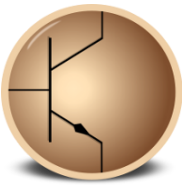


Circuit Simulation Project

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

DESIGN OF HALF WAVE PRECISION RECTIFIER CIRCUIT USING OP-AMP

by

PRARTHANA PRASANNA KUMAR

Under the guidance of Dr Subhashini N, SENSE,

VELLORE INSTITUTE OF TECHNOLOGY,

CHENNAI

THEORY AND DESCRIPTION:

Rectification is a process of separating the positive and negative portions of a waveform from each other and selecting from them what part of the signal to retain. A rectifier is a circuit that converts alternating current (AC) to Direct current (DC). An alternating current always changes its direction over time, but the direct current flows continuously in one direction. In a typical rectifier

circuit, we use diodes to rectify AC to DC. But this rectification method can only be used if the input voltage to the circuit is greater than the forward voltage of the diode which is typically 0.7V. To overcome this issue, the Precision Rectifier Circuit was introduced. The precision rectifier is a configuration obtained with an operational amplifier in order to have a circuit behave like an ideal diode and rectifier. It is very useful for high-precision signal processing. The precision rectifier is another rectifier that converts AC to DC, but in a precision rectifier an op-amp to compensate for the voltage drop across the diode.

DESIGN:

The diode D2 will conduct if the positive half of the sinusoidal signal is applied as an input. Now the Op-amp is acting as an inverting amplifier, if we look at point P1, the voltage is 0V as a virtual ground is formed at that point, so current cannot flow through the resistor R19, and in the output point P2, the voltage is negative 0.7V as the op-amp is compensating for the diode drop, so there is no way that current can go to point P3. So, that is how we have achieved a 0V output whenever a positive half cycle of the signal is applied to the input of the Op-amp.

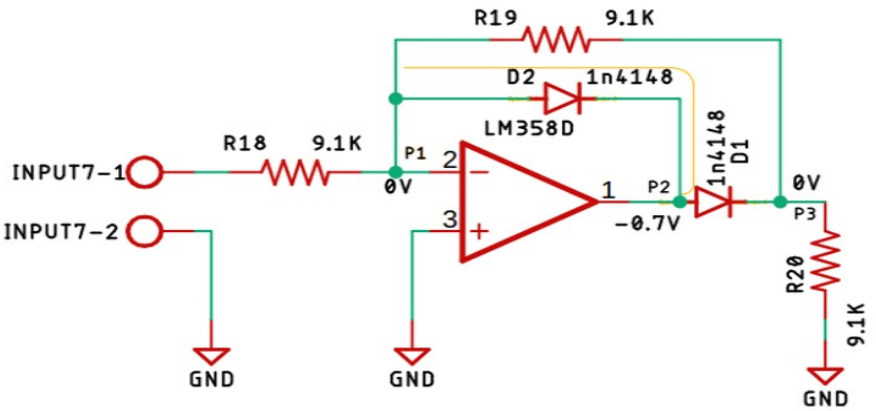
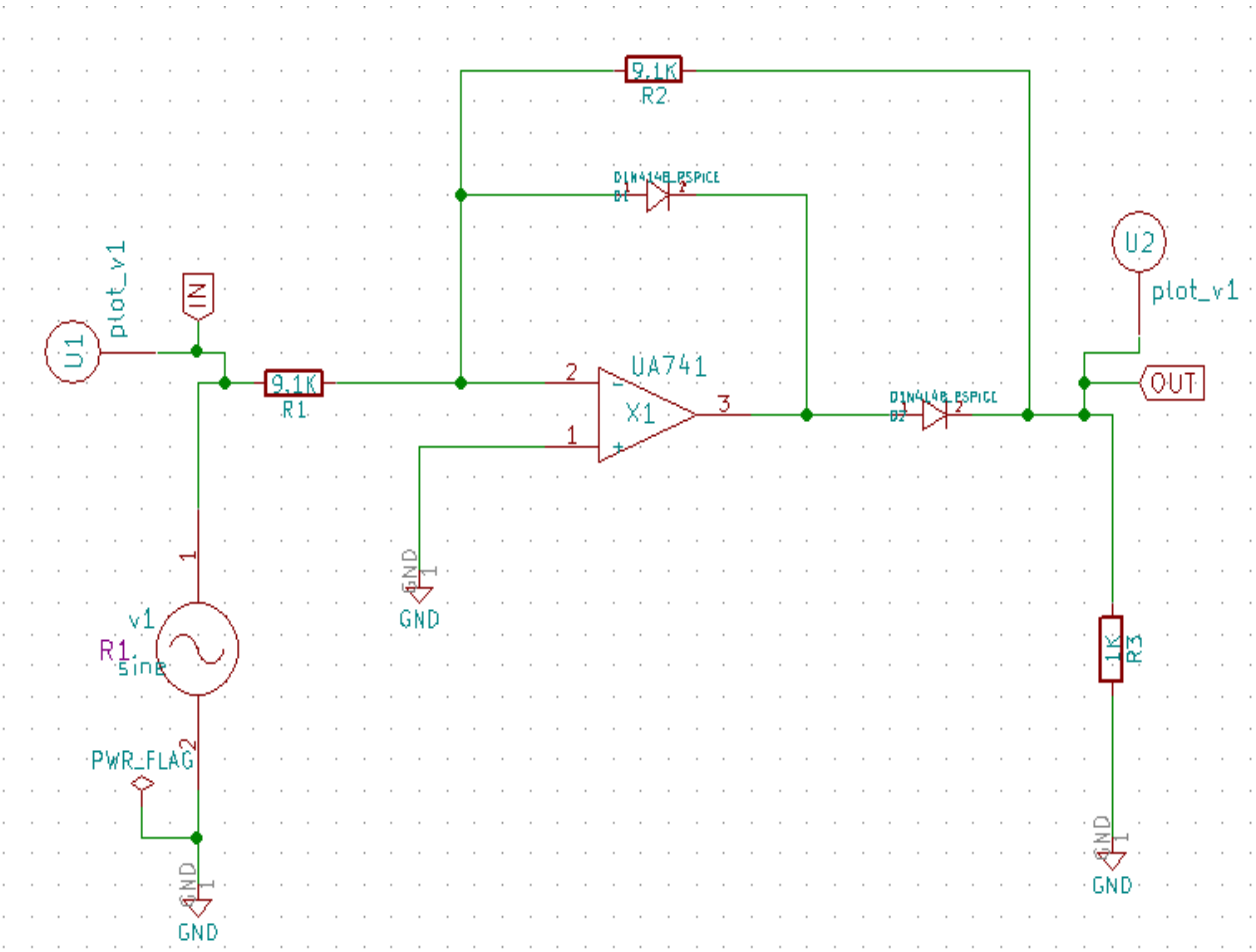


Figure 1. Circuit Schematic

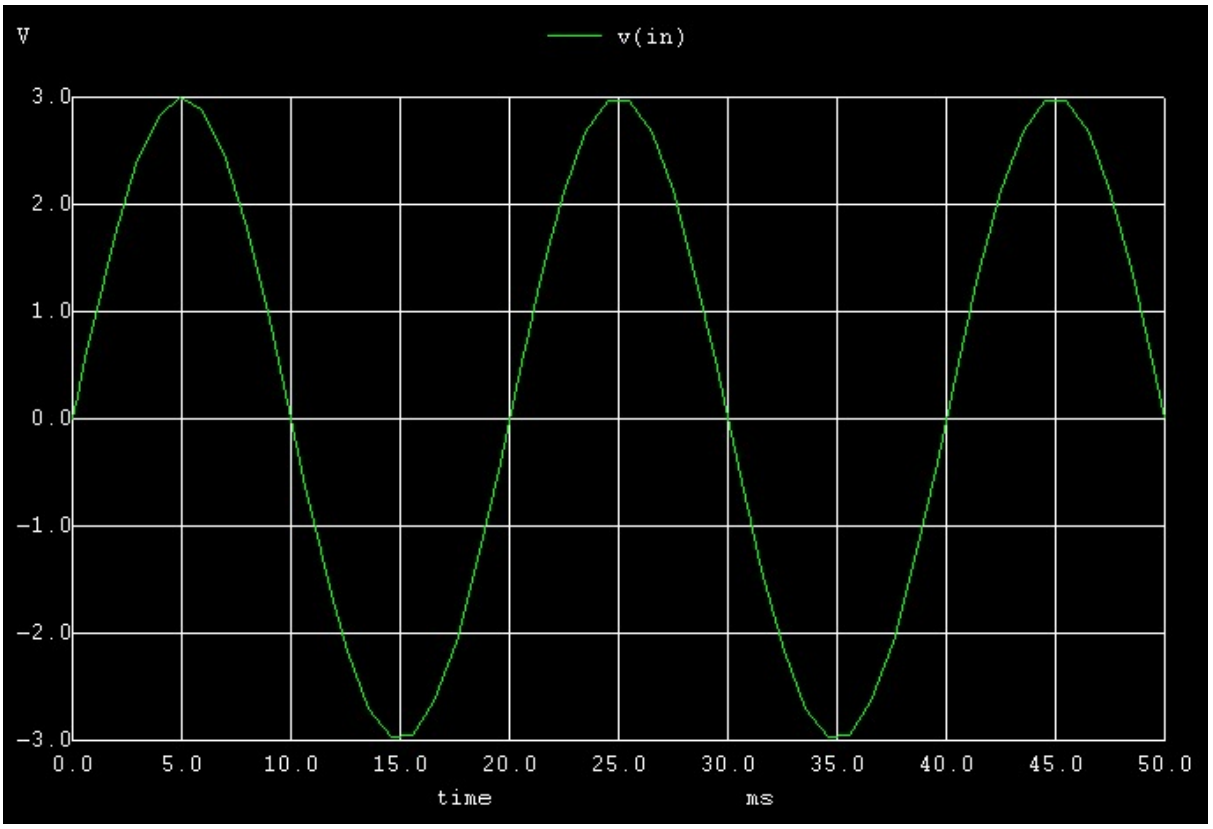
SCHEMATIC DIAGRAM:



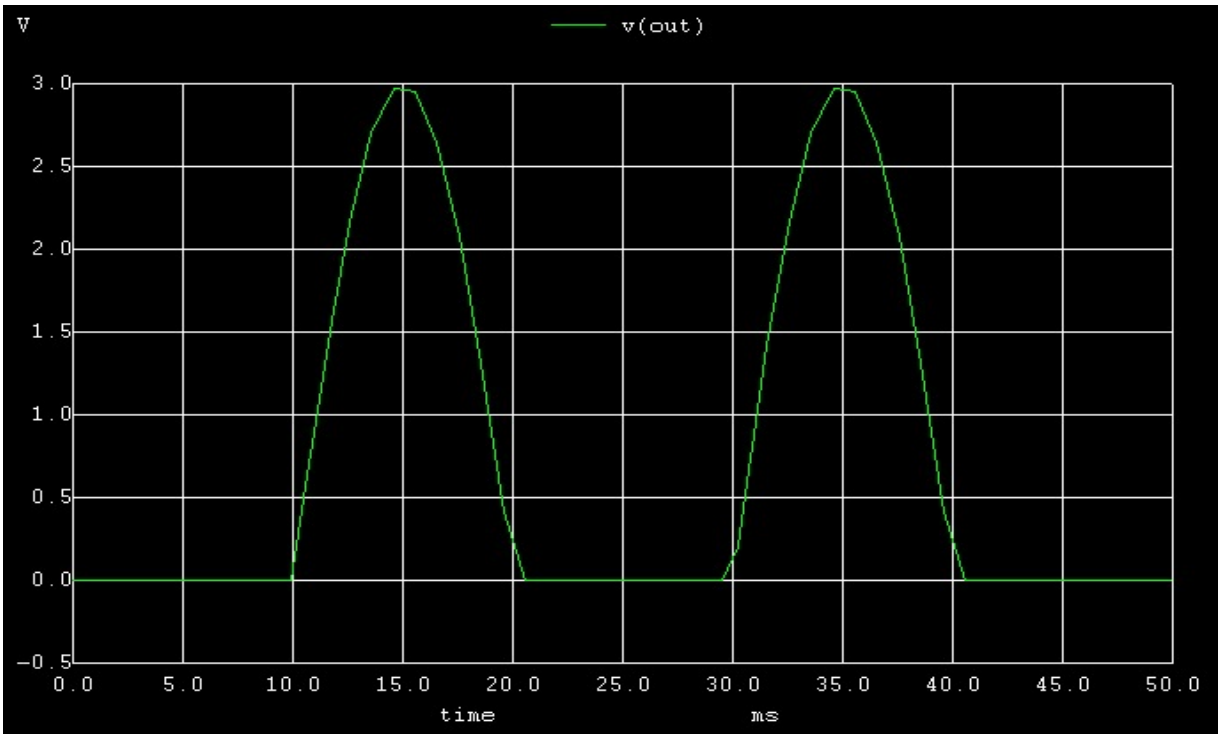
SIMULATION RESULTS:

NGSPICE PLOTS:

INPUT PLOT

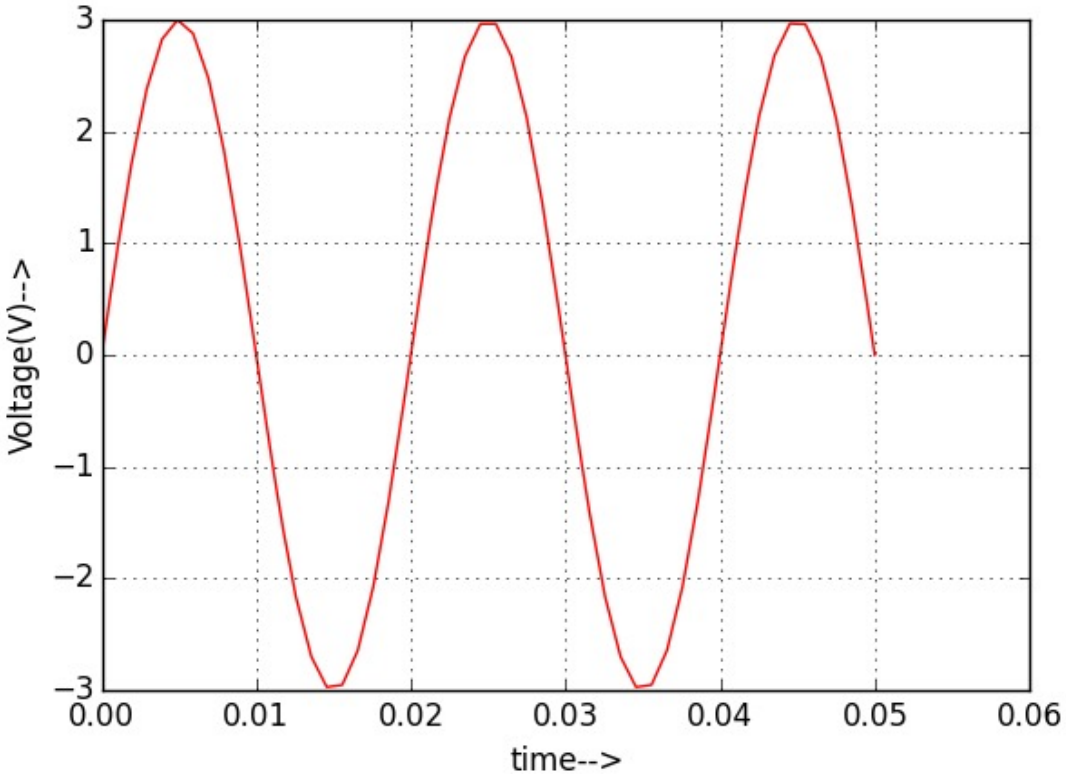


OUTPUT PLOT

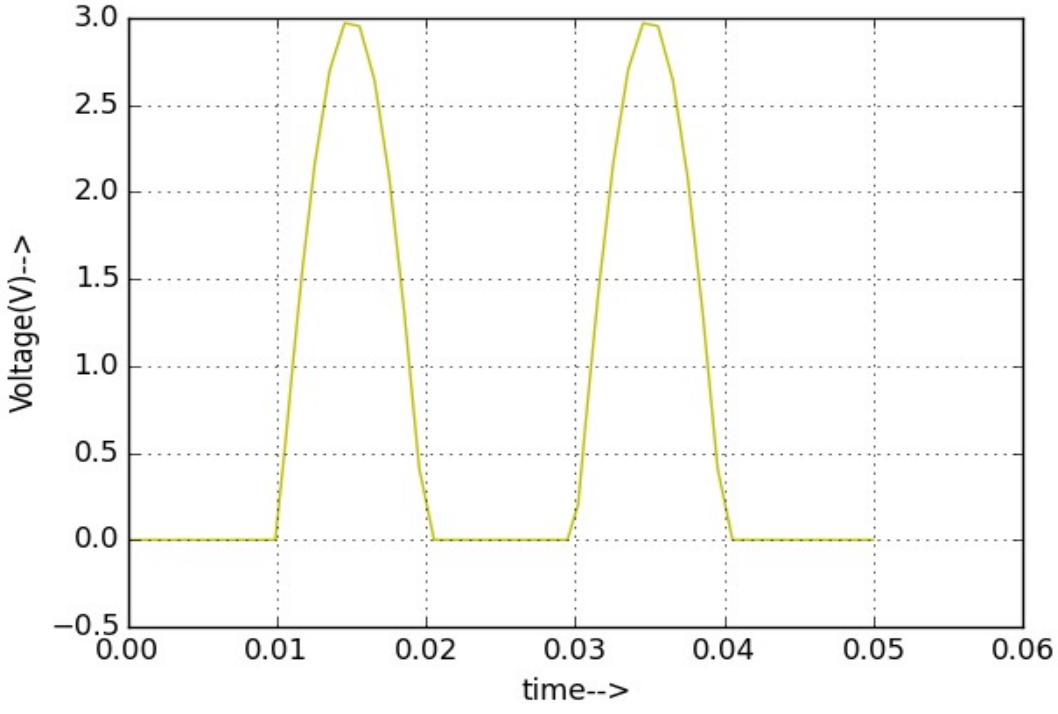


PYTHON PLOTS:

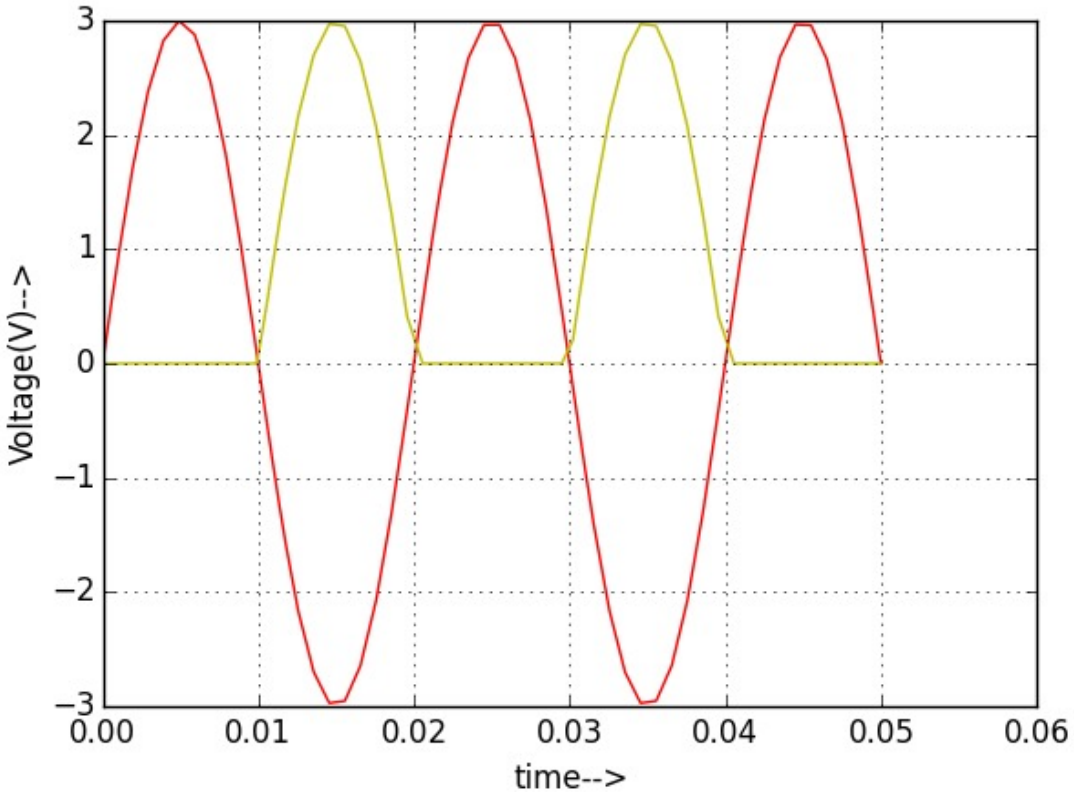
INPUT PLOT



OUTPUT PLOT



INPUT AND OUTPUT PLOT



CONCLUSION:

Hence, the Half wave Rectifier circuit using OpAmp is designed and simulated on eSim.

REFERENCES:

- https://circuitdigest.com/electronic-circuits/half-wave-and-full-wave-precision-rectifier-circuit-using-op-amp
- https://en.wikipedia.org/wiki/Precision_rectifier