Heaven's light is our guide.

Rajshahi University of Engineering and Technology (RUET)

Department of Electrical & Electronic Engineering

Course no. EEE2204

Course title: Electronics III Sessional

Experiment no. 03

Experiment name: Experimental study of precision half wave and full wave rectifier circuits using Op-Amp.

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Date of experiment: March 10, 2021.

Date of submission: March 25, 2021.

Experiment no. 03

Name of the Experiment: Experimental study of precision half wave and full wave rectifier circuits using Op-Amp.

Objectives: Followings are the main objectives of this experiment,

1. To understand the theory of operation of precision half wave and full wave rectifier circuits.
2. To study the diode applications in precision half wave and full wave rectifier circuits.
3. To observe wave shapes that meet the precision half wave and full wave rectifier circuits' needs.

List of Components:

1. Function Generator
2. DC power supply (61mV)
3. Resistors (1kΩ; 4 pieces)
4. Op- Amp (µA741; 2 pieces)
5. Diode (1N 4007; 2 pieces)
6. Oscilloscope
7. Project board
8. Connecting wires
9. Simulator (Multisim 11.0)

Circuit diagram:

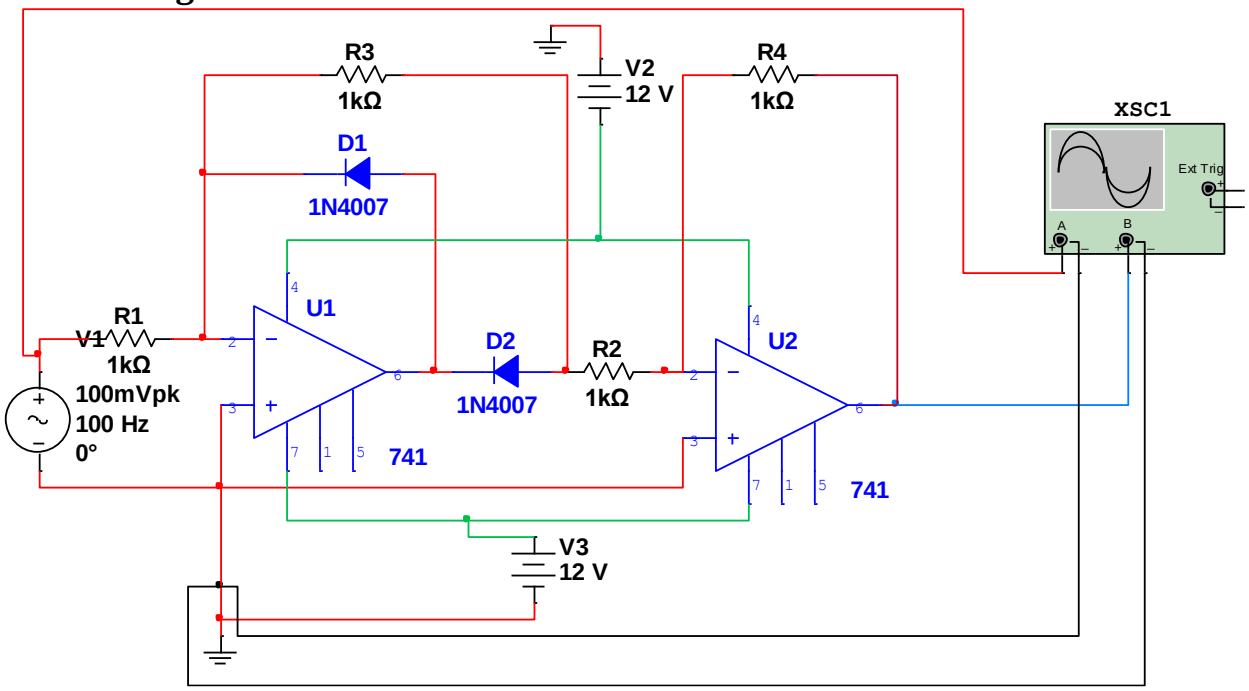


Fig 1.1: *Circuit diagram for precision half wave rectifier circuits using Op-Amp.*

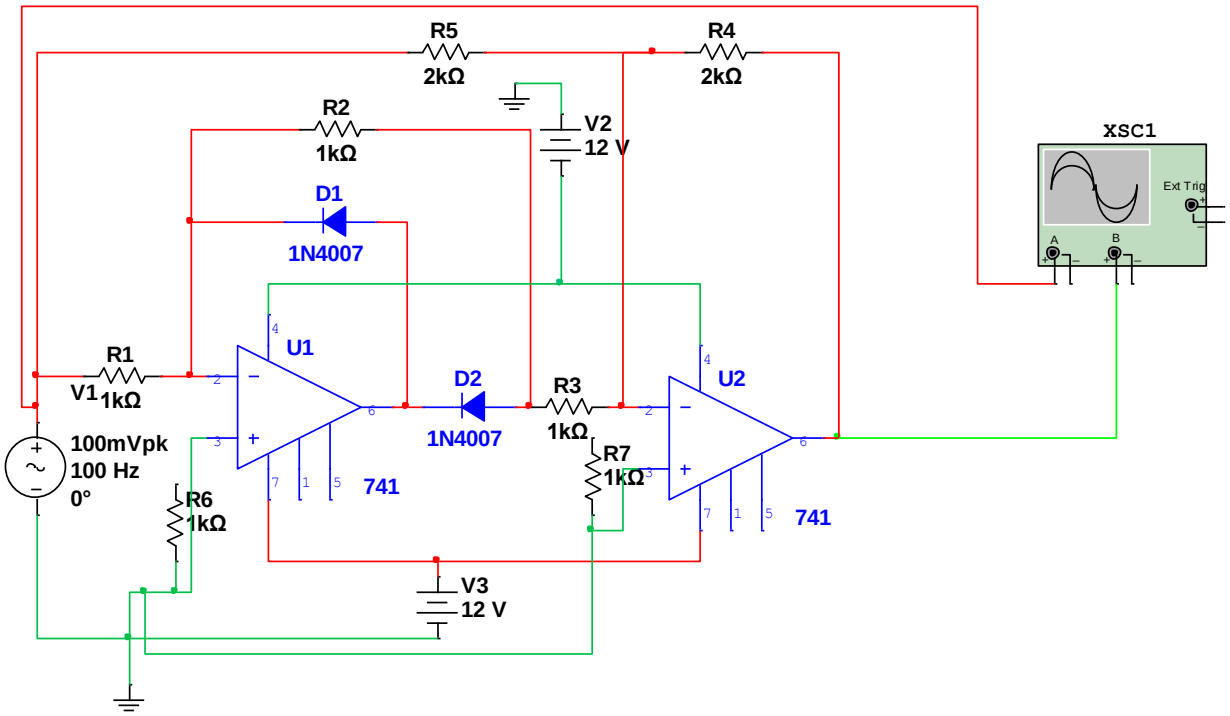
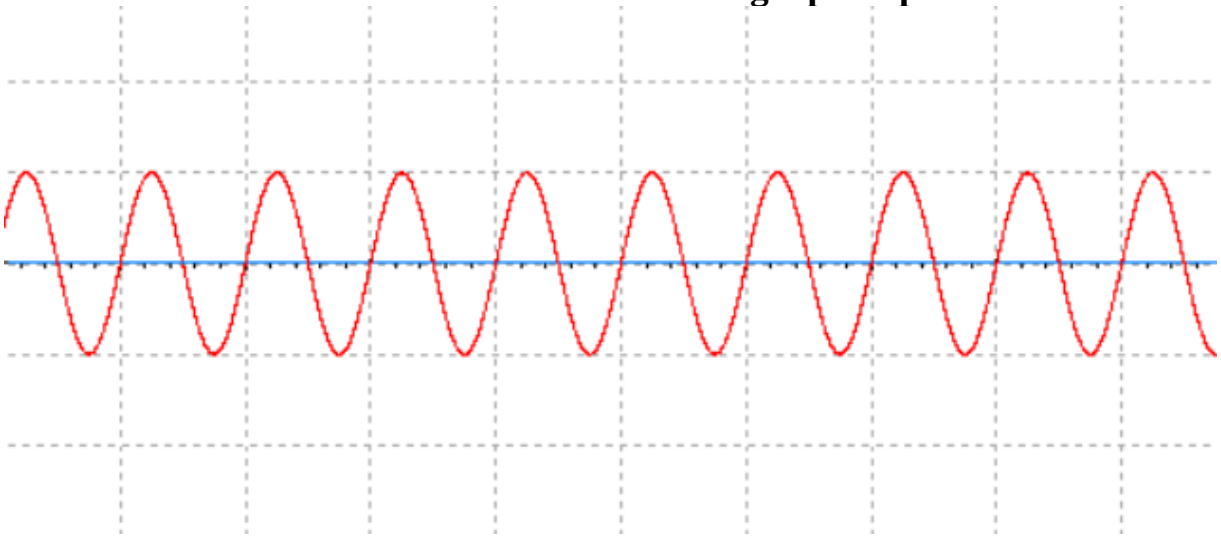


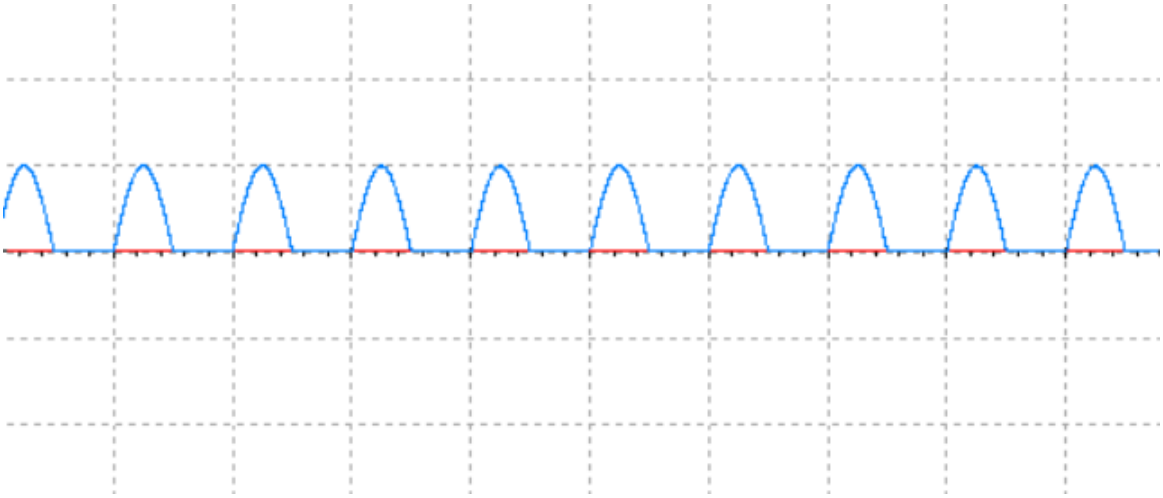
Fig 1.2: *Circuit diagram for precision full wave rectifier circuits using Op-Amp.*

Waveshape:

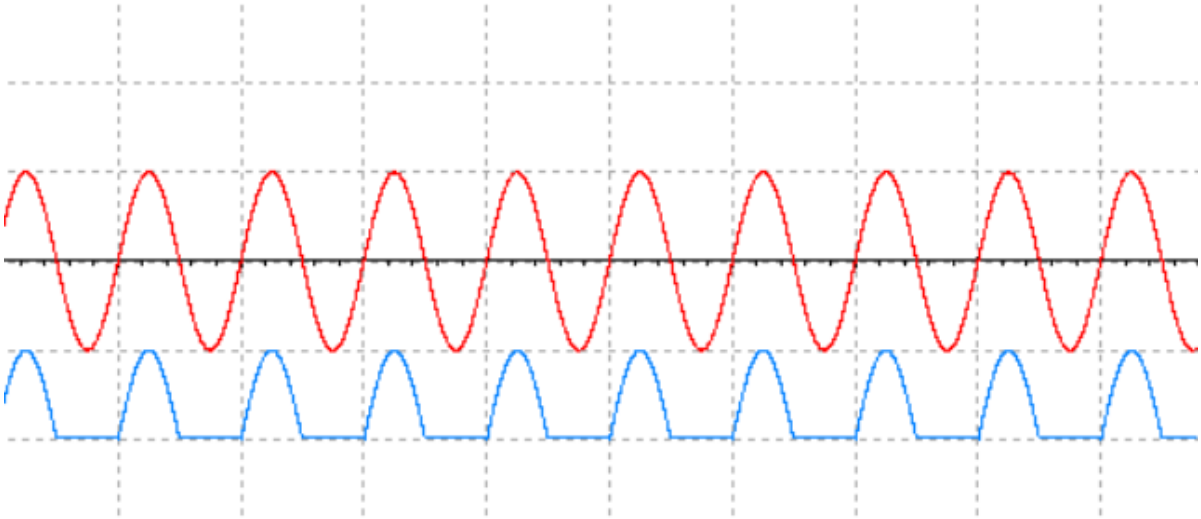
1. Precision half wave rectifier circuits using Op-Amp:



Graph 1.1: *Input signal for precision half wave rectifier circuits using Op-Amp.*

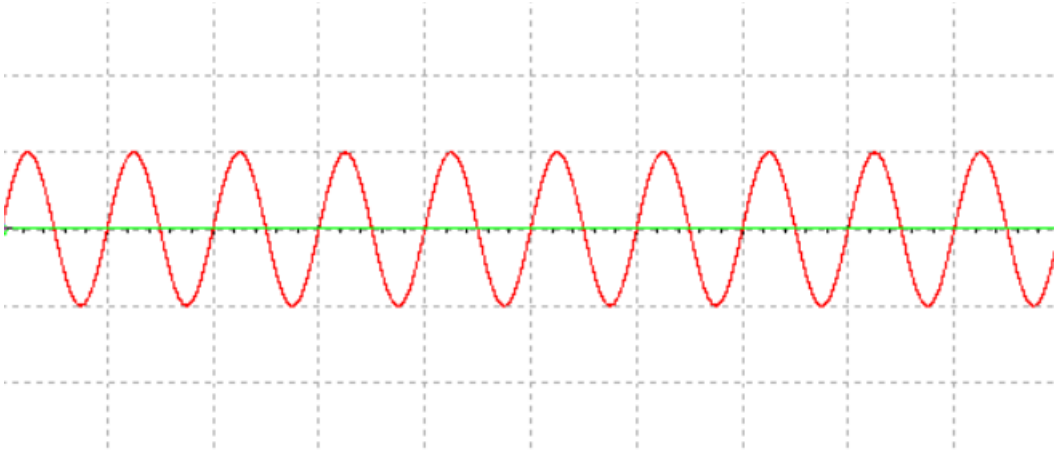


Graph 1.2: *Output signal for precision half wave rectifier circuits using Op-Amp.*

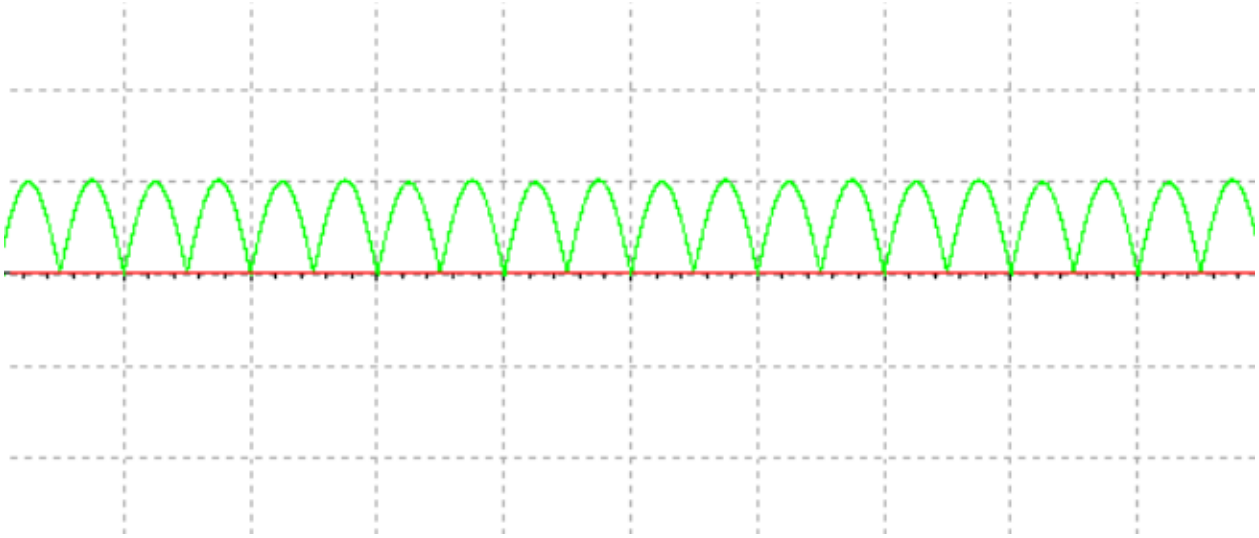


Graph 1.3: *Input and output signal for precision half wave rectifier circuits using Op-Amp.*

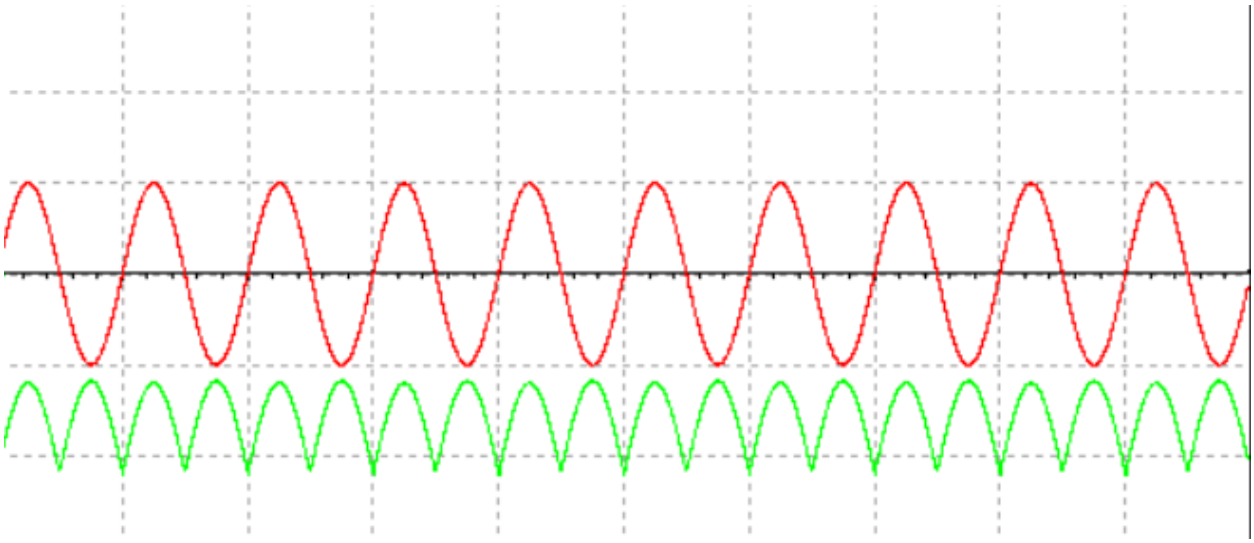
2. Precision full wave rectifier circuits using Op-Amp:



Graph 2.1: *Input signal for precision full wave rectifier circuits using Op-Amp.*



Graph 2.2: *Output signal for precision full wave rectifier circuits using Op-Amp.*



Graph 2.3: *Input and output signal for precision full wave rectifier circuits using Op-Amp.*

Result:

In precision half wave rectifier circuit, in positive half cycle, output was almost equal to input but negative half cycle was completely clipped.

In precision full wave rectifier circuit, negative half cycle was inverted and was same as positive half cycle.

Conclusion:

For both precision half wave and full wave rectifier circuit, the desired output signal was obtained when large input signal was given.

In case of precision half wave rectifier circuit, R_1, R_2, R_3 and R_4 were equal in value. For positive half cycle, D_2 was short circuited. Therefore, V_{out} is equal to $V_{in.}$ On the other hand, for negative half cycle, D_2 was open and D1 was short circuited. V_{out} becomes zero.

In case of precision full wave rectifier circuit, R_1, R_2, R_3, R_6, R_7 were equal in value and R_4 and R_5 were double their value. For positive half cycle, D_2 was short. So, source voltage and output of the first op-amp, both worked as an adder circuit where R5 was feedback for second op-amp. The output of this adder is equal to $V_{in.}$ On the other hand, for negative half cycle, D_2 was open. V_{out} was just inverted.