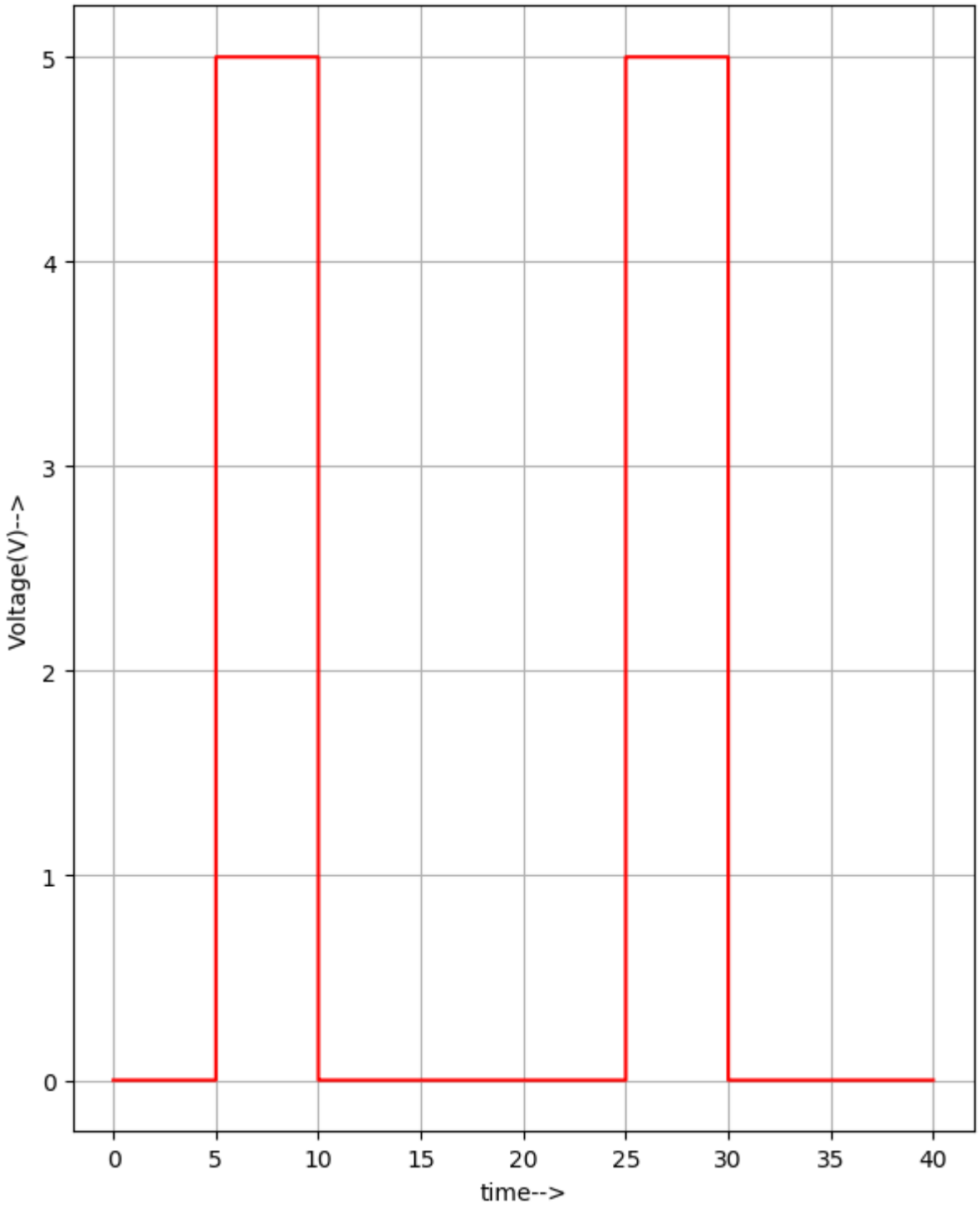
N:



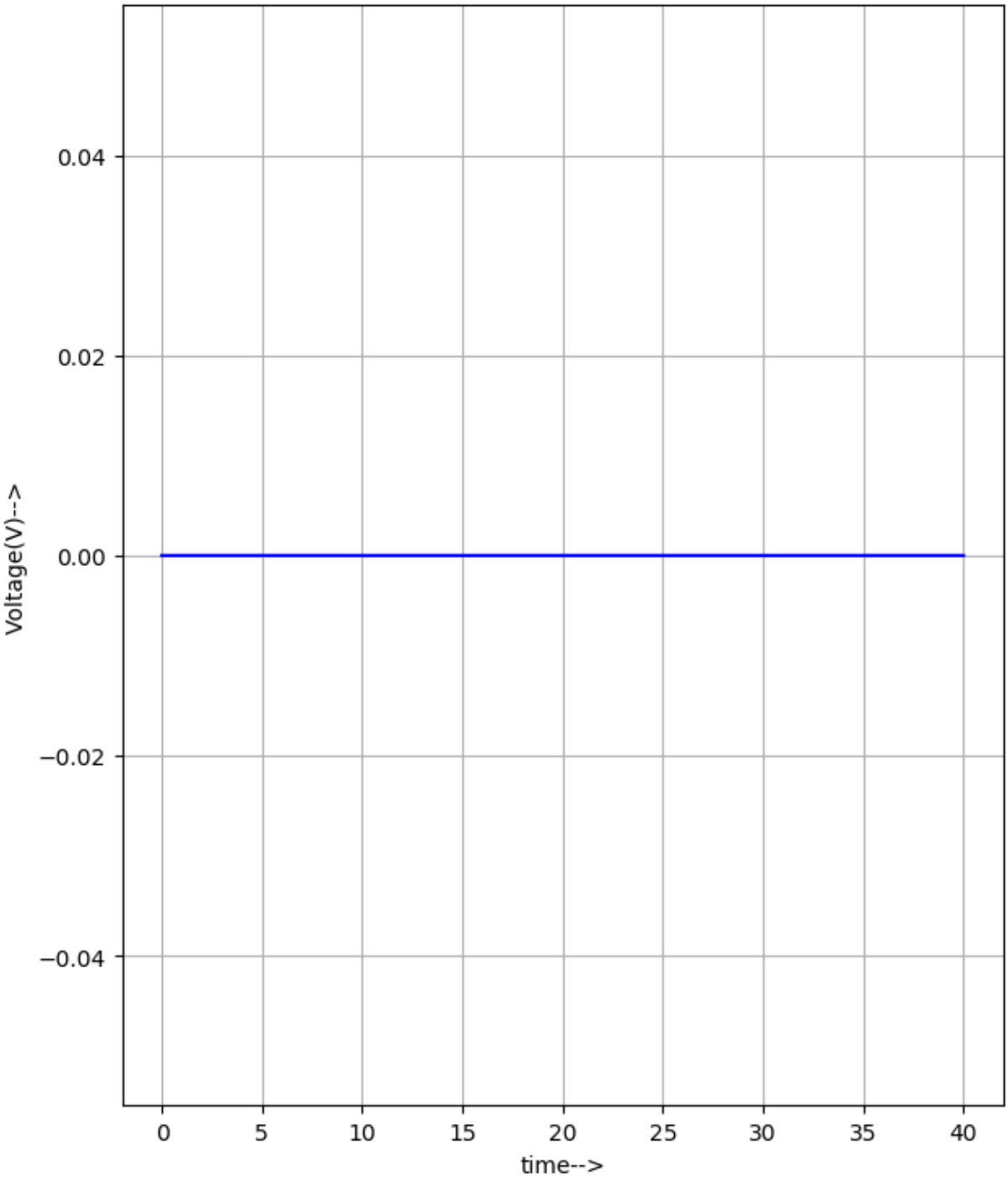
O:



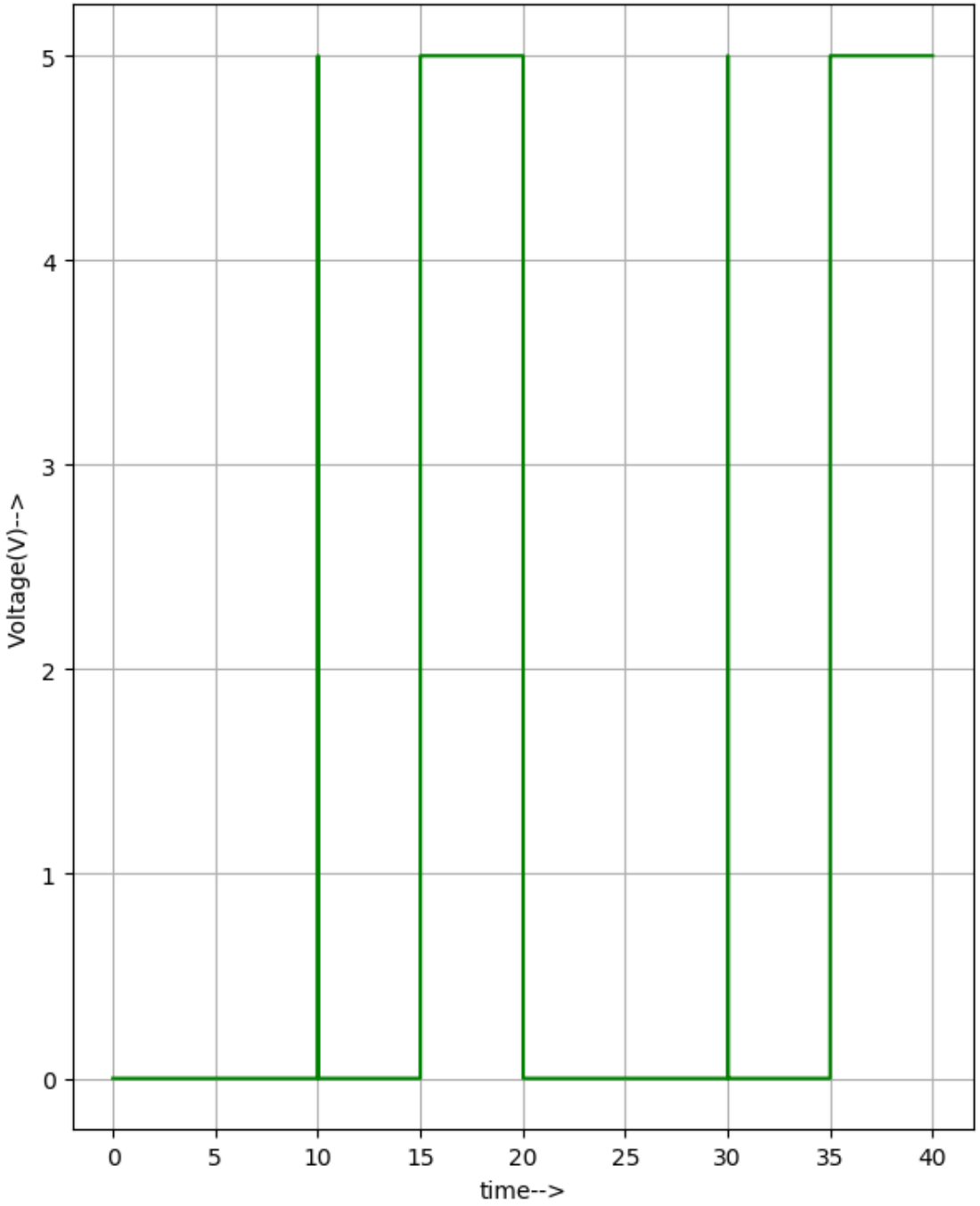
P:



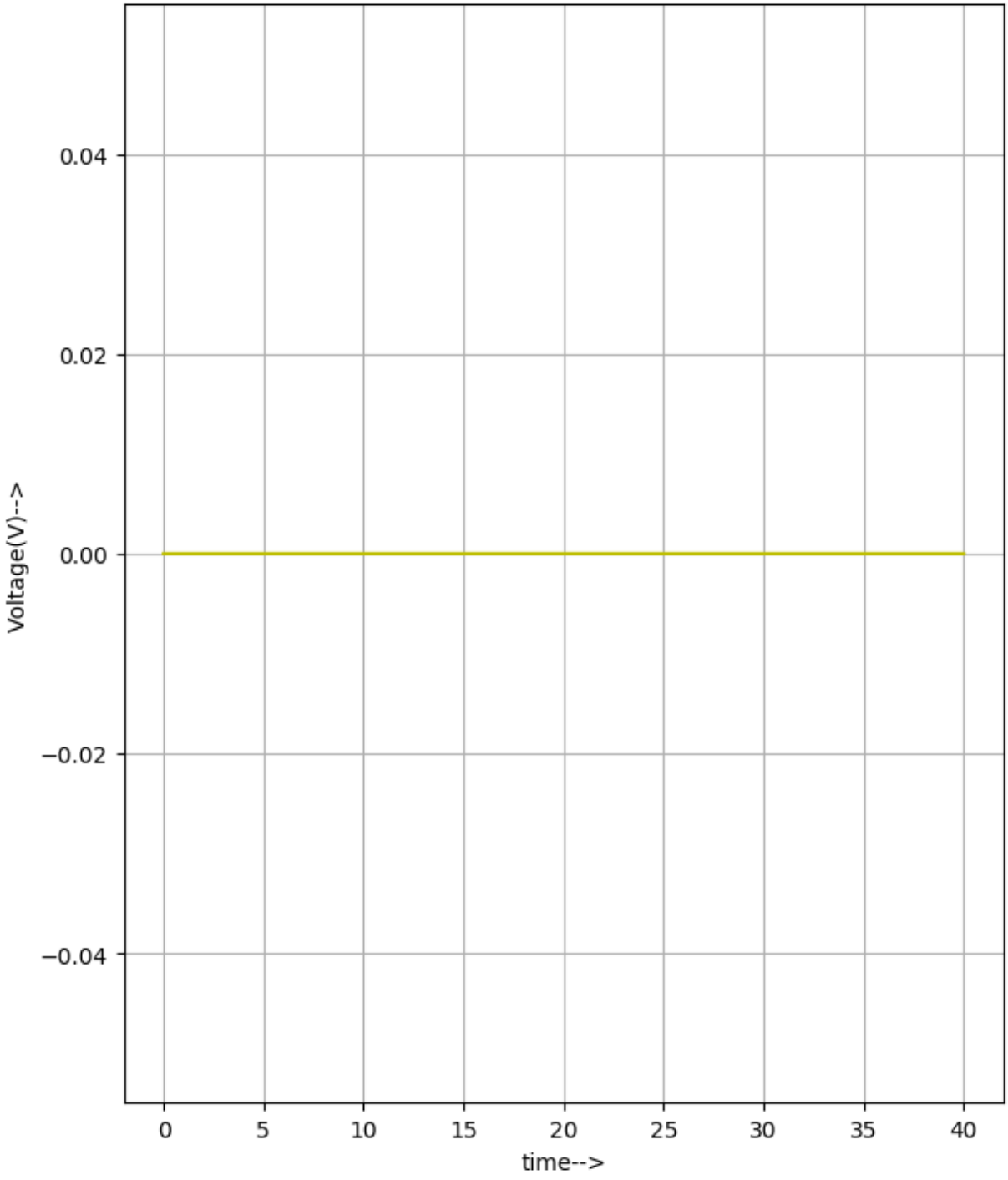
Q:



R:



S:



Source/Reference(s):

https://www.elprocus.com/designing-3-line-to-8-line-decoder-demultiplexer/