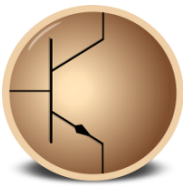

Circuit Simulation Project

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

DESIGN OF FULL WAVE PRECISION RECTIFIER CIRCUIT USING OP-AMP

by

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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. 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. The full wave rectifier is typically used to create a dc level from an ac input. The Precision Full Wave Rectifier circuits accept an ac signal at the input, inverts either the negative or the positive half, and delivers both the inverted and non inverted halves at the output.

DESIGN:

In the positive half cycle of applied ac input signal, output of op-ampA1 is negative. so diode D2 is reversed biased. Thus op-amp A1 works as an inverting amplifier with gain=(-R/R1), Therefore voltage at point 'A'(output of op-amp A1) is given as VA=(-R/R1)*Vin

The non-inverting terminal of op-amp A2 is also virtually grounded, so op-amp A2 also works as an inverting amplifier. Therefore the output voltage Vo is given as ∴ Vo=-R/R [-R/R1 Vin]

∴ Vo=(R/R1) Vin

In the negative half cycle of applied ac input signal, output of op-amp A1 is positive .So diode D2 is forward biased and diode D1 is reverse biased. Thus op-amp A1 works as an inverting amplifier.

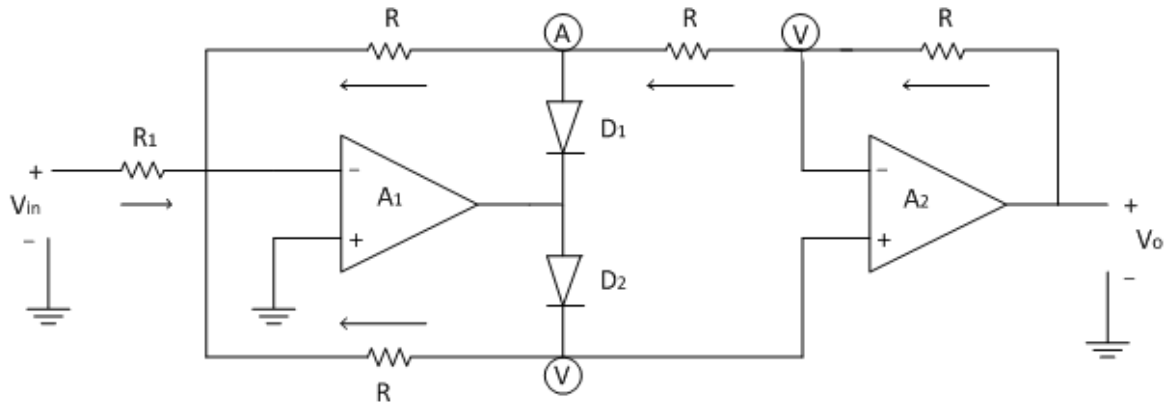
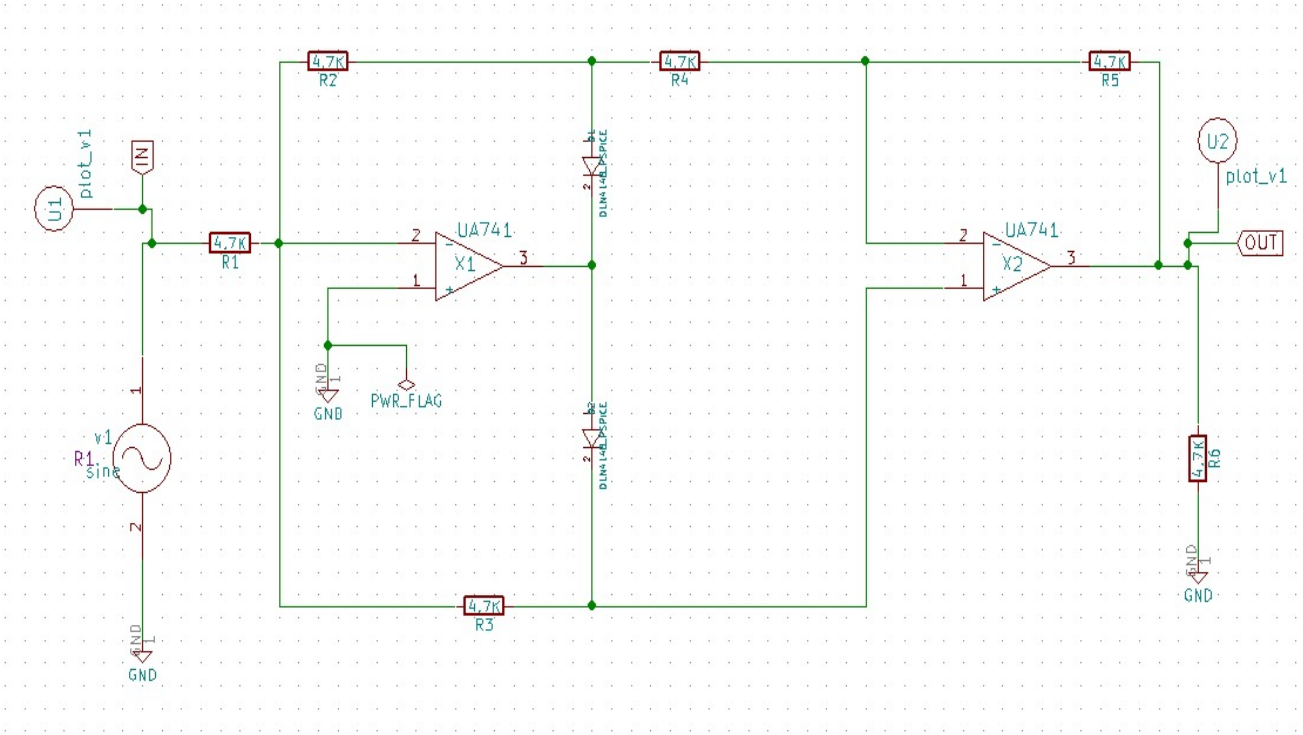


Figure 1. Circuit Schematic

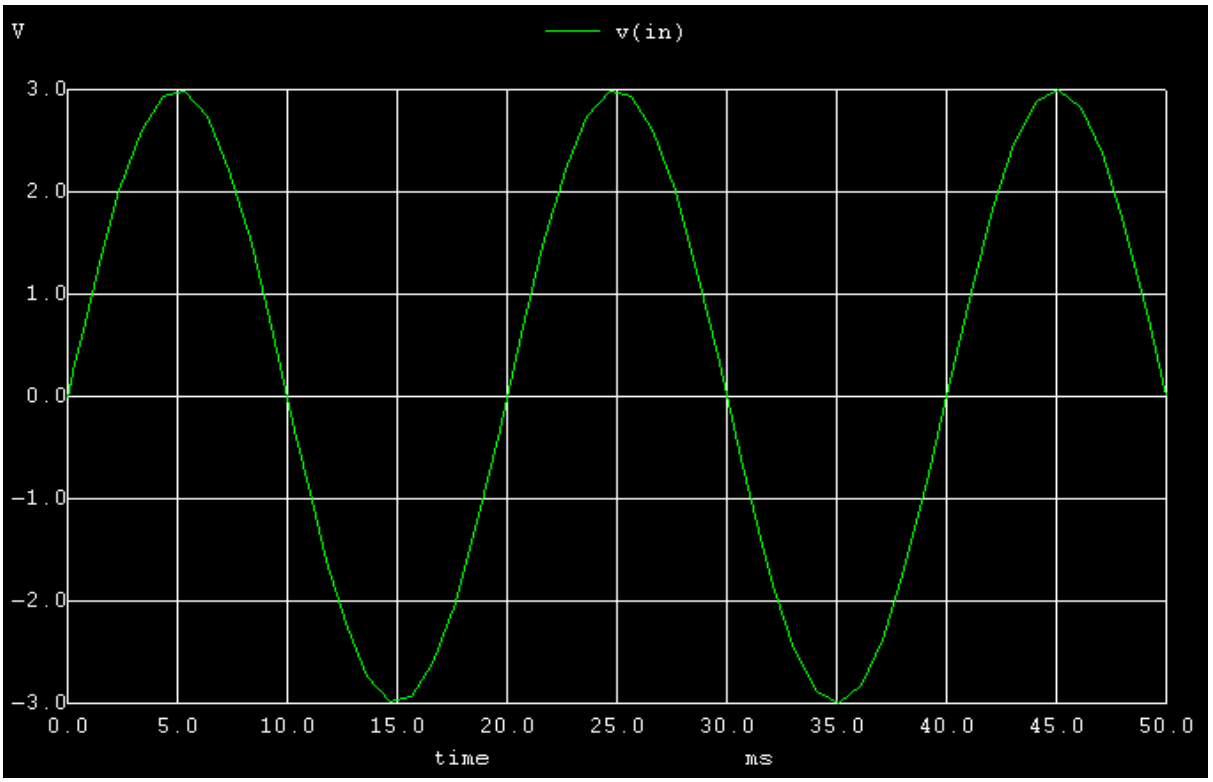
SCHEMATIC DIAGRAM:



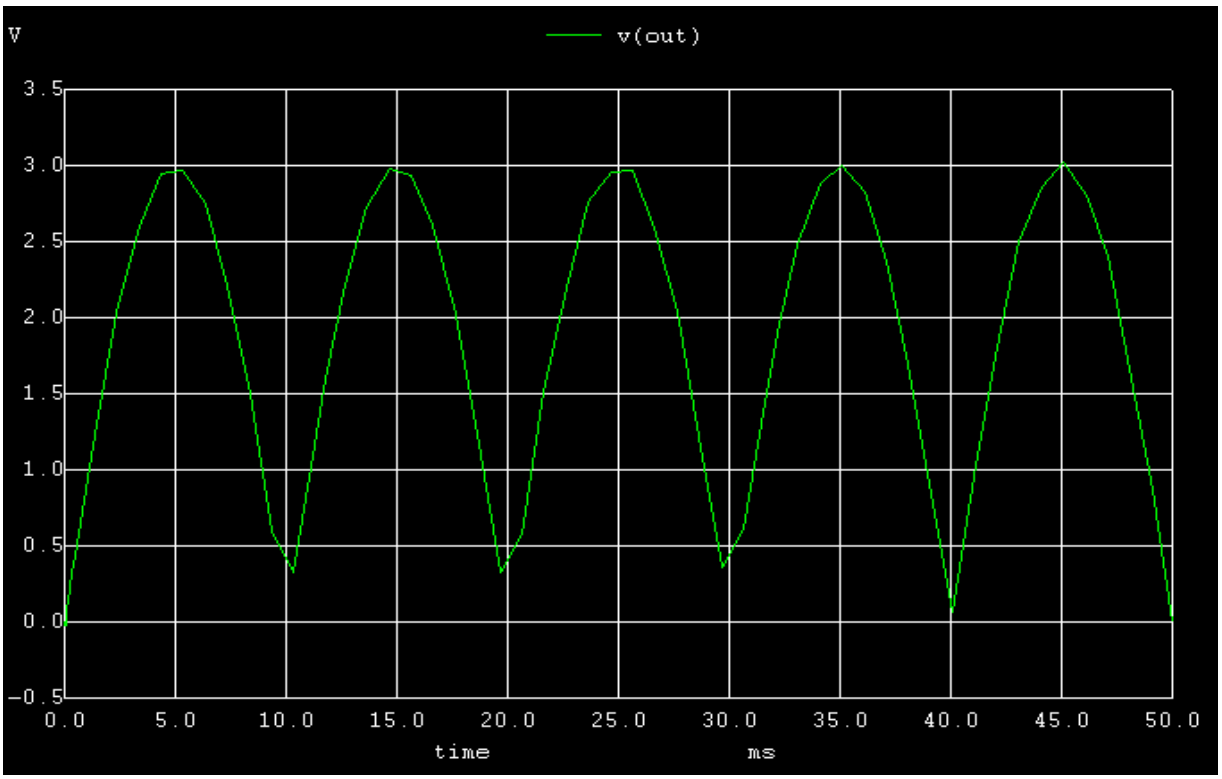
SIMULATION RESULTS:

NGSPICE PLOTS:

INPUT PLOT

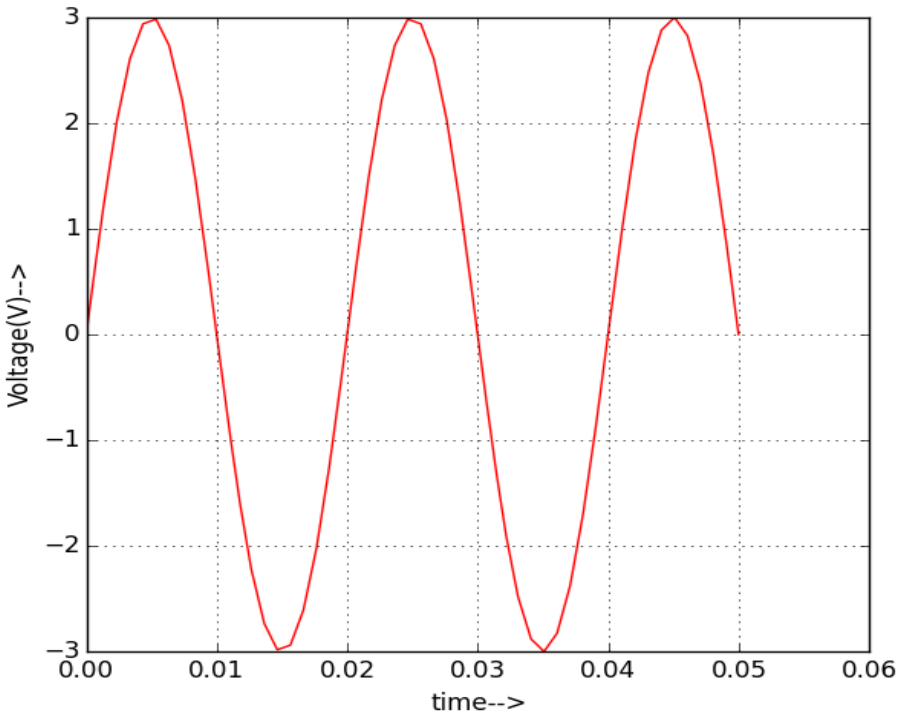


OUTPUT PLOT

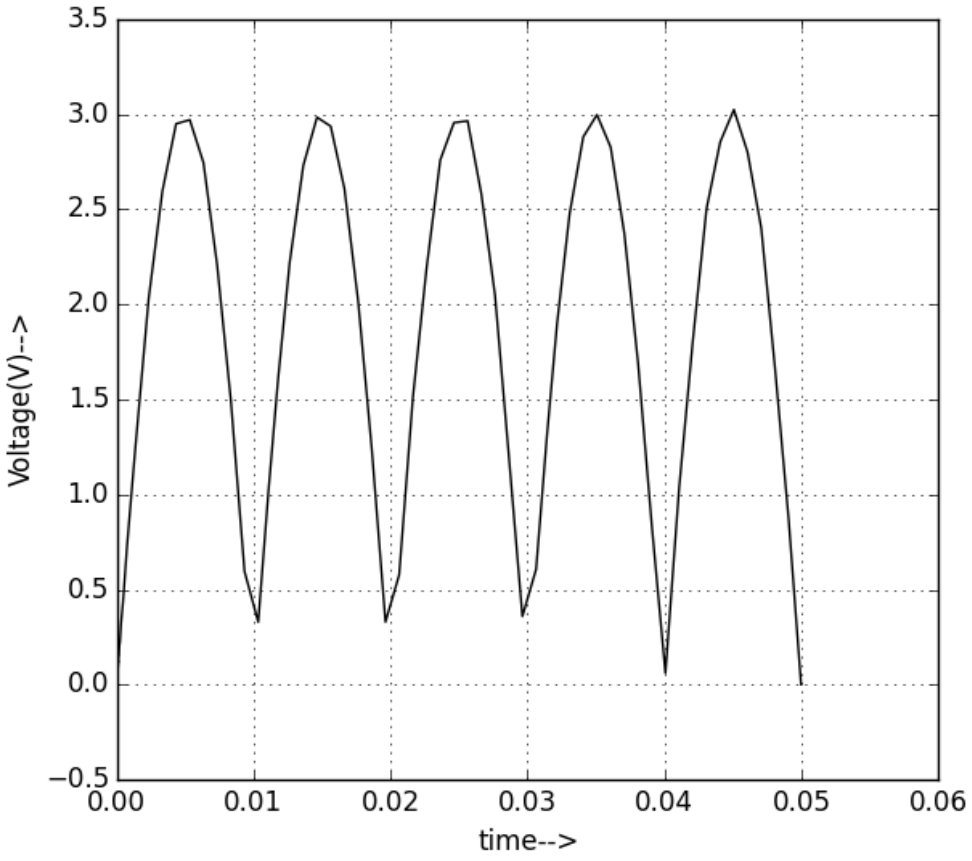


PYTHON PLOTS:

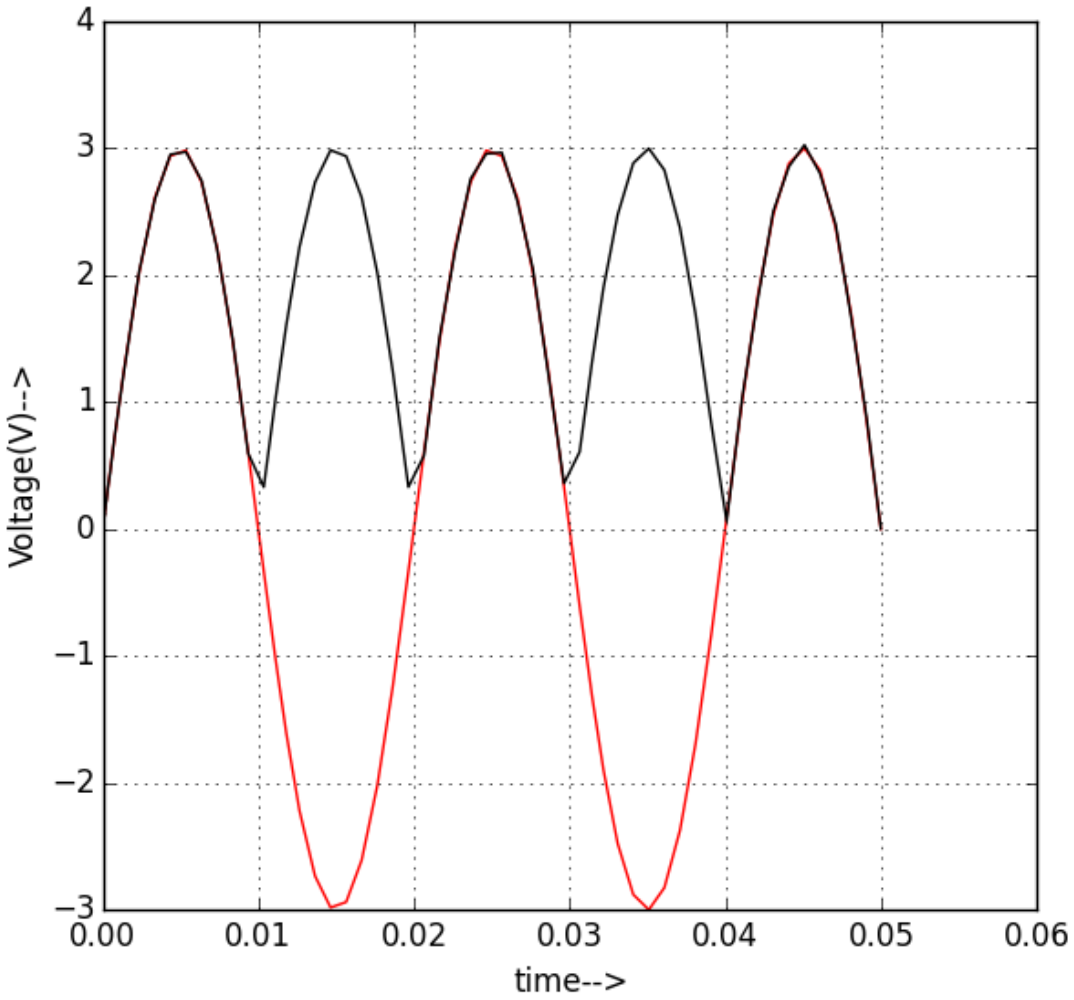
INPUT PLOT



OUTPUT PLOT



INPUT AND OUTPUT PLOT



CONCLUSION:

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

REFERENCES:

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