

Circuit Simulation Project

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

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Project Guide: Dr R. Maheshwari

Title of the Circuit: 4-Bit MOD-3 Counter using JK Flip Flop

Description:

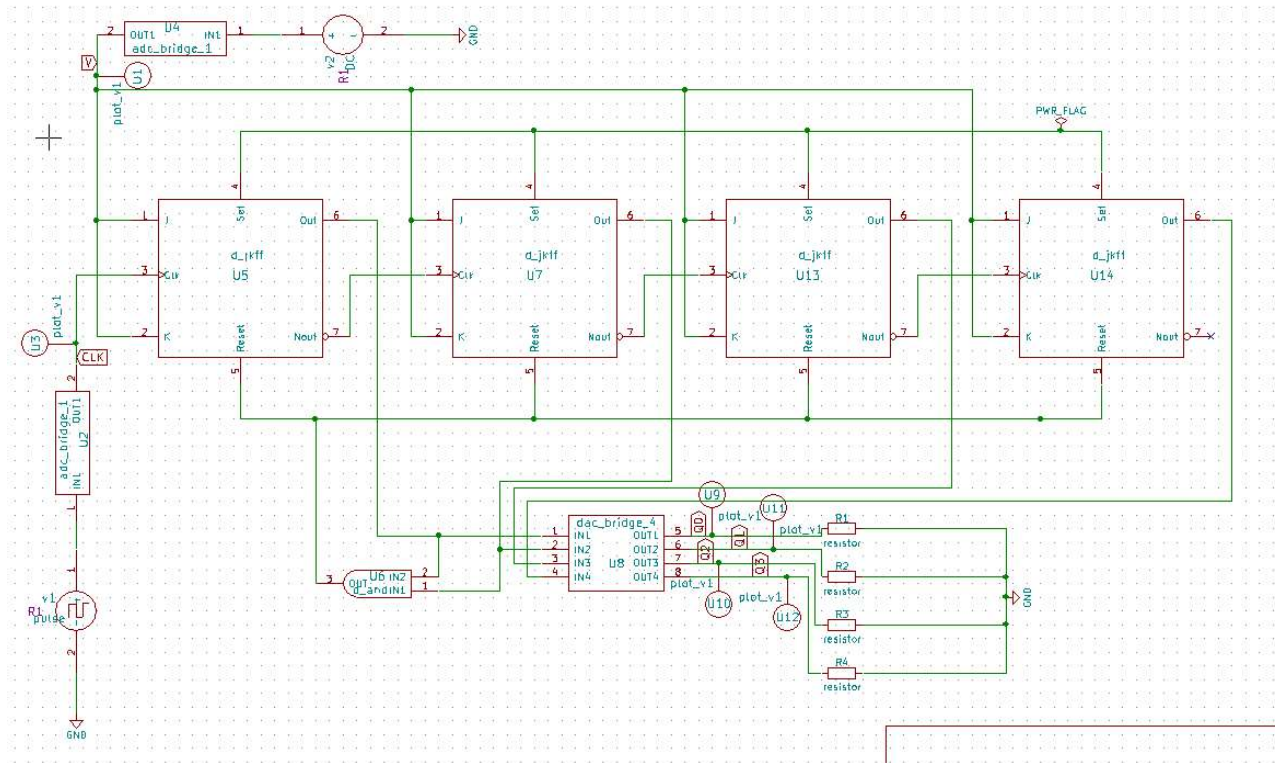
A counter is a sequential logic circuit that goes through a prescribed sequence of states upon the application of input pulses. The prescribed sequence can be a binary sequence or any other sequence. A counter that goes through $2N$ (N is the number of flip-flops in the series) states is called a binary counter. The modulus of a counter is the number of different states it is allowed to have. Counter modulus is normally $2N$ unless controlled by a feedback circuit which limits the number of possible states (an example being the decimal counter). Counters are very widely used in almost all computers and other digital electronic systems. There are two major categories of counters:

- Asynchronous counters
- Synchronous counters.

Asynchronous counter can count using Asynchronous clock input. Counters can be easily made using flipflops.

As the count depends on the clock signal, in case of an Asynchronous counter, changing state bits are provided as the clock signal to the subsequent flip-flops. Those Flip-flops are serially connected together and the clock pulse ripples through the counter. Due to the ripple clock pulse, it's often called a ripple counter. An Asynchronous counter can count $2n - 1$ possible counting states.

A MOD-3 counter is a ripple counter that counts from 0 to 2, then resets and starts from 0 again.



kicadToNgspice-1

AnalysisSource DetailsNgspice ModelDevice ModelingSubcircuits

Select Analysis Type

☐ AC☐ DC☒ TRANSIENT

Transient Analysis

Start Time

0

Sec

Step Time

10

ms

Stop Time

100

Sec

Convert

kicadToNgspice-1

AnalysisSource DetailsNgspice ModelDevice ModelingSubcircuits

Add parameters for pulse source v1

Enter initial value(Volts/Amps):

0

Enter pulsed value(Volts/Amps):

5

Enter delay time (seconds):

0

Enter rise time (seconds):

0

Enter fall time (seconds):

0

Enter pulse width (seconds):

5

Enter period (seconds):

10

Add parameters for DC source v2

Enter value(Volts/Amps):

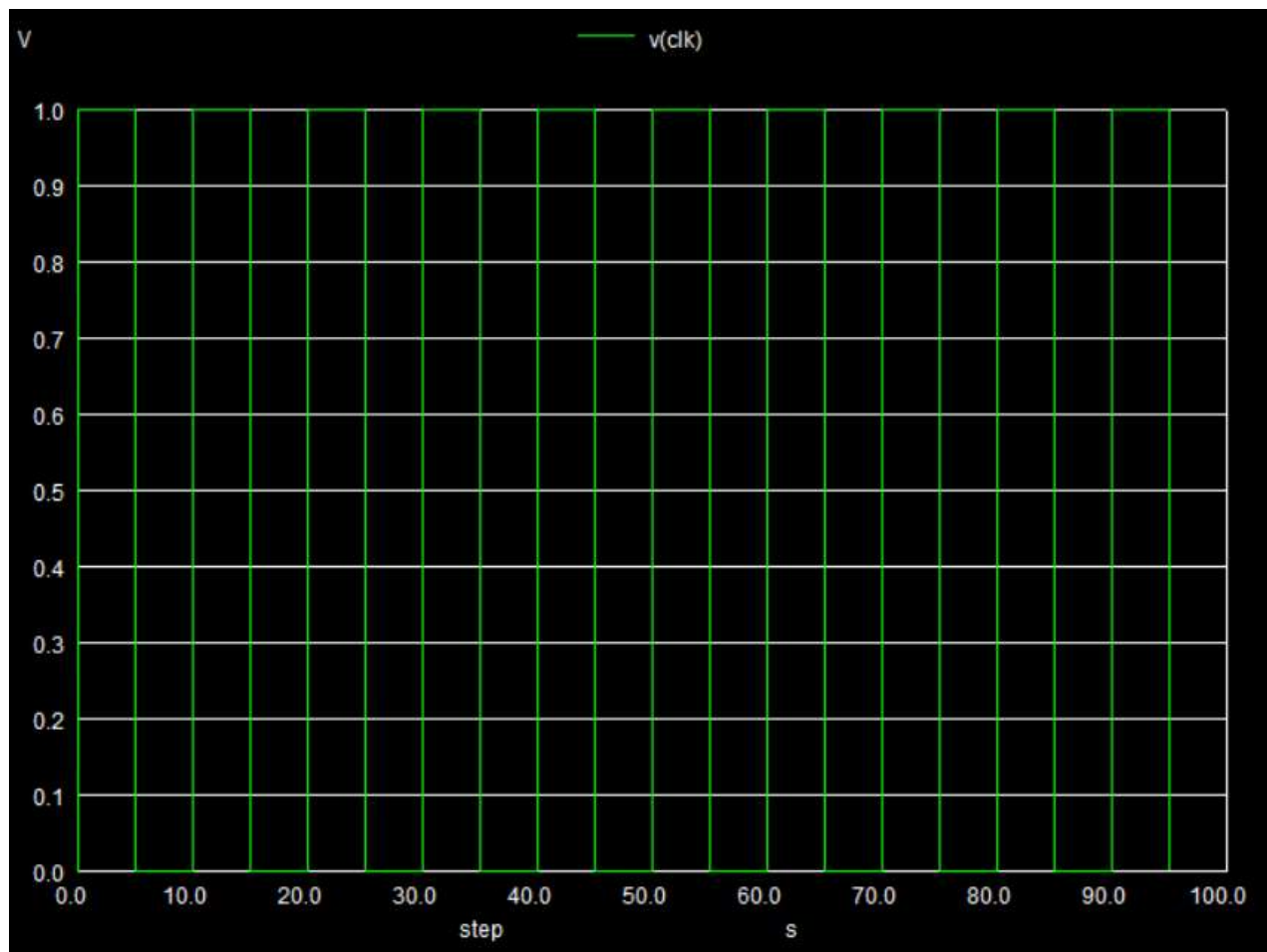
5

Convert

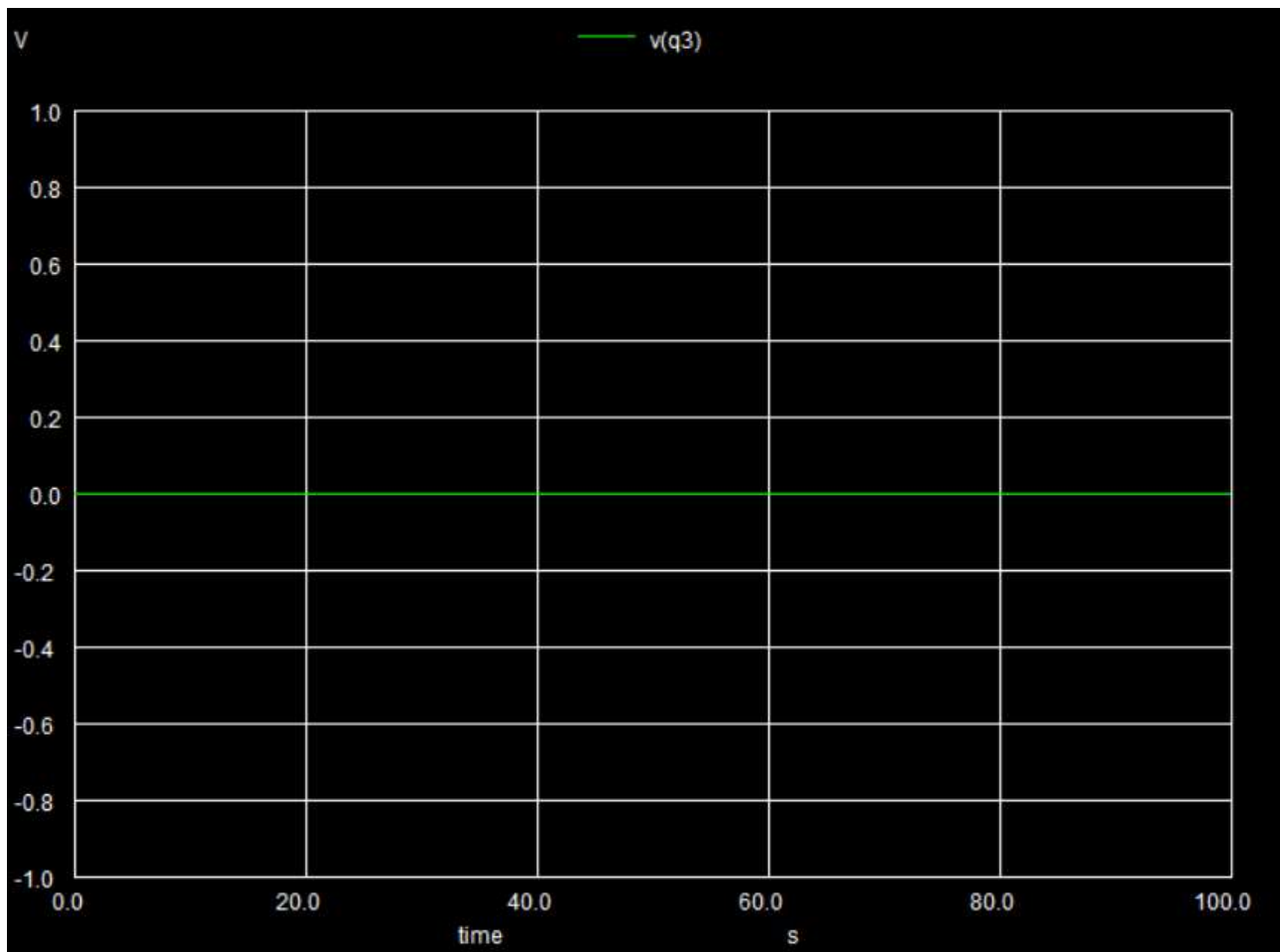
Simulation results:

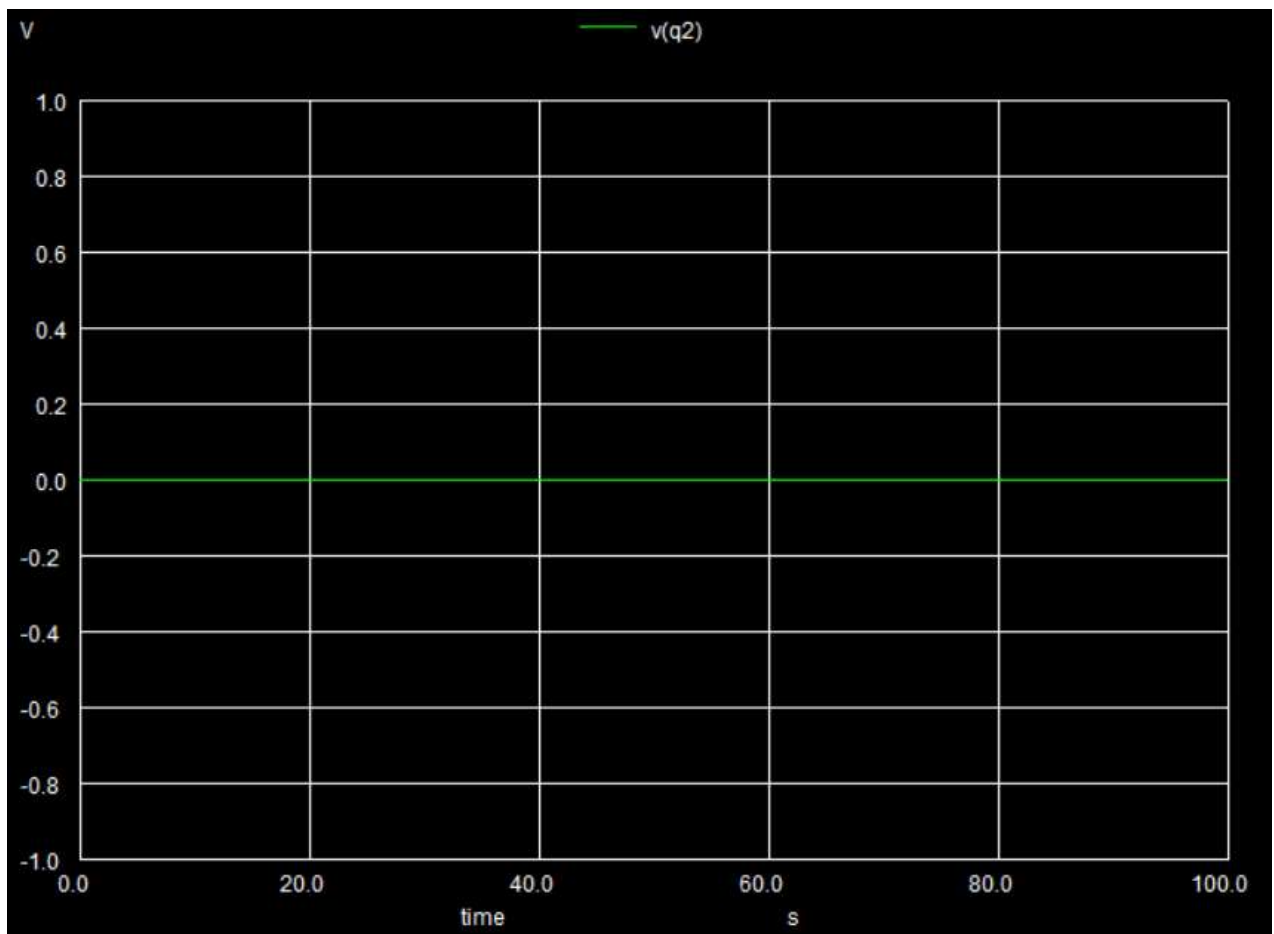
1.NgSpice Waveforms

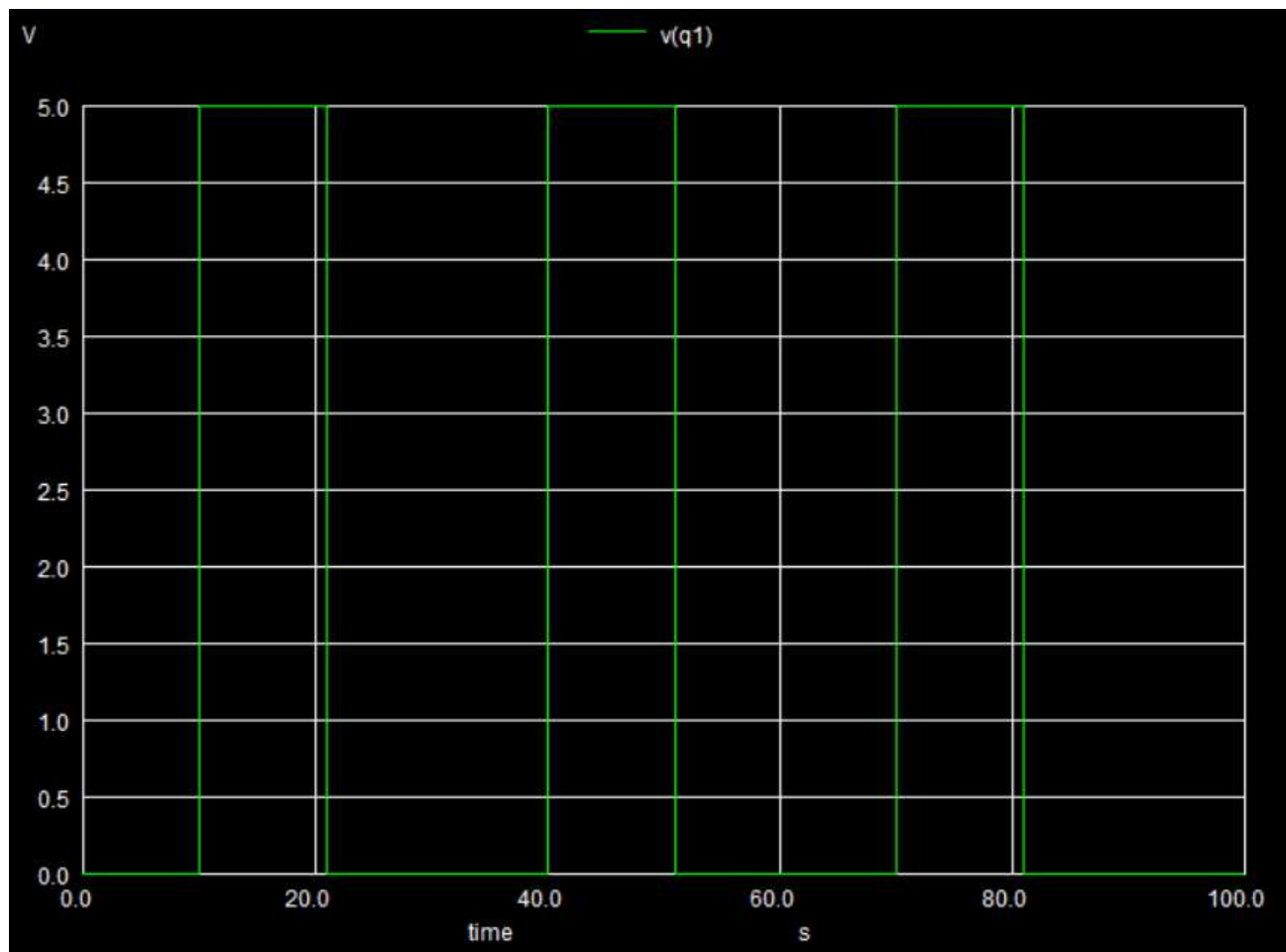
CLOCK Pulse:



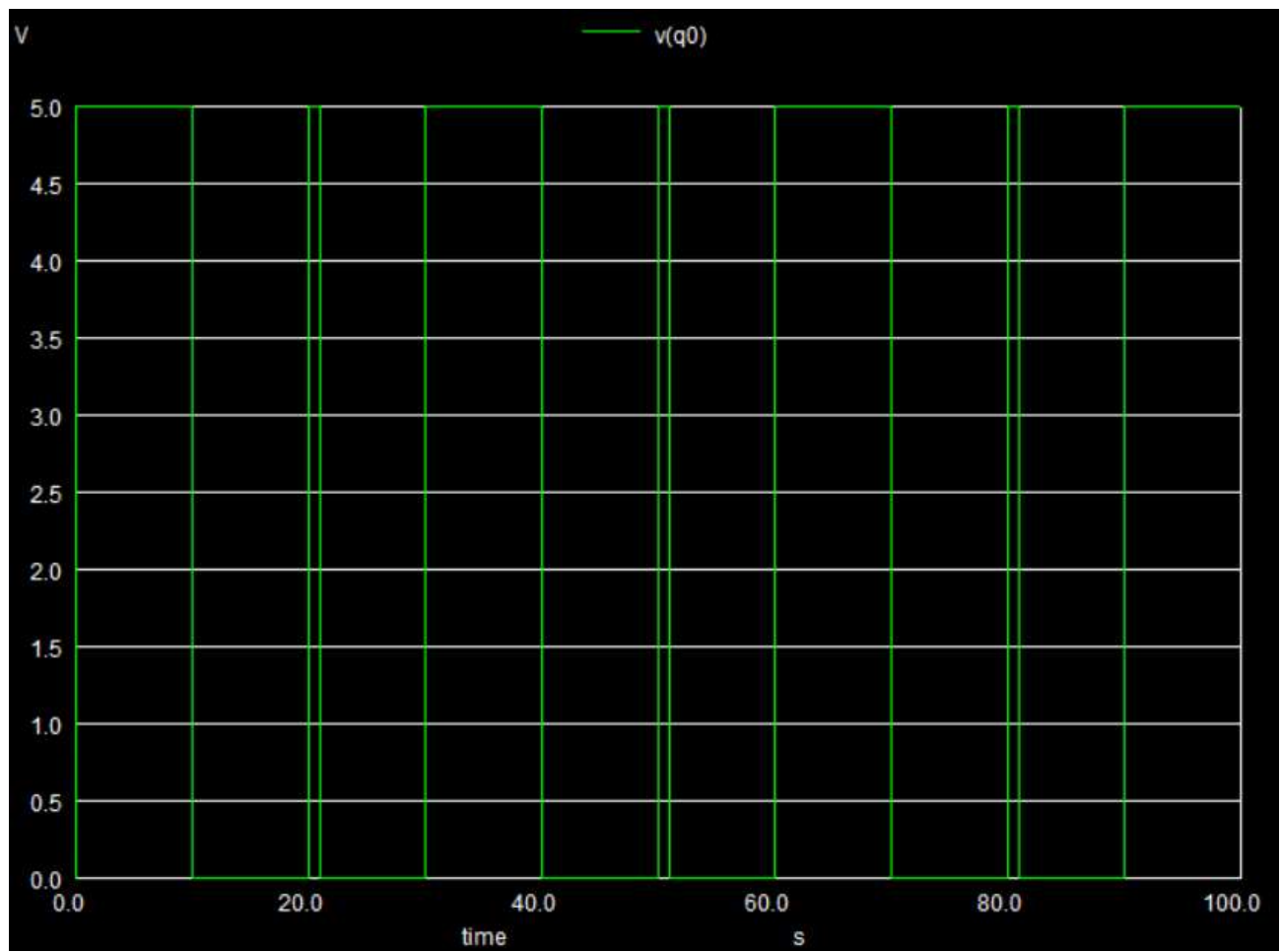
Q3(MSB):





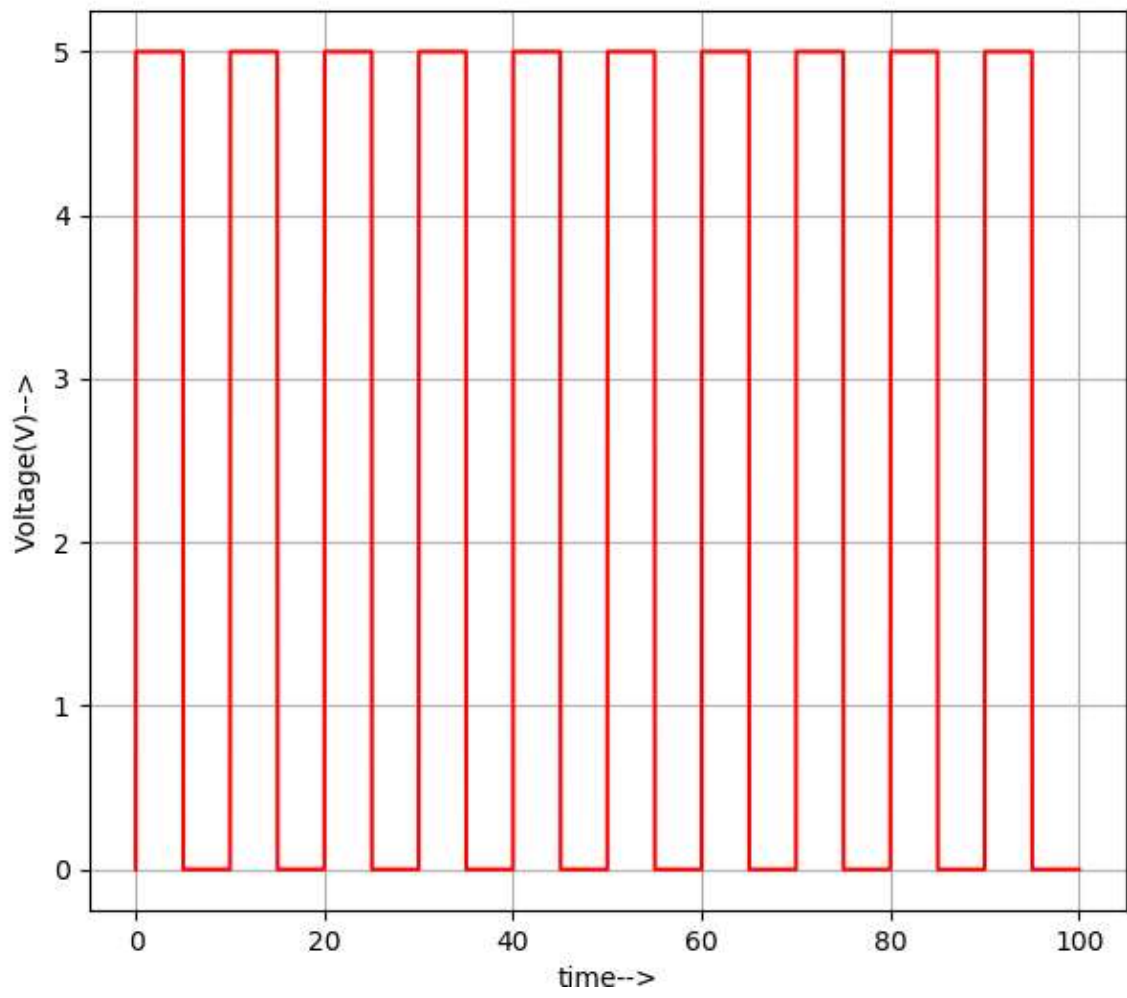


Q0(LSB):

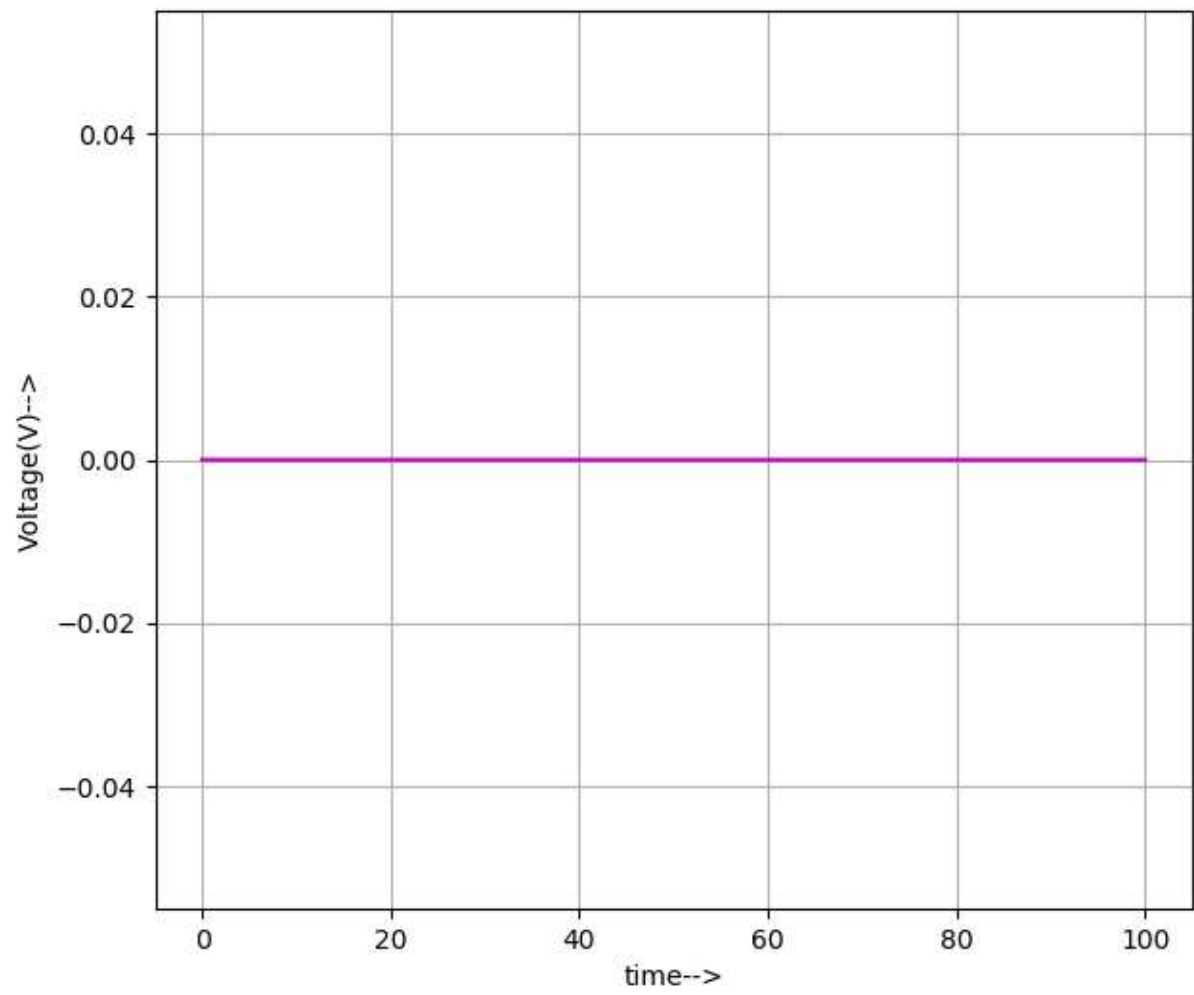


2. Python Waveform

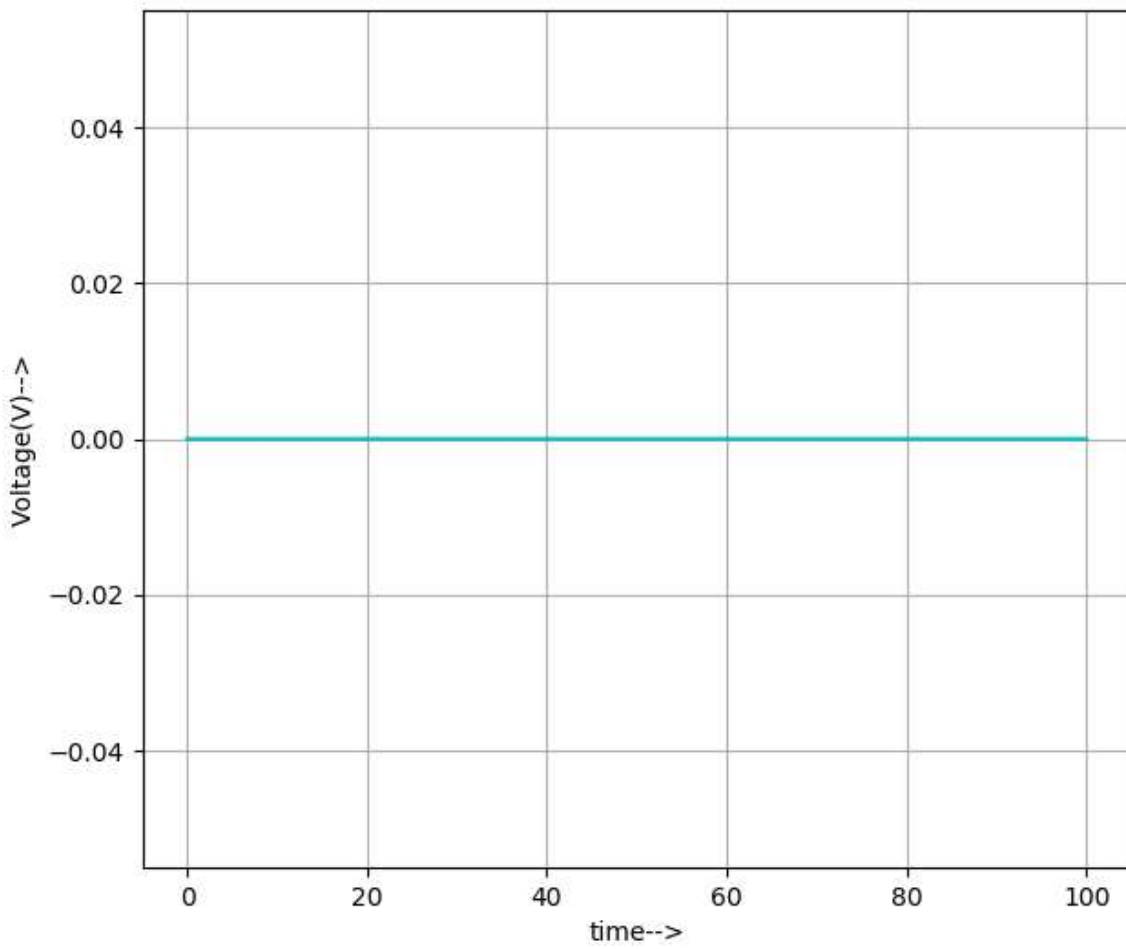
CLOCK Pulse:



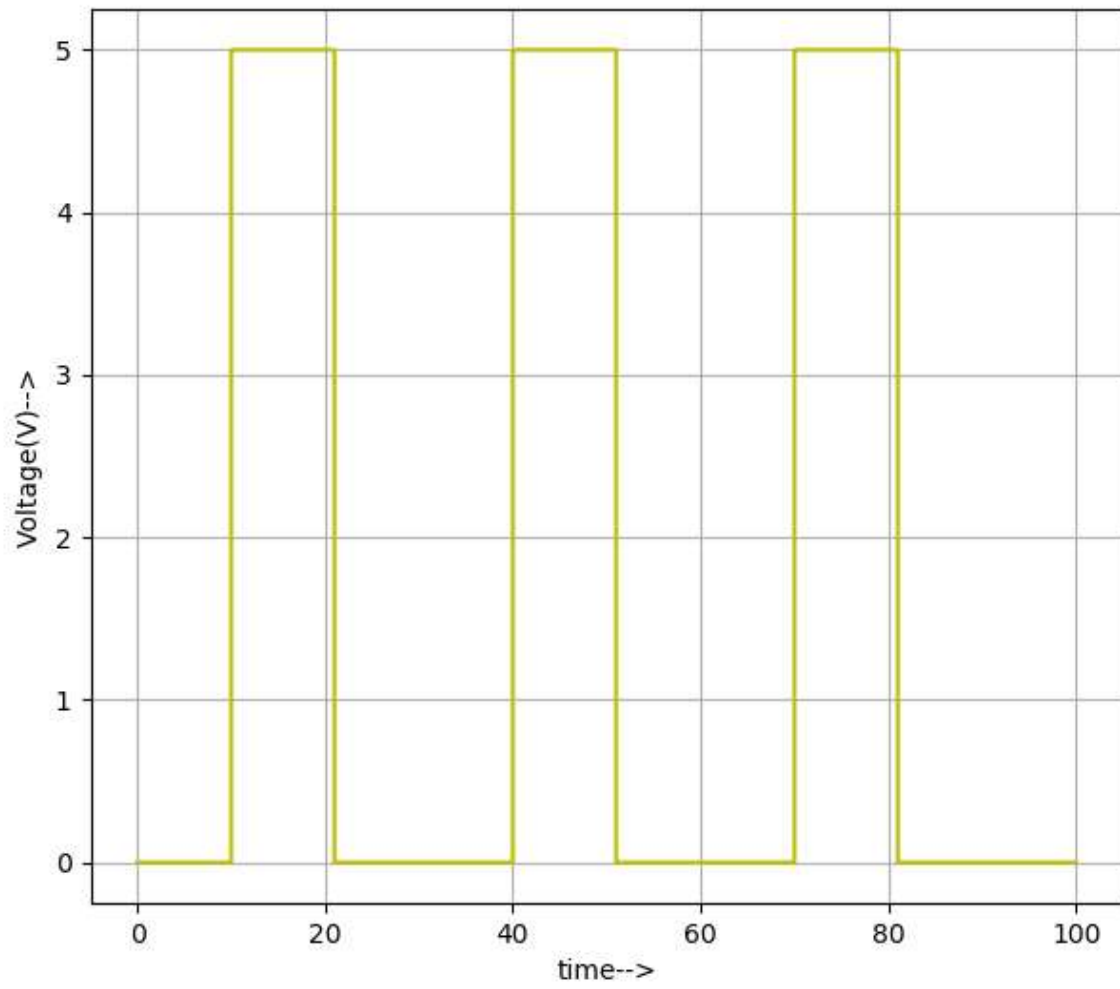
Q3(MSB):



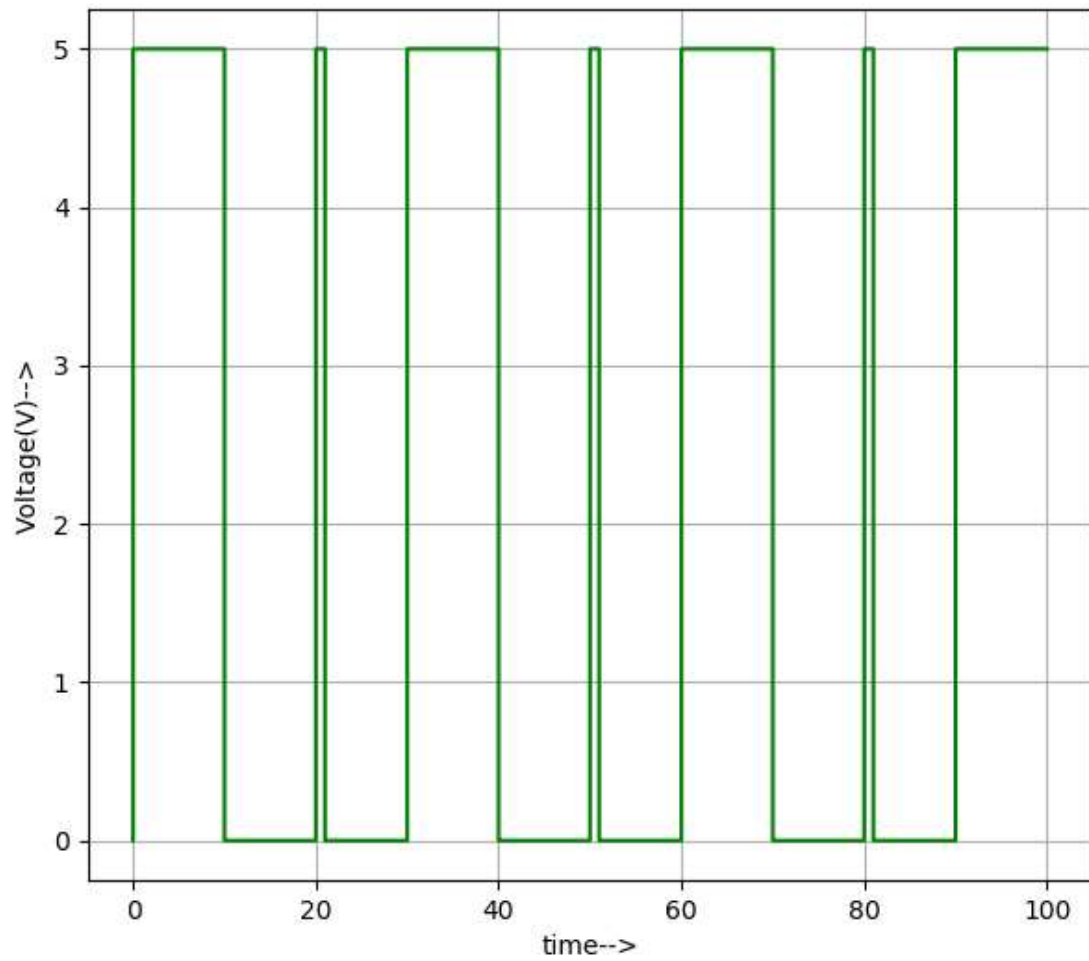
Q2



Q1:



Q0(LSB):



REFERENCES:

<https://electronics-course.com/truncated-ripple-counter>