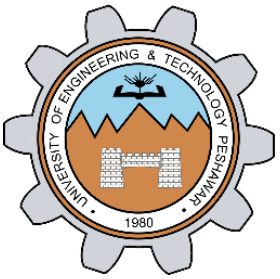
LAB 06: Clampers



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CSE-206L Electronic Circuits Lab

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LAB 06 CLAMPERS

Objectives of the lab:

To become familiar with the function and operation of clampers

Equipment:

- Oscilloscope
- Function Generator
- Digital Multimeter

Components:

- Silicon Diode (D1N4002)
- Resistors (2.2k ohms, 3.3k ohms)
- Capacitor 1μF

Diode:

A diode is a two-terminal electronic component with asymmetric conductance; it has low (ideally zero) resistance to current flow in one direction and high (ideally infinite) resistance in the opposite direction. It's like a one-way valve for electrical current, allowing it to flow freely in one direction while blocking it in the other. Diodes are commonly used in various electronic circuits for rectification, signal modulation, voltage regulation, and many other purposes. They come in various types, such as the standard semiconductor diodes, light-emitting diodes (LEDs), Scotty diodes, and Zener diodes, each designed for specific applications.

Clamper:

A clamper is an electronic circuit that changes the DC level of a signal to the desired level without changing the shape of the applied signal. In other words, the clamper circuit moves the whole signal up or down to set either the positive peak or negative peak of the signal at the desired level. The dc component is simply added to the input signal or subtracted from the input signal. A clamper circuit adds the positive dc component to the input signal to push it to the positive side. Similarly, a clamper circuit adds the negative dc component to the input signal to push it to the negative side.

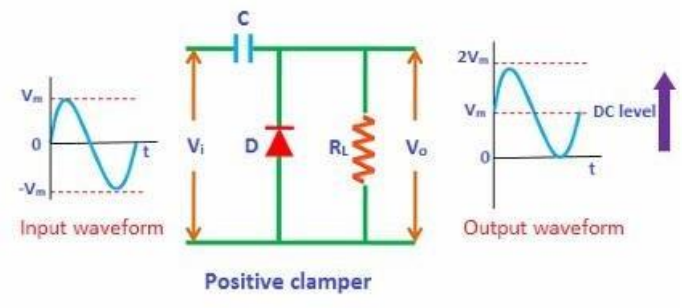

Figure 1 POSITIVE CLAMPER CIRCUIT

Procedure:

Part A:

Clampers (R,C Diode combination):

1. Build the circuit shown in Figure 2.
2. Use a sine wave signal that goes from 0 volts to 16 volts and back to 0 volts with a frequency of 1000 Hertz as the input.
3. Write down the resistance value you find in the circuit.
4. Change the oscilloscope to DC mode.
5. Connect the oscilloscope probes to the function generator and draw what the input waveform looks like.

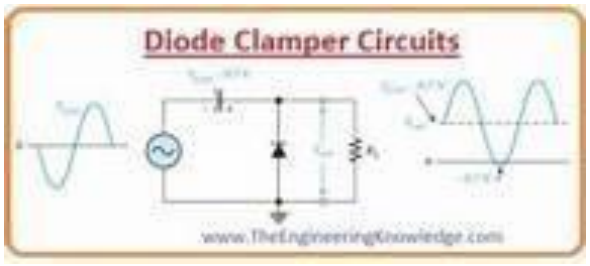

Figure 2 the clamper circuit

Output:

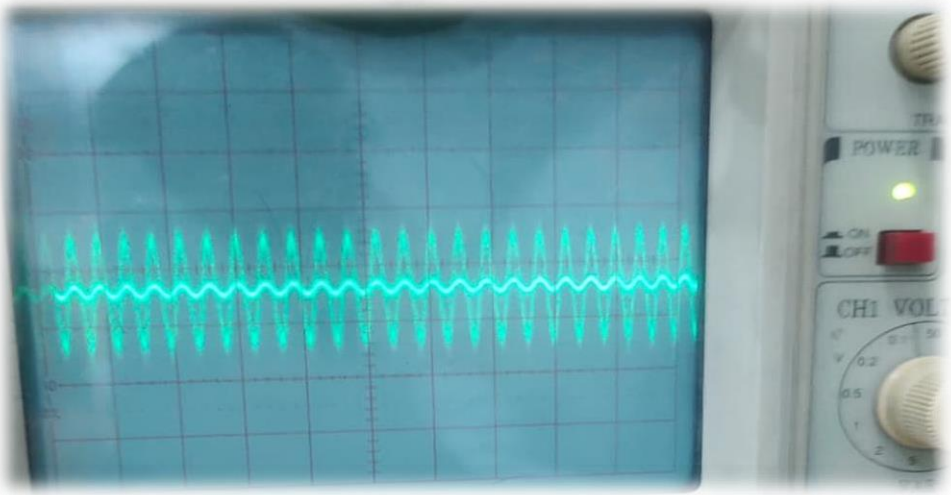

Figure 3 output of a clamper circuit on oscilloscope

Results:

Resistor R = 100 KΩ

V_T = 0.49 V

E = -4.70 V

V_O = -5– 2.29 = -7.29 V

Measured V_O = 7.1 V

Part B

Clampers with DC:

- Construct the circuit in Fig 4 and record the measured values

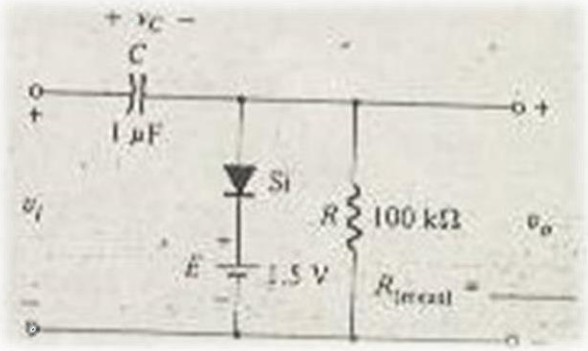

Figure 4 clamper circuit with DC supply

Figure 5 circuit for clampers on breadboard

Output:

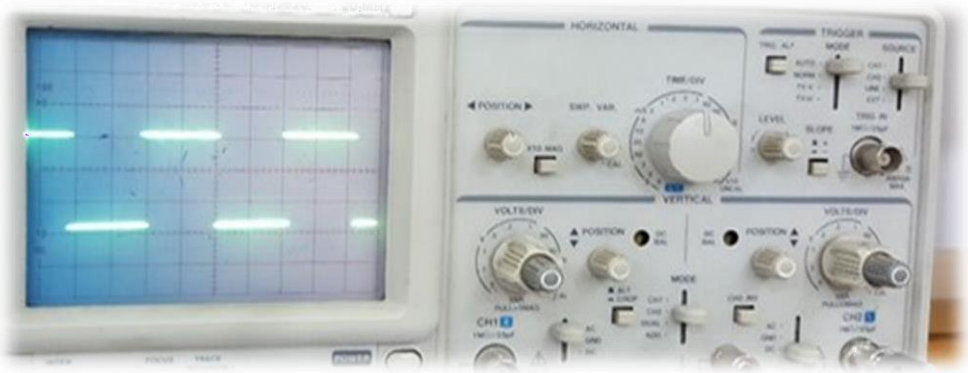

Figure 6 Showing the output of clamper with DC supply

Results:

Resistor R = 1.01 KΩ

V_T = 0.49 V

DC Supply = 5 V

By KVL V_O = 5.22 + 2.3V = 7.52V

Measured V_O = 7.3V

Conclusion:

1. Clampers can boost the average level of a signal.
2. To clean up the output signal, we use a large-value resistor alongside the diode.
3. By adding a DC power source to the clamper setup, we can shift the signal's average level.