EXPERIMENT NO: 4

AIM: Construct biased and unbiased series and shunt clipping circuits & combinational clipper circuit for positive and negative peak clipping of a sine wave.

THEORY: A clipper is an electronic circuit that produces an output by removing a part of the input above or below a reference value. That means, the output of a clipper will be same as that of the input for other than the clipped part. Due to this, the peak-to-peak amplitude of the output of a clipper will be always less than that of the input. The main advantage of clippers is that they eliminate the unwanted noise present in the amplitude of an ac signal.

Clippers can be classified into the following two types based on the clipping portion of the input.

- Positive Clipper
- Negative Clipper

(a)Positive Clipper: A positive clipper is a clipper that clips only the positive portion(s) of the input signal. In the circuit shown below, a sinusoidal voltage signal V_t is applied to the non-inverting terminal of the op-amp. The value of the reference voltage V_{ref} can be chosen by varying the resistor R_2.

The operation of the circuit shown above is explained below.

If the value of the input voltage V_i is less than the value of the reference voltage V_{ref}, then the diode D1 conducts. Then, the circuit given above behaves as a voltage follower. Therefore, the output voltage V_0 of the above circuit will be same as that of the input voltage V_i, for $V_i < V_{ref}$.

If the value of the input voltage V_i is greater than the value of reference voltage V_{ref}, then the diode D1 will be off. Now, the op-amp operates in an open loop since

the feedback path was open. Therefore, the output voltage V_0 of the above circuit will be equal to the value of the reference voltage V_{ref}, for $V_i > V_{ref}$.
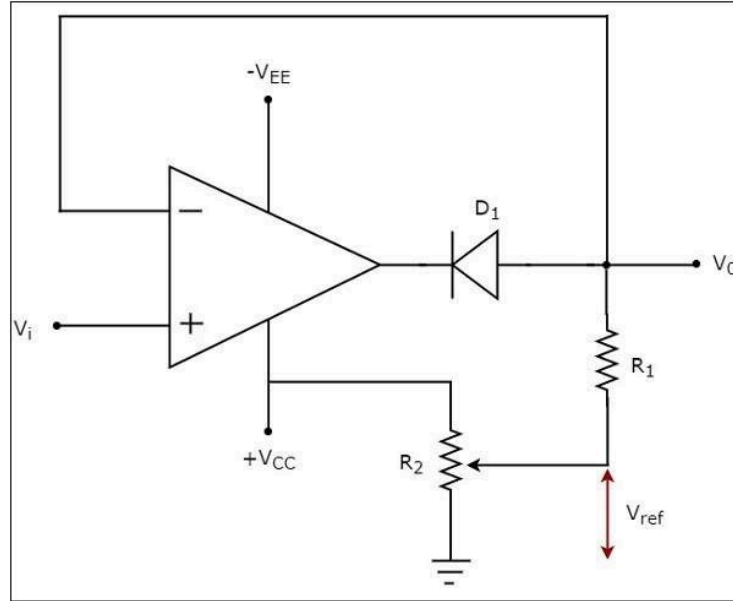
CIRCUIT DIAGRAM:

Figure4.1: Circuit diagram of positive clipper circuit.

WAVEFORMS:

The input wave form and the corresponding output wave form of a positive clipper for a positive reference voltage V_{ref}, are shown in the following figure
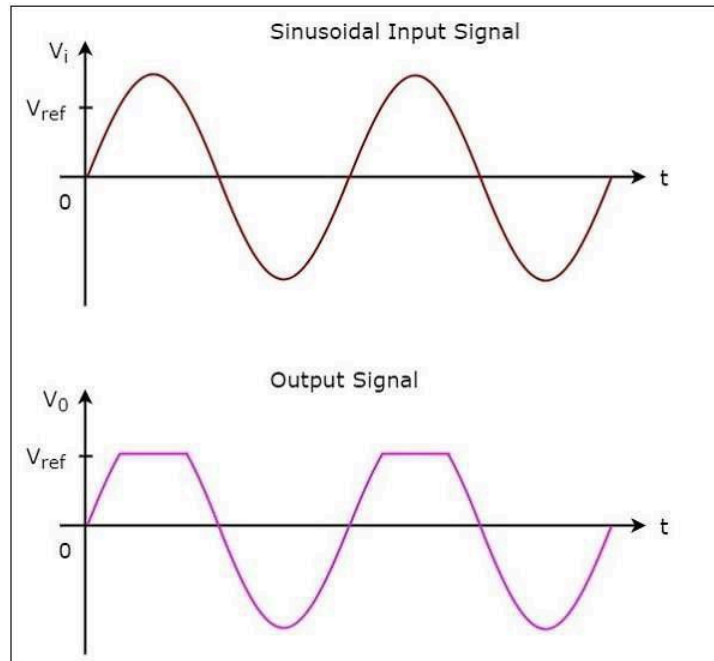
Figure4.2: Input and output waveforms of positive clipper circuit.

Observation:

Vi = ?

Vo = ?

Draw the input and output waveforms on the graph.

Graph:

(b)Negative Clipper: A negative clipper is a clipper that clips only the negative portion(s) of the input signal. We can obtain the circuit of the negative clipper just by reversing the diode and taking the reverse polarity of the reference voltage, in the circuit that you have seen for a positive clipper. The circuit diagram of a negative clipper is shown in the following figure. In the given circuit, a sinusoidal voltage signal V_i is applied to the non-inverting terminal of the op-amp. The value of the reference voltage V_{ref} can be chosen by varying the resistor R_2.

The operation of a negative clipper circuit is explained below.

If the value of the input voltage V_t is greater than the value of reference voltage V_{ref}, then the diode D1 conducts. Then, the above circuit behaves as a voltage follower. Therefore, the output voltage V_0 of the above circuit will be same as that of the input voltage V_i for $V_i > V_{ref}$.

If the value of the input voltage Vi is less than the value of reference voltage , then the diode D1 will be off. Now, the op-amp operates in an open loop since the feedback path is open. Therefore, the output voltage V0 of the above circuit will be equal to the value of reference voltage, V_{ref} for $V_i < V_{ref}$.
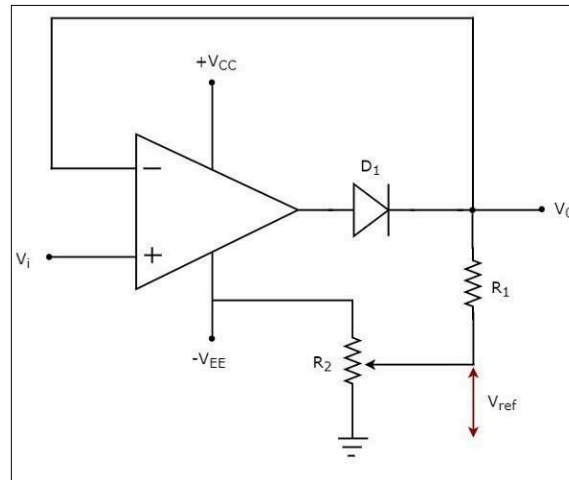
CIRCUIT DIAGRAM:

Figure4.3: Circuit diagram of negative clipper circuit

 WAVEFORMS

The input wave form and the corresponding output wave form of a negative clipper, for a negative reference voltage V_{ref}, are shown in the following figure
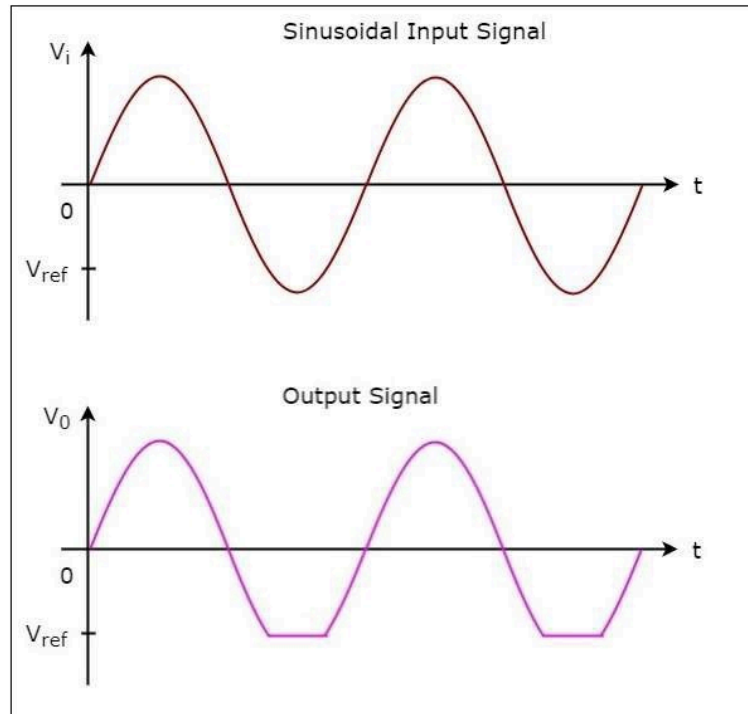
Figure 4.4: Input and output waveforms of negative clipper circuit

Observation:

Vi = ?

Vo = ?

Draw the input and output waveforms on the graph.

Graph:

CONCLUSION