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. 04

Experiment name: Experimental study of a comparator and a Zero crossing detector circuit using Op-Amp.

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Date of experiment: March 18, 2021.

Date of submission: March 24, 2021.

Experiment no. 04

Name of the Experiment: Experimental study of a comparator and a Zero crossing detector circuit using Op-Amp.

Objectives: Followings are the main objectives of this experiment,

1. To understand the theory of operation of a comparator and a Zero crossing detector circuit.
2. To study the Op-Amp applications in a comparator and a Zero crossing detector circuit.
3. To observe wave shapes that meet a comparator and a Zero crossing detector circuits' needs.

List of Components:

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

Circuit diagram:

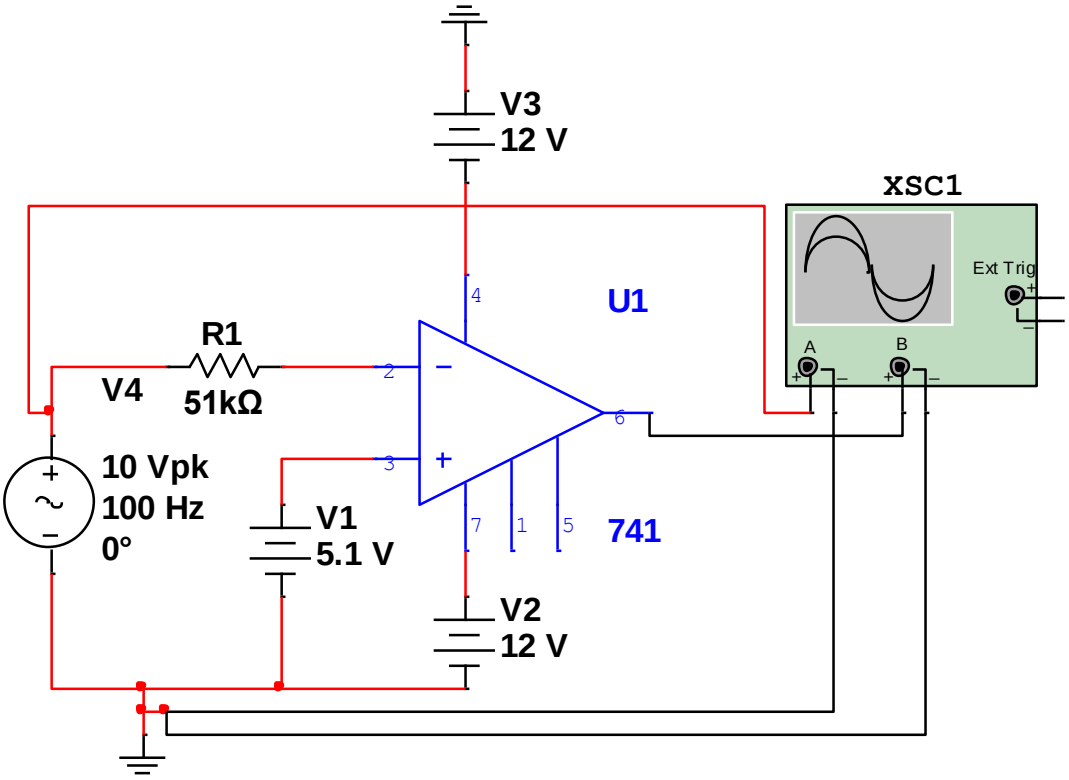


Fig 1.1: *Circuit diagram for a comparator circuit using Op-Amp.*

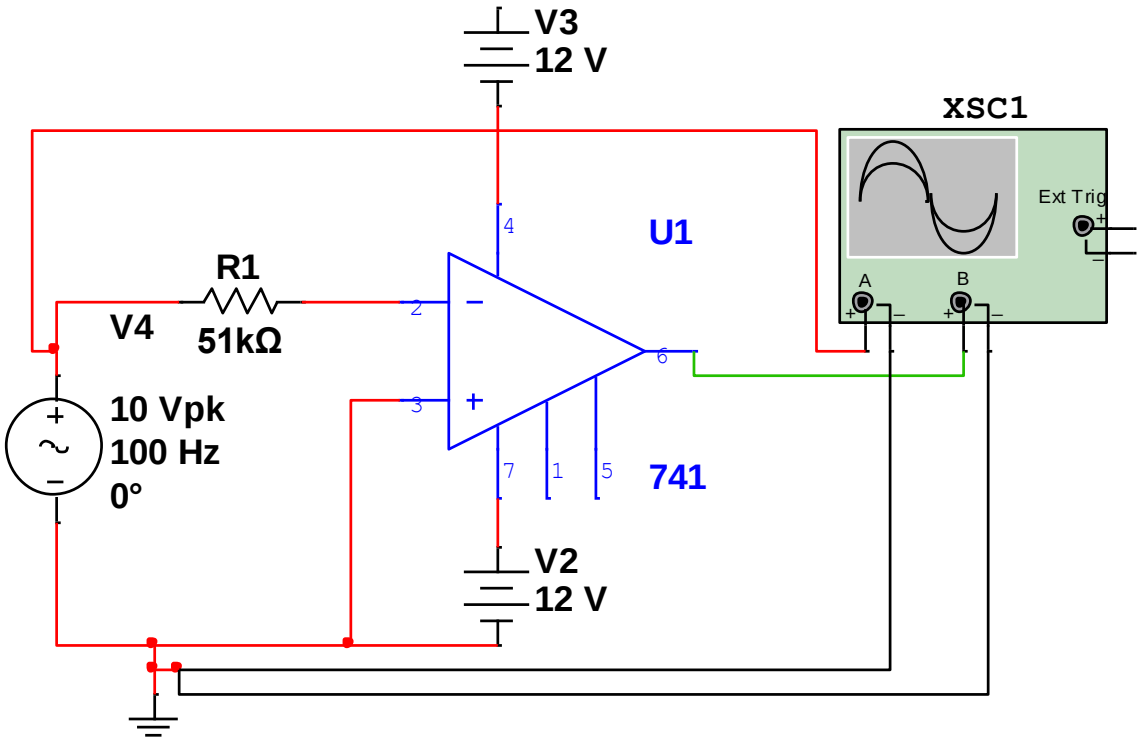
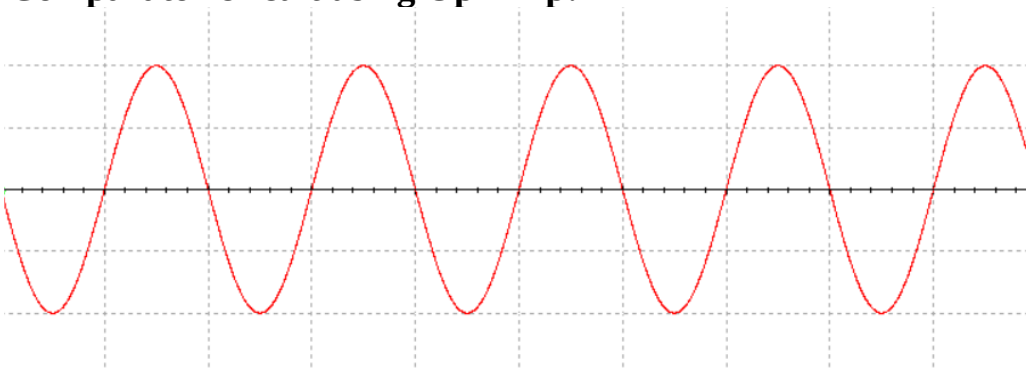


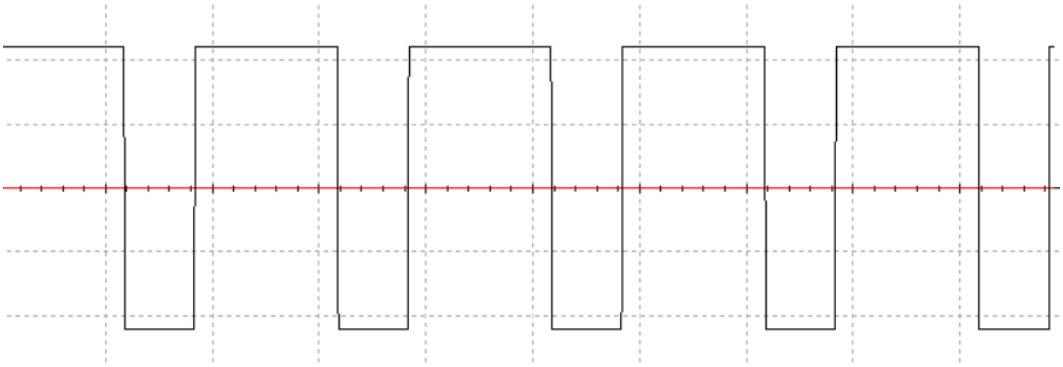
Fig 1.2: *Circuit diagram for zero-crossing detector circuits using Op-Amp.*

Waveshape:

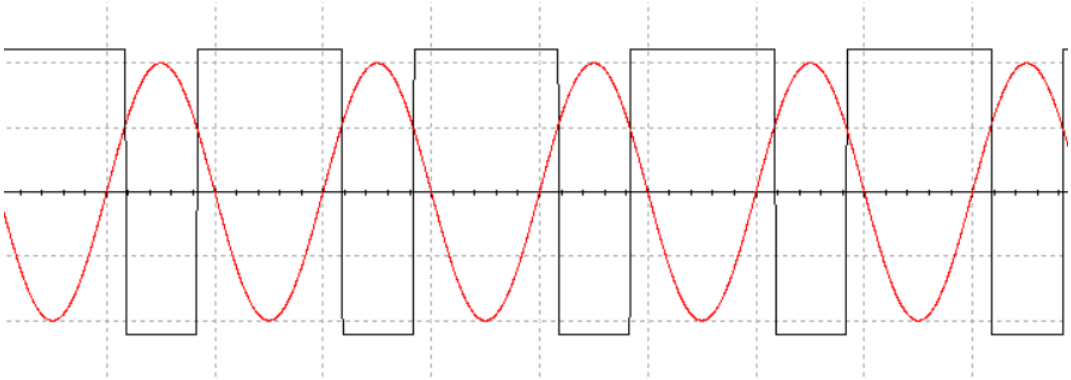
1. Comparator circuit using Op-Amp:



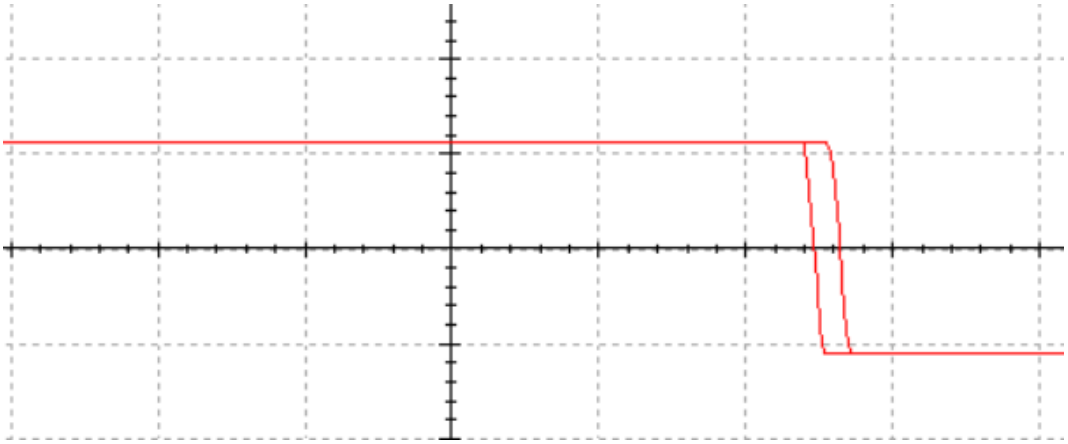
Graph 1.1: *Input signal for a comparator circuit using Op-Amp.*



Graph 1.2: *Output signal for a comparator circuit using Op-Amp.*



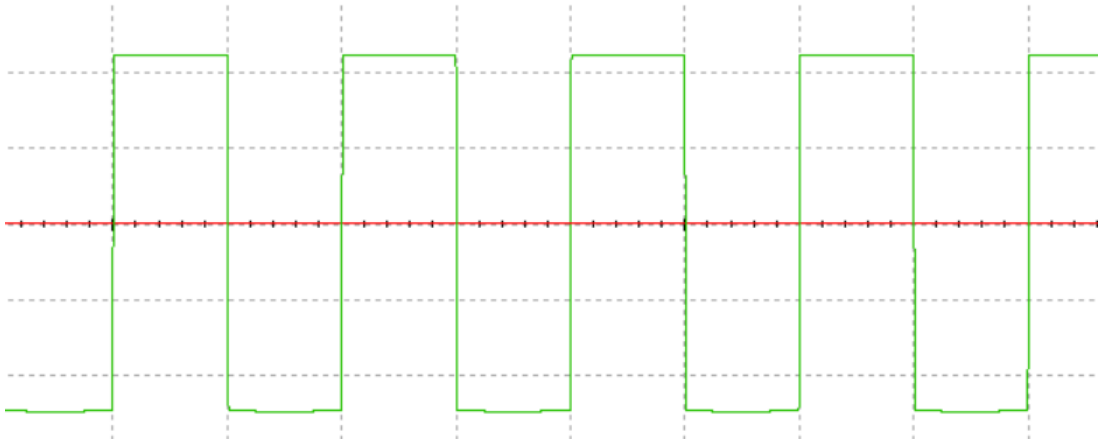
Graph 1.3: *Input and output signal for a comparator circuit using Op-Amp.*



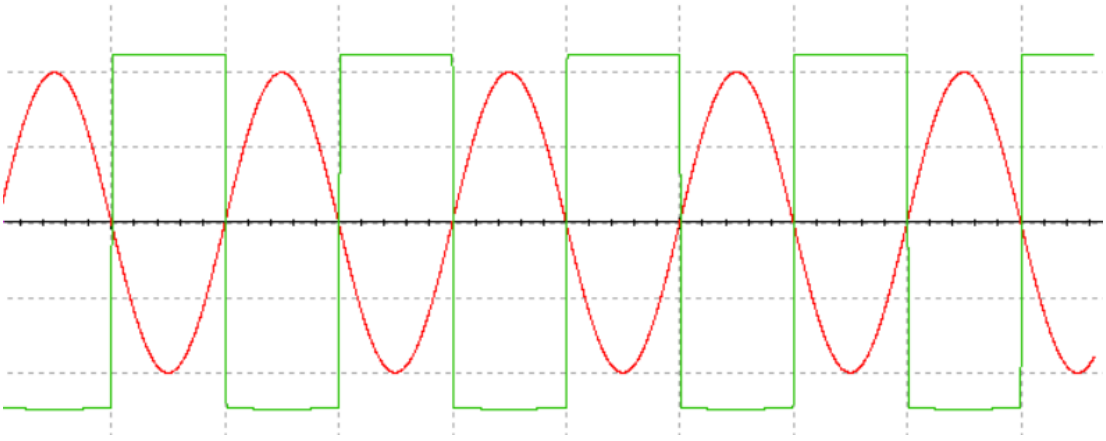
Graph 1.4: *Transfer characteristics for a comparator circuit using Op-Amp.*

2. Zero crossing detector circuits using Op-Amp:

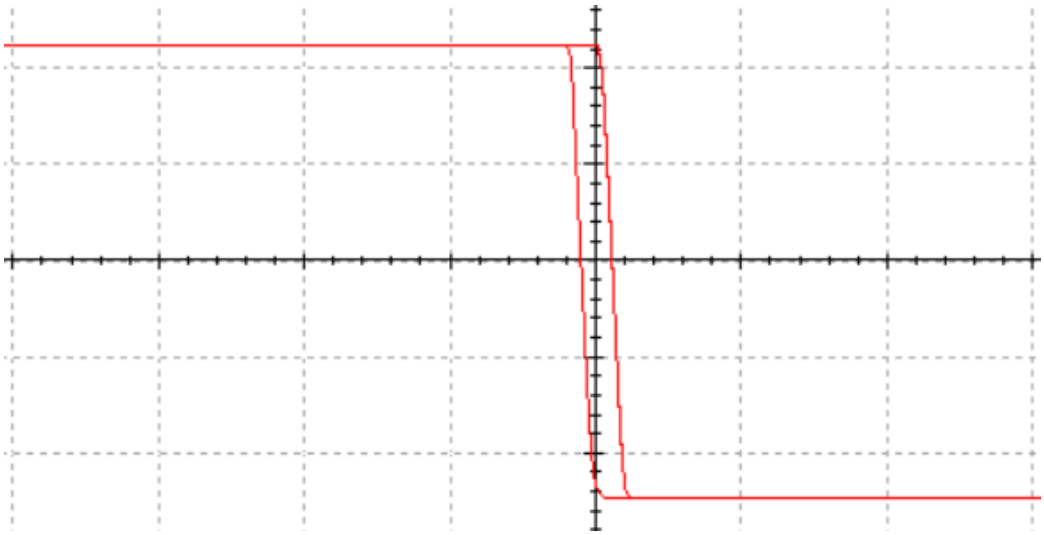
Graph 2.1: *Input signal for zero-crossing detector circuits using Op-Amp.*



Graph 2.2: *Output signal for zero-crossing detector circuit using Op-Amp.*



Graph 2.3: *Input and output signal for zero-crossing detector circuits using Op-Amp.*



Graph 2.4: *Transfer characteristics for a zero-crossing detector circuit using Op-Amp.*

Result:

In comparator circuit, for input sinusoidal signal, a digital signal with a positive peak of $+V_{CC}$ and negative peak of $-V_{CC}$ which intercepted the positive half cycle of input voltage at a reference voltage of 4.8V was found at the output.

In zero-crossing detector circuit, for input sinusoidal signal, a digital signal with $-V_{CC}$ and V_{CC} peaks which crossed the input signal at zero voltage was obtained at the output.

Conclusion: