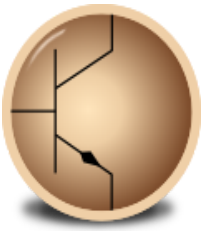


PROJECT REPORT:

DIODE LADDER FILTER

Pooja R A, Muthoot Institute of Technology and Science, Kochi

Diode Ladder Filter

Introduction:

A diode ladder filter is a type of analog filter circuit commonly used in synthesizers. It is a type of voltage controlled filter. It implements voltage control with a thread of diodes. It was originally developed by EMS(Electronic Music Studios) in order to work around a Moog patent.

The diode ladder works on a similar principle to the Moog transistor ladder- the diode, under the influence of an applied control voltage, permits or limits current flow to a filter capacitor, such that as the control voltage is varied, the filter's cutoff frequency changes. The many applications of diode ladder filters are in Analog synthesizers, Modular synth systems, Filter modules. Additionally, they are also frequently employed in standalone filter modules.

Resources and Components

eSim software, version 2.4

eSim software was used for the design of schematics and for circuit simulation.

Diodes

In the ladder configuration, diodes act as variable resistors. Their resistance changes with the control voltage, affecting the current flow through the capacitors and thus the cutoff frequency of the filter.

Capacitors

In the diode ladder filter, capacitors are placed between each diode stage and ground. By working together with the diodes, they help shape the signal by attenuating frequencies above the cutoff point.

Resistors

In the diode ladder filter, resistors are used for biasing the diodes.

Op-Amps

Op-amps are used in this circuit for many purposes such as buffering, resonance, feedback and gain control. LM 741 was used as the op-amp in this project.

Voltage Sources

The diode ladder filter typically requires dual power supplies to power the op-amps and other active components.

Transistors:

Transistors in a diode ladder filter serve to stabilize current, amplify signals, and provide voltage control. They are essential for maintaining the filter's performance and ensuring it operates as intended across varying conditions.

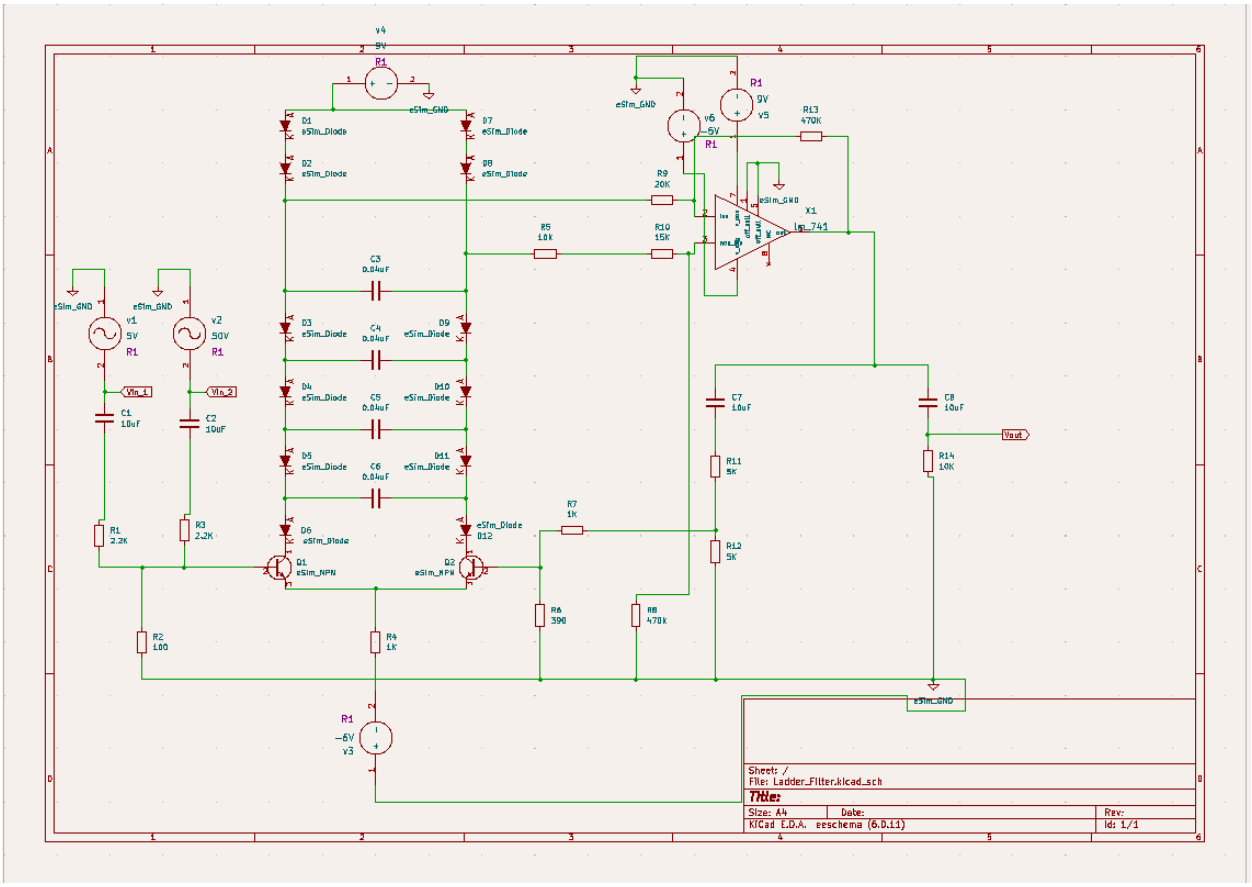
Circuit working:

The circuit is a diode ladder filter, commonly used in audio synthesis and other signal processing applications. It works with various power supply connections and capacitors with micro range that helps stabilize the input voltage, diode ladder configuration, op-amps and transistors.

Applications:

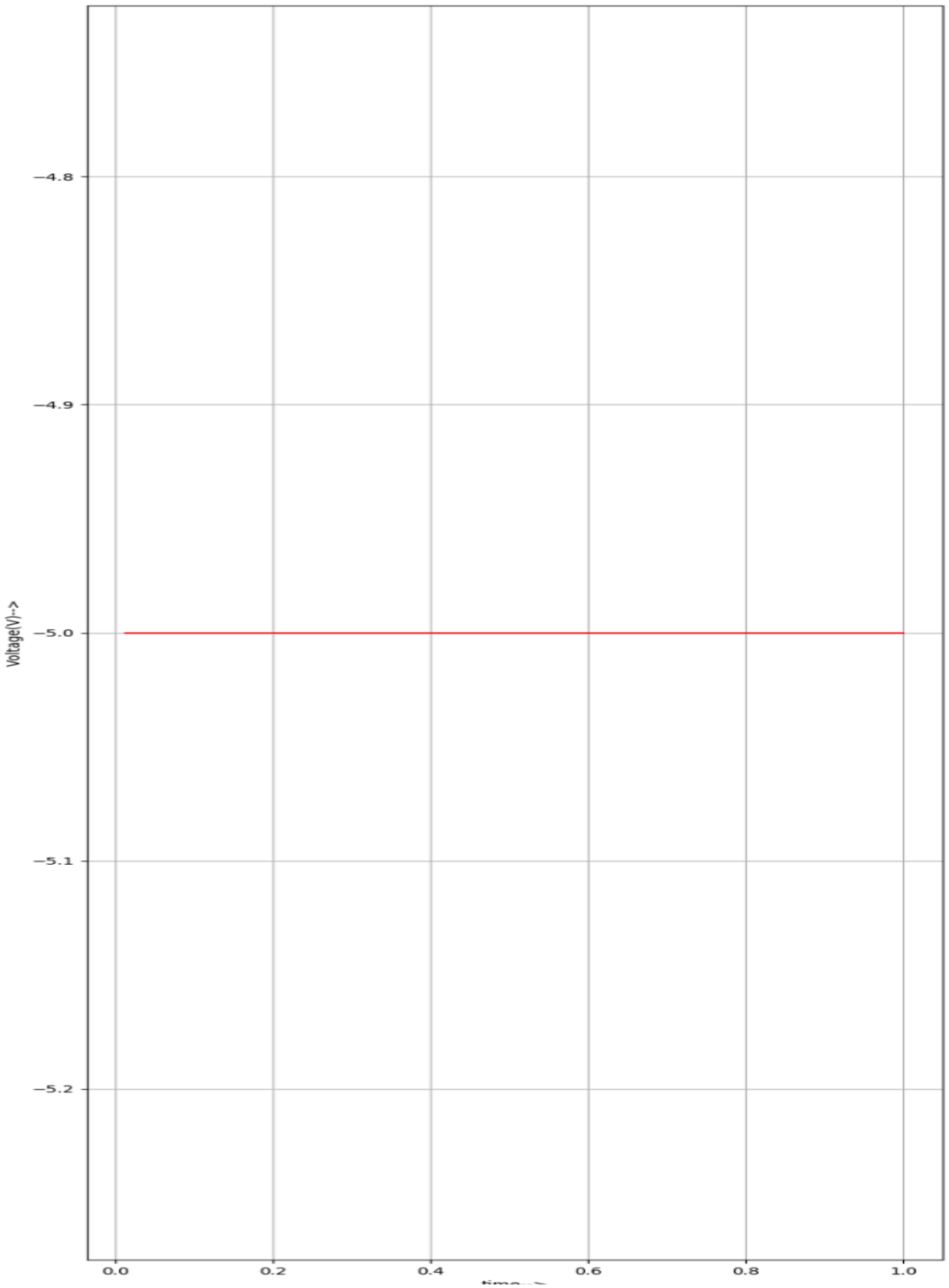
The many applications of diode ladder filters are as Analog synthesizers, Modular synth systems and Filter modules. Additionally, diode ladder filters are frequently employed in standalone filter modules. These modules can be used in various audio processing applications, such as equalization and distortion effects.

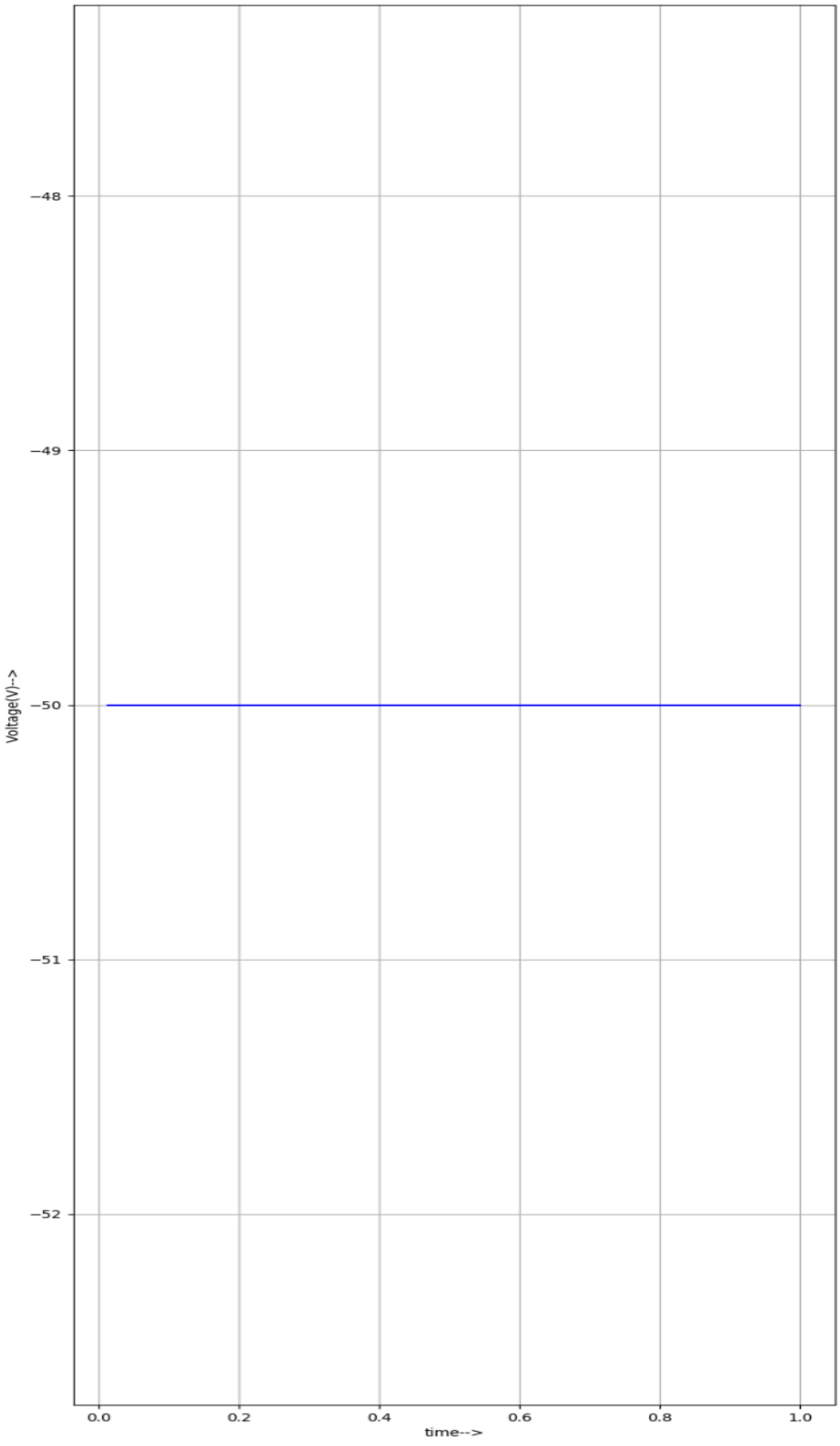
Circuit Diagram:



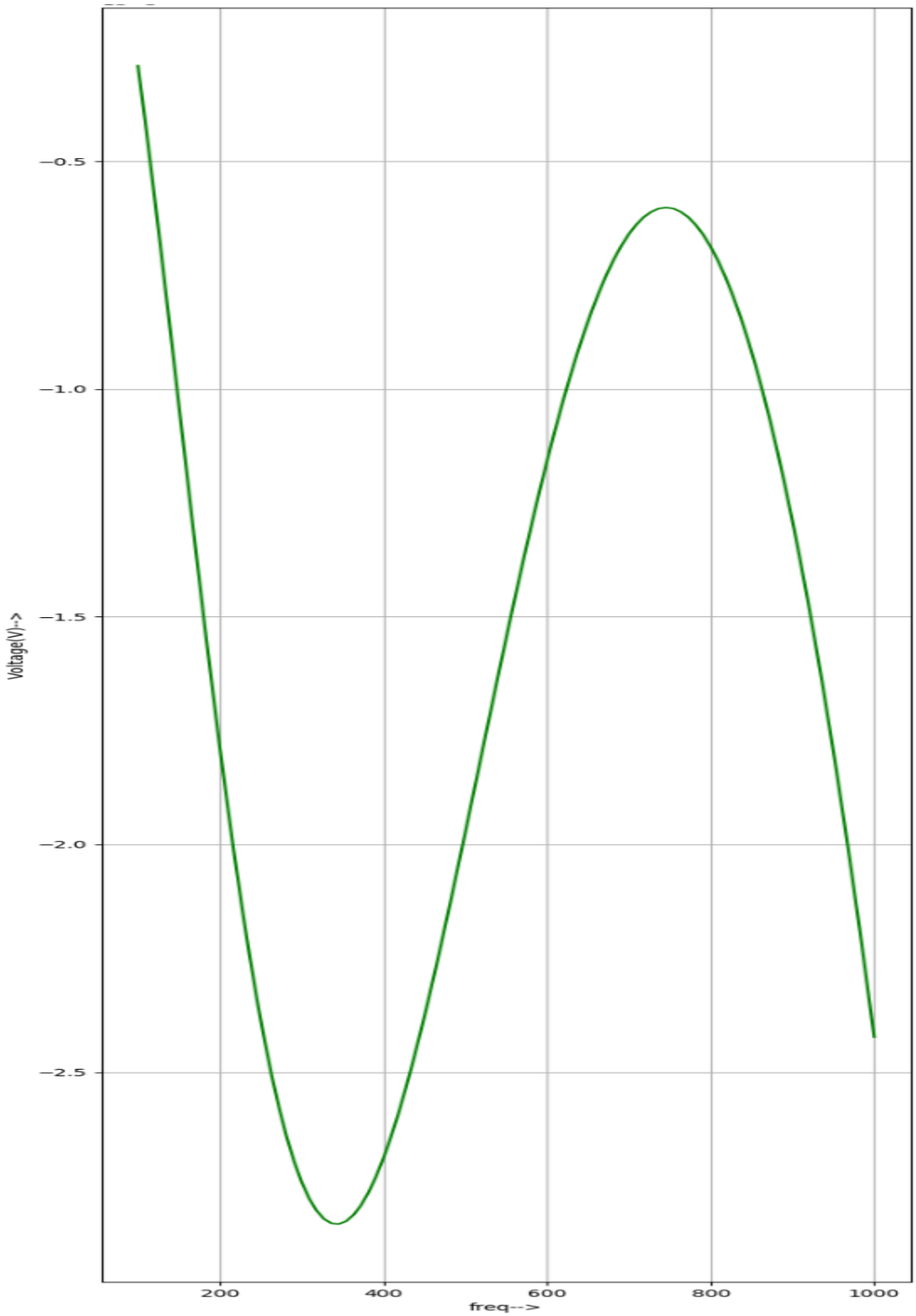
Simulation Results:

Input




−48
−49
−50
−51
−52
Voltage(V)-->
0.0
0.2
0.4
0.6
0.8
1.0
time-->

Output



References:

https://youtu.be/jvNNgUl3al0?si=TzXgJMcStFfI2nj3

https://www.timstinchcombe.co.uk/synth/Moog_ladder_tf.pdf

https://www.google.com/