Practical No.13: Construct clamper circuit and observe waveforms

I Practical Significance

A Clamper circuit can be defined as the circuit that consists of a dio a resistor and a capacitor that shifts the waveform to a desired DC le without changing the actual appearance of the applied signal. Clampers be constructed in both positive and negative polarities. Clamper essentia adds a DC level to the AC output signal; clampers are commonly used analog TV receivers.

II Industry / Employer Expected Outcome

This practical is expected to develop the following skill: **'Use electro components and circuits in electrical equipment and systems'.**

III Course Level Learning Outcome

Use semiconductor transistors in different applications.

IV Laboratory Learning Outcomes

1. Construct and Test Positive Clamper Circuit
2. Construct and Test negative Clamper Circuit

V Relevant Affective Domain related Outcomes

1. Handle components and equipment with care.
2. Work in team.

VI Minimum Theoretical Background

A clamper is an electronic circuit that changes the DC level of a sig to the desired level without changing the shape of the applied signal. In ot words, the clamper circuit ADDS positive or negative DC level. The component is simply added to the input signal or subtracted from the in signal. A clamper circuit adds the positive dc component to the input sig to push it to the positive side. Similarly, a clamper circuit adds the negat dc component to the input signal to push it to the negative side.

Positive clamper

If the circuit pushes the signal upwards then the circuit is said to b positive clamper. When the signal is pushed upwards, the negative peak of signal meets the zero level. The positive clamper is made up of a volt source Vi, capacitor C, diode D, and load resistor RL. In the Figure 1 diagram, the diode is connected in parallel with the output load. So positive clamper passes the input signal to the output load when the di is reverse biased and blocks the input signal when the diode is forward bias

During negative half cycle:

During the negative half cycle of the input AC signal, the diode is forward biased and hence no signal appears at the output. In forward biased condition, the diode allows electric current through it. This current will flows to the capacitor and charges it to the peak value of input voltage Vm. The capacitor charged in inverse polarity (positive) with the input voltage. As input current or voltage decreases after attaining its maximum value -Vm, the capacitor holds the charge until the diode remains forward biased.

During positive half cycle:

During the positive half cycle of the input AC signal, the diode is reverse biased and hence the signal appears at the output. In reverse biased condition, the diode does not allow electric current through it. So, the input current directly flows towards the output.

Negative clamper

During positive half cycle:

During the positive half cycle of the input AC signal, the diode is forward biased and hence no signal appears at the output. In forward biased condition, the diode allows electric current through it. This current will flow to the capacitor and charges it to the peak value of input voltage in inverse polarity -Vm. As input current or voltage decreases after attaining its maximum value Vm, the capacitor holds the charge until the diode remains forward biased.

During negative half cycle:

During the negative half cycle of the input AC signal, the diode is reverse biased and hence the signal appears at the output. In reverse biased condition, the diode does not allow electric current through it. So, the input current directly flows towards the output.

VII Practical setup in Laboratory

(a) Sample

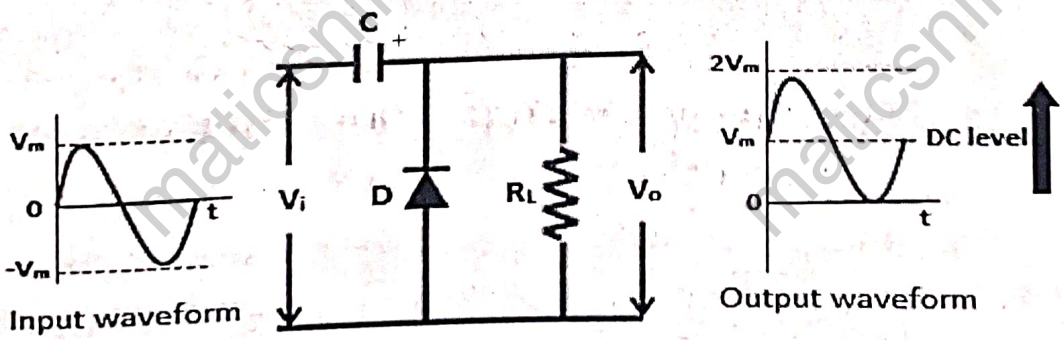


Figure 13.1: Circuit diagram of Positive clamper.

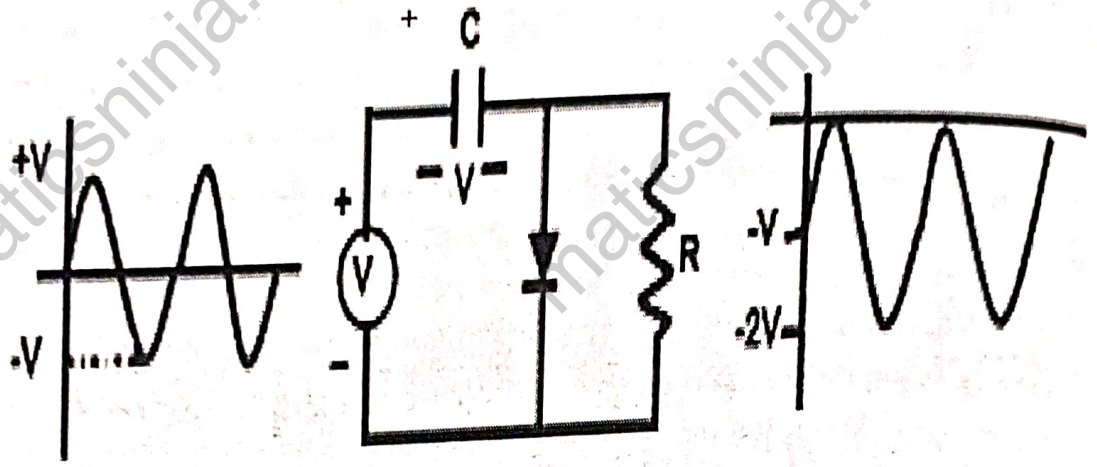
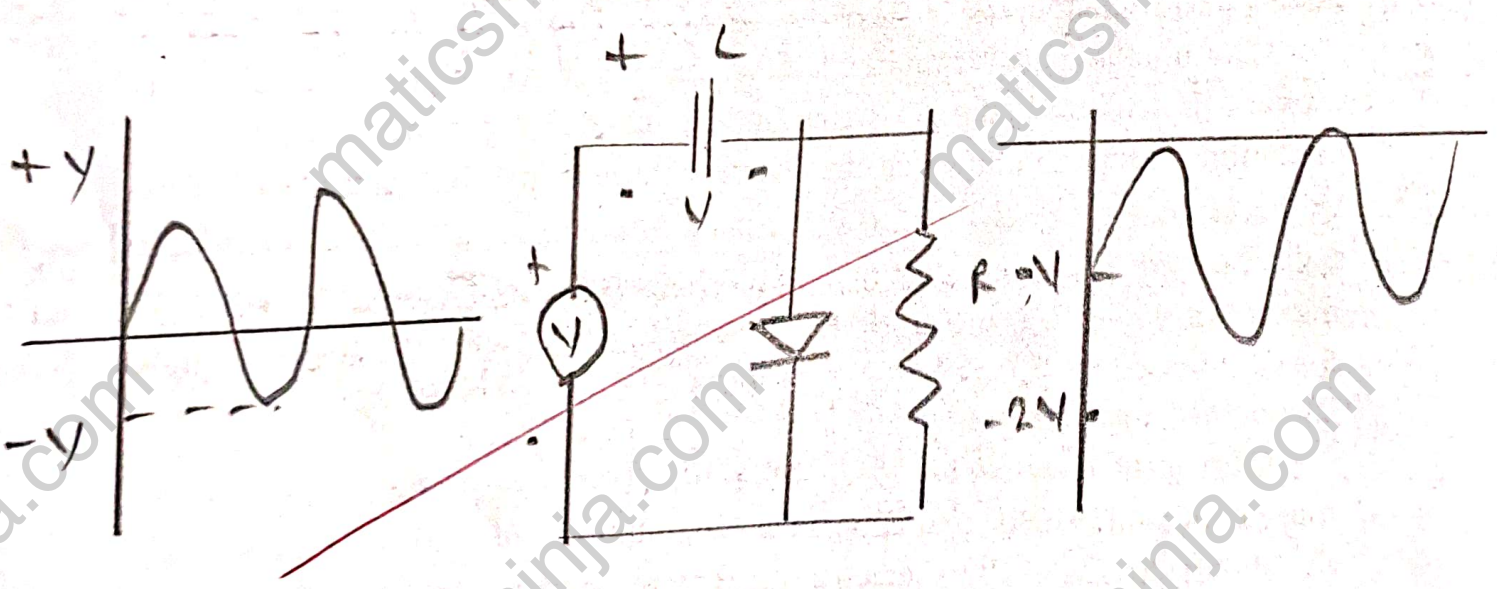


Figure 13.2: Circuit diagram of Negative clamper.

(b) Actual Circuit Diagram used in Laboratory



(c) Actual practical set up used in Laboratory

VIII Required Resources/apparatus/equipment with specifications

Sr. No	Instruments/Components	Specification	Quantity
1	Digital Multimeter	3 ½ -digit display with AC and DC voltage measurement and Current measurement facility and Diode testing facility.	1
2.	Cathode Ray Oscilloscope	Dual Trace 20Mhz. 1 5Mega ohm Input impedance.	1
3.	Function Generator	0-2 MHz with Sine, square and triangular output with variable frequency and amplitude.1MHz, Multi waveform output	1
4.	Diode	IN4007(or any other equivalent diode)	1
5.	Resistors	1 KΩ (0.5watts/0.25watts	1
6.	Capacitor	1μf (or any other capacitor value)	1
7.	Bread board	5.5 CM X 17CM	1
8.	Connecting wires	Single strand Teflon coating (0.6mm)	As per requirement

IX Precautions to be followed

1. Care should be taken while handling the terminals of components.
2. Connect wire tightly while building circuits.
3. Do not switch ON the power supply unless you have checked the circuit connections as per the circuit diagram.

X Procedure

1. Make the connections on breadboard as per circuit diagram as shown in figure 13.1 and 13.2
2. Apply sine wave as input of 8V peak to peak to the circuit.
3. Observe and draw the input and output waveforms from CRO.

XI Observation Table

Table 1: Positive clamper circuit

Sr. No.	Vin(volts)	Vout (Volts)	Output Waveform	Comment
1.	5.5	4.4	sine	

Table 2: Negative clamper circuit

Sr. No.	Vin(volts)	Vout (Volts)	Output Waveform	Comment
1.	5	4.3	square	

XII Results

In this practical we learn about constraction of clipper circuit.

XIII Interpretation of results

We observe the output wave form of clipper circuit CRO.

XIV Conclusions and Recommendation

XV Practical related Questions

1. Repeat the above experiment for input voltage 6 volt peak to peak and 2 vo peak to peak.
2. Repeat the above experiment for 4 volt peak to peak and observe output an input.
3. Compare between clipper and clamper circuit

[Space for answers]

(3) - - - - - ?

→ The major difference between clipper and clamper is that clipper is a limiting circuit and which limits the output voltage while clamper is a circuit which shifts the DC level of output voltage. The clipper and clamper circuits are exctly working principal.