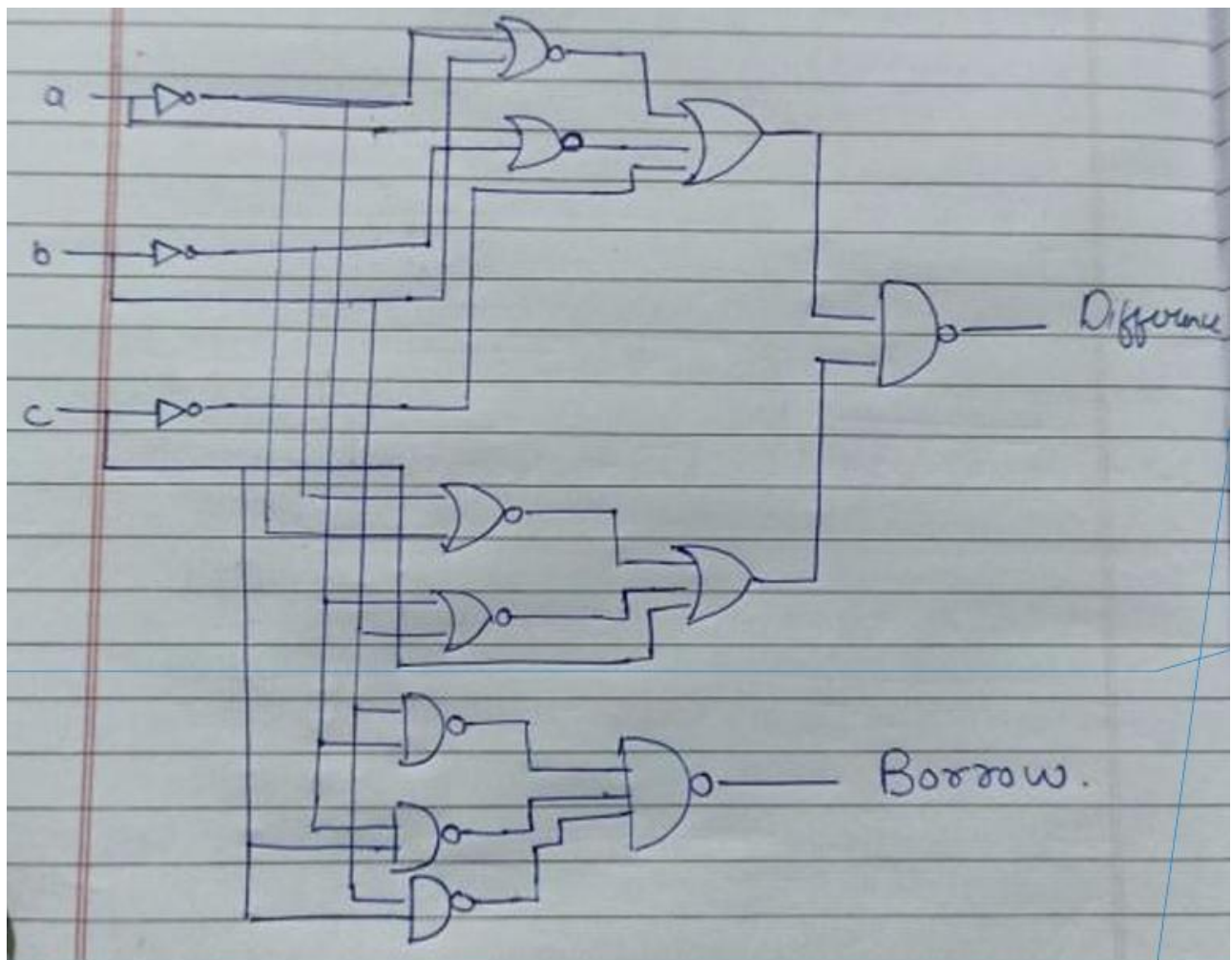


## Project title : Full subtractor using nand gate

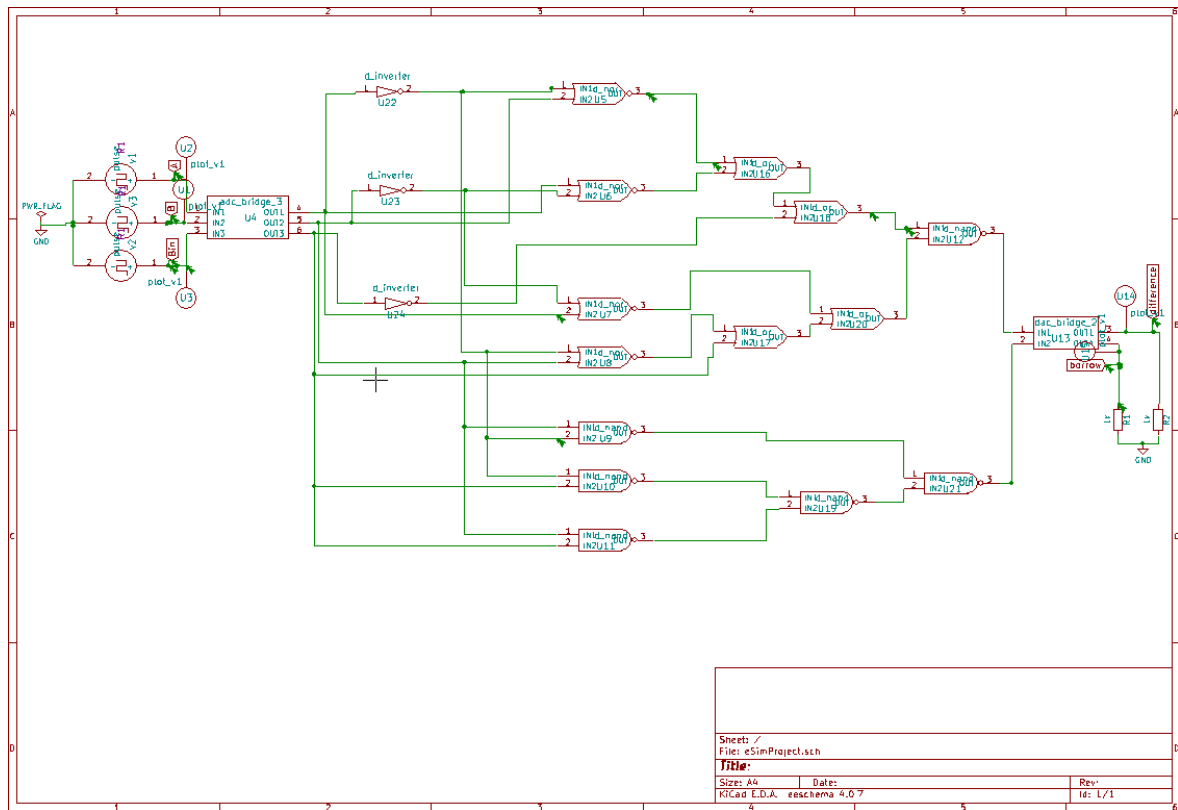
### Objective :

In order to learn how various logic gates can be combined to perform binary subtraction, the goal of this experiment is to design, implement, and verify the operation of a Full Subtractor circuit using a combination of 6 NAND gates, 4 OR gates, 4 NOR gates, and 3 NOT gates. To show how different logic gate combinations can be used to implement arithmetic operations in digital electronics, the primary goal is to design and validate a Full Subtractor circuit using six NAND, four OR, four NOR, and three NOT gates.

### Circuit diagram:



**Circuit schematic:**



Source details :

Analysis

Source Details

Ngspice Model

Device Modeling

Subcircuits

Select Analysis Type

☐ AC

☐ DC

☒ TRANSIENT

Transient Analysis

Start Time

0

sec

Step Time

20

ms

Stop Time

40

sec

Convert

Analysis

Source Details

Ngspice Model

Device Modeling

Subcircuits

Add parameters for pulse source v1

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):

50

Add parameters for pulse source v3

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

Convert

Add parameters for pulse source v2

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):

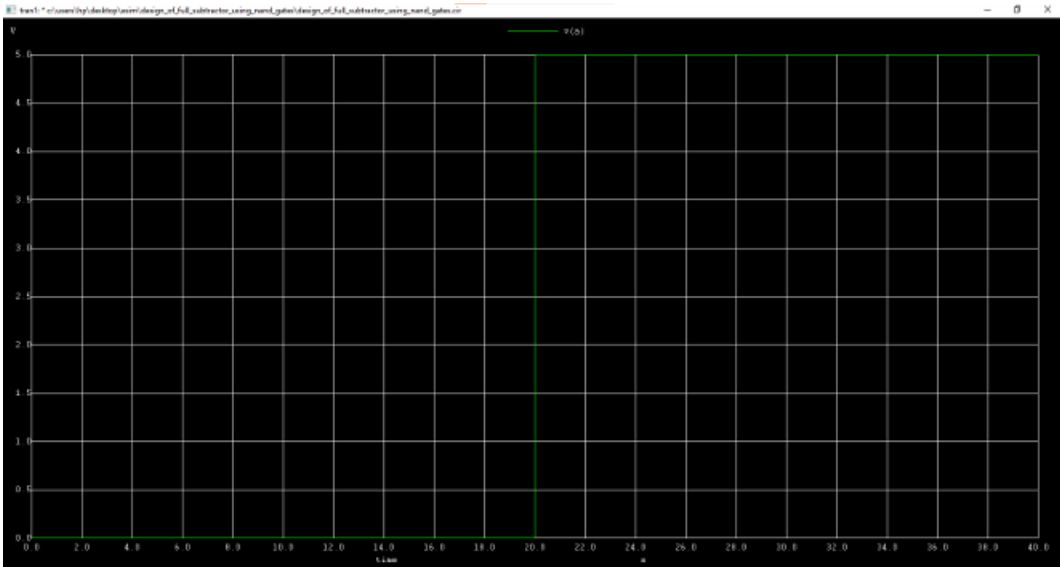
10

Convert

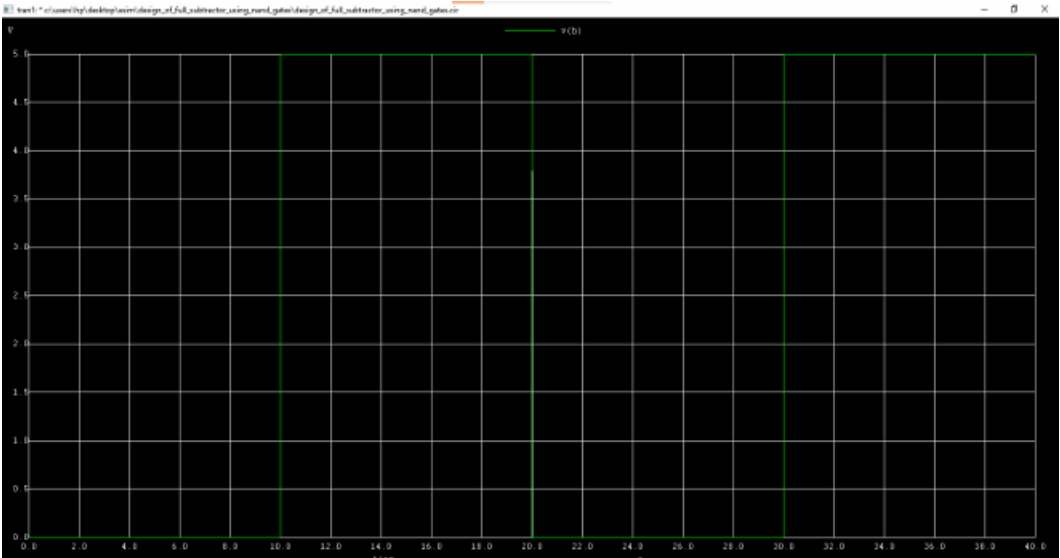
Simulation Result :

Input :

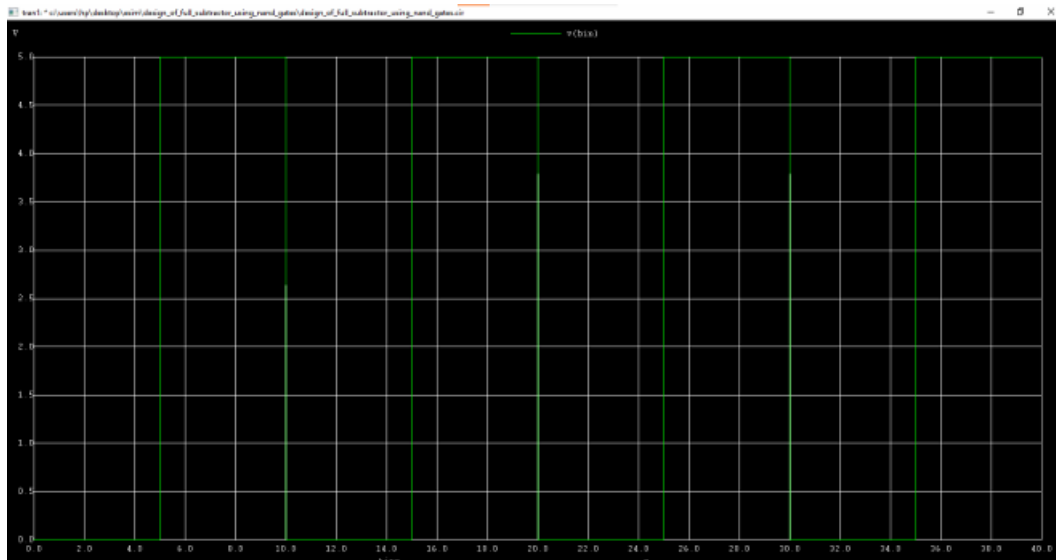
A



B

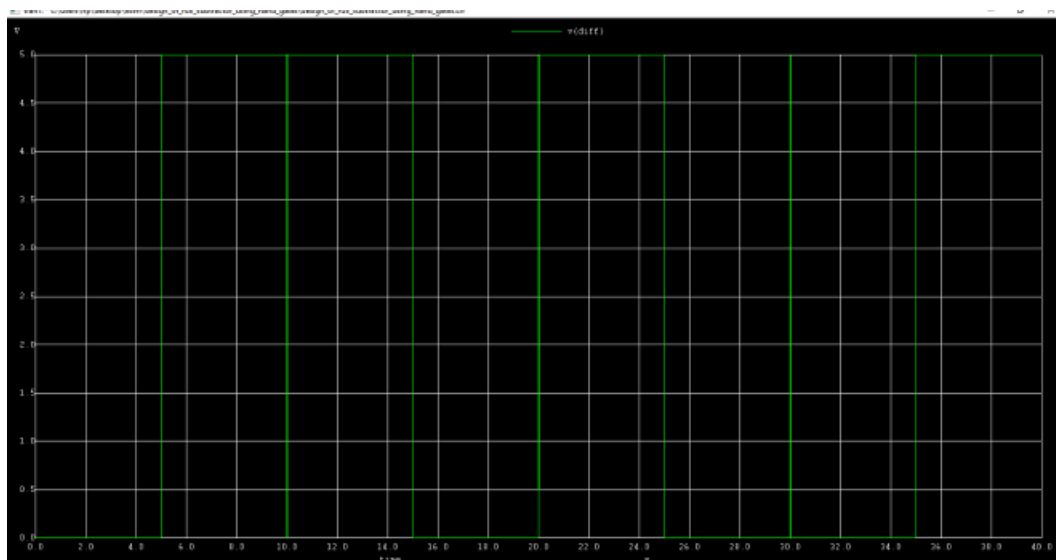


Bin

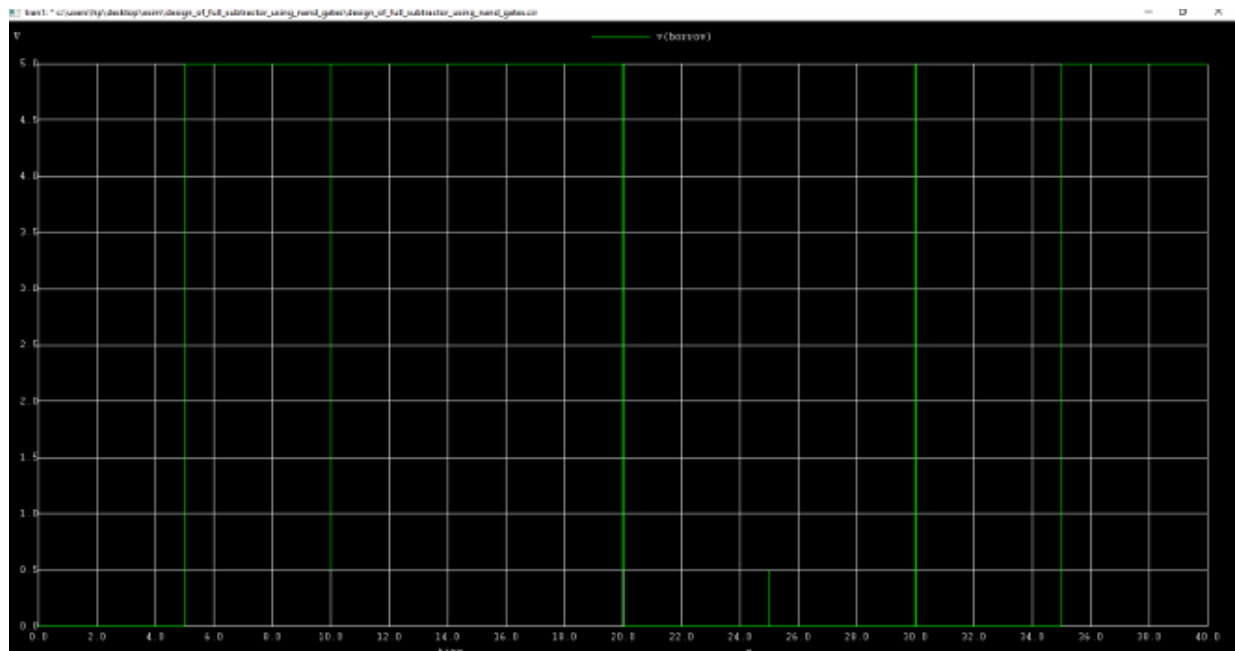


**Output :**

**Difference**



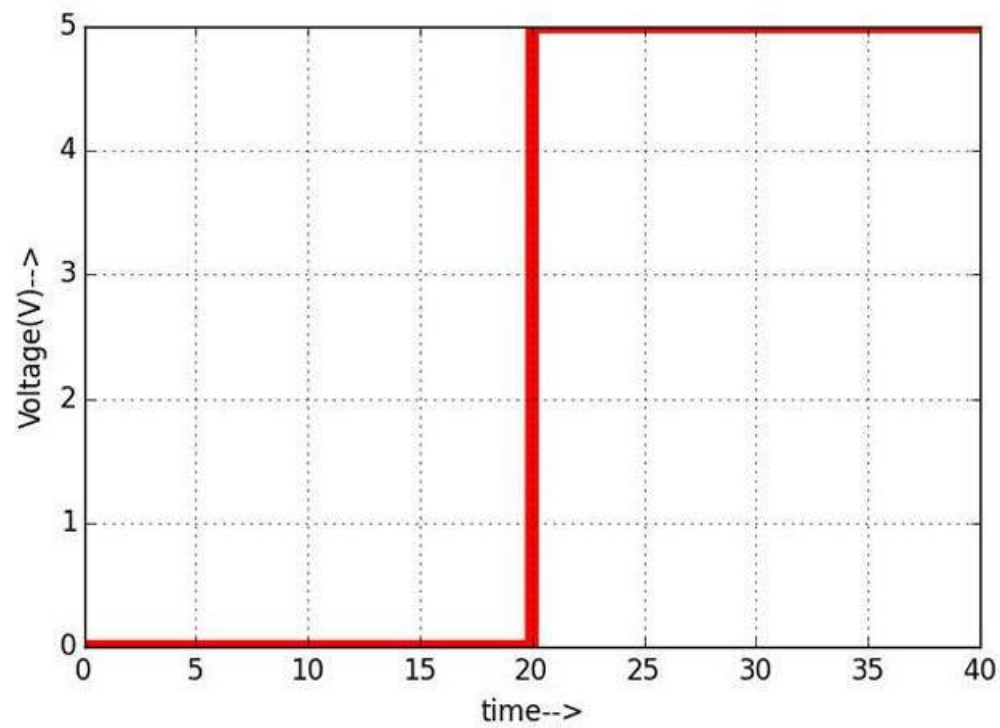
**Borrow**



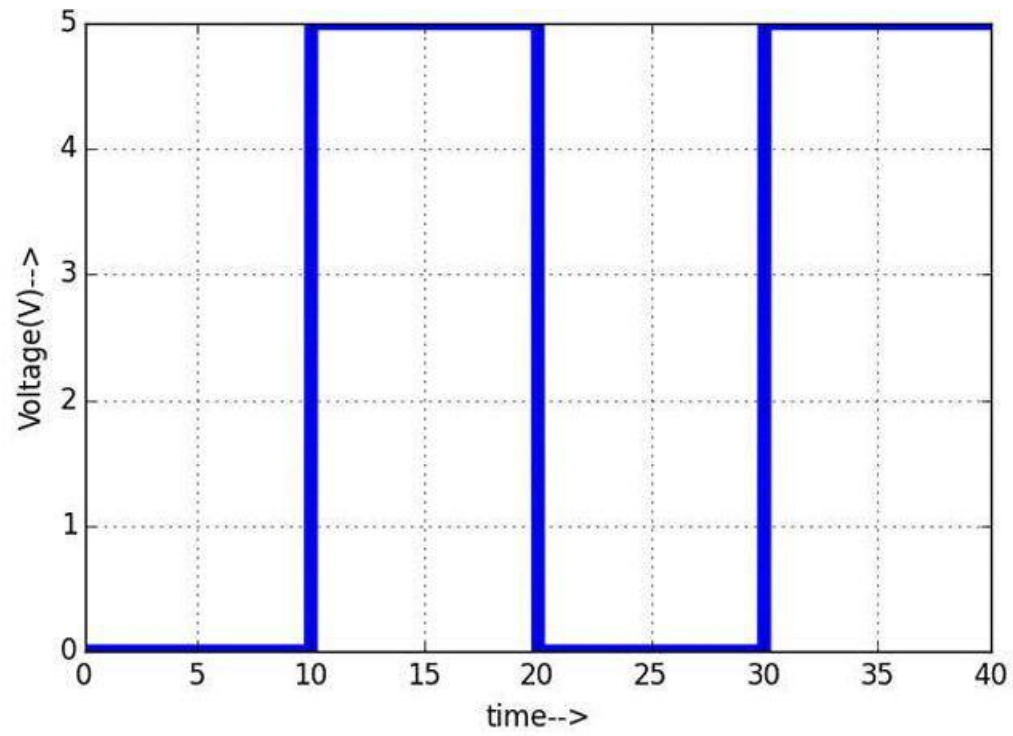
Python plot :

Input :

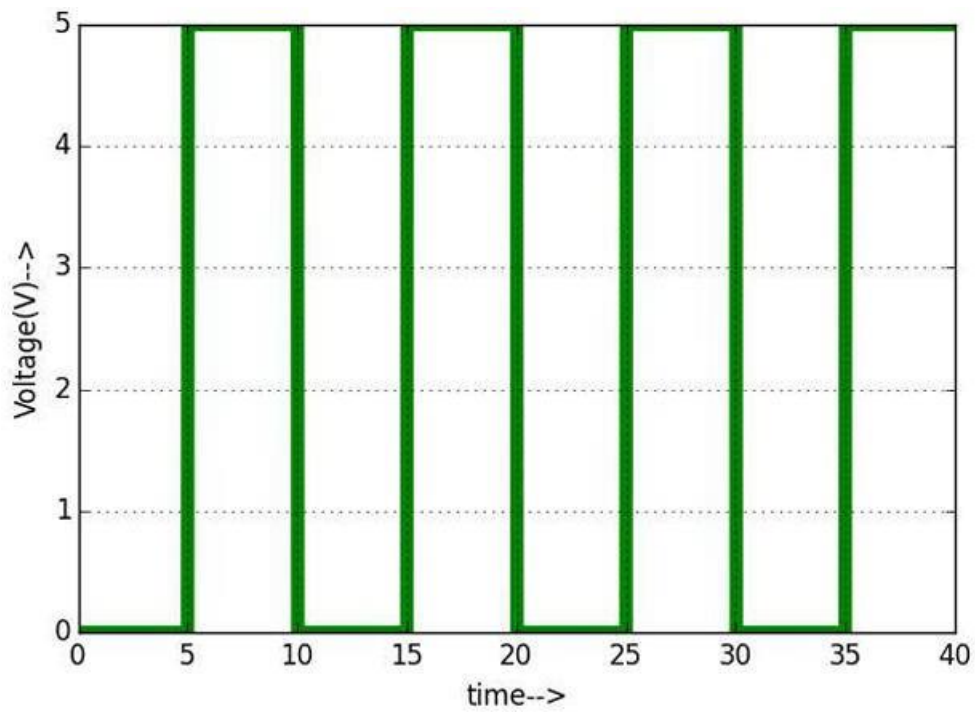
A



**B**

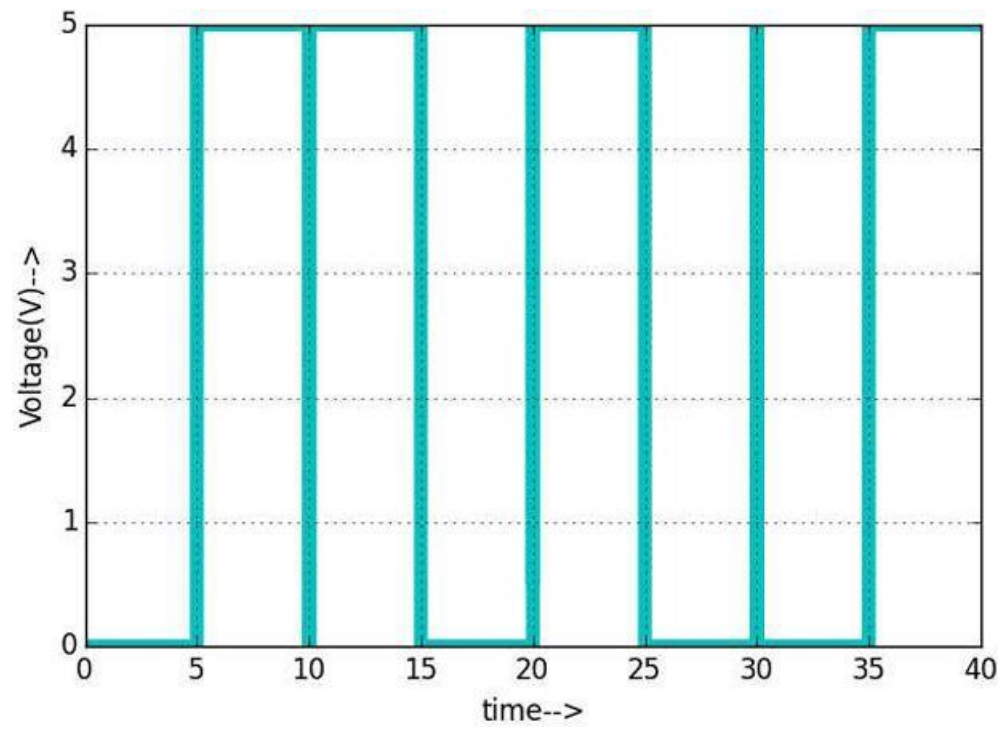


**Bin**

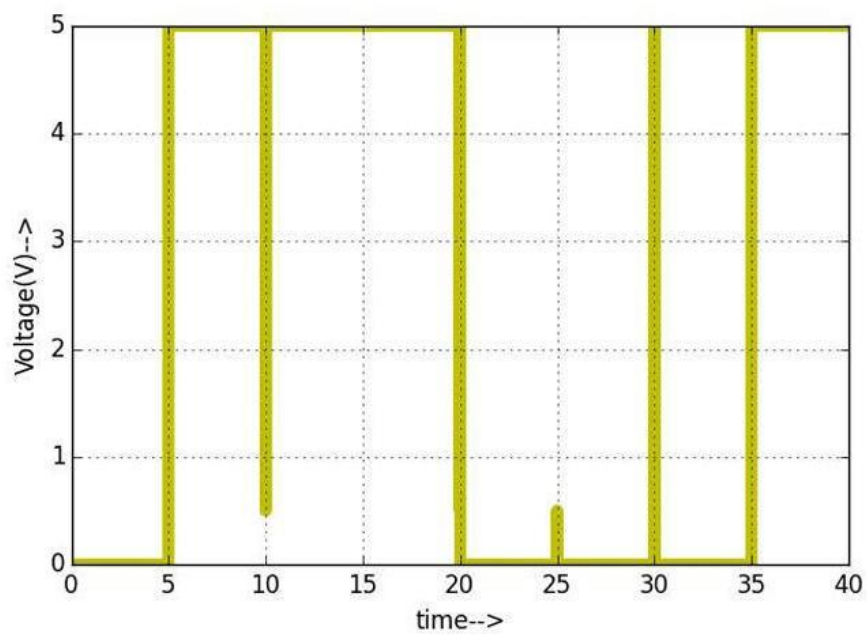


**Output :**

**Difference**



**Borrow**





**Github repository :**

**<https://github.com/ShrutikaWADIBHASME/eSimproject>**

**Conclusion : The waveforms successfully generated and we got the simulation result .**