EXPERIMENT NO. 12 & 13

To Study The Operation Of Diode Clampers And Diode Biased Clampers.

OBJECTIVE

- To analyze the clamping circuits
- To plot the output of clamping circuits using equip-mental values

EQUIPMENT REQUIRED

- Capacitor
- Digital multimeter
- Resistors
- Diode
- DC power supply
- Breadboard
- Function generator

THEORY

It adds a DC level to an AC voltage. They are also known as DC resistor. When input voltage initially goes negative, the diode is forward biased and allows the capacitor to charge to the near of peak value of input voltage. The negative peak diode is reverse biased.

This is due to cathode which is nearly equal to the

Vpin – 0.7

Capacitor can only discharge through high resistance of Rn, so from peak of one negative half cycle to the next cycle, capacitor discharge very small.

For any good clamping circuit, Rc time constant should be less than the period of input frequency.

DIODE CLAMPERS

NEGATIVE CLAMPER

The Negative Clamping circuit consists of a diode connected in parallel with the load. The capacitor used in the clamping circuit can be chosen such that it must charge very quickly and it should not discharge very drastically. The anode of the diode is connected to the capacitor and cathode to the ground. During the positive half cycle of the input, the diode is in forward bias and as the diode conducts the capacitor charges very quickly.

During the negative half cycle of the input, the diode will be in reverse bias and the diode will not conduct, the output voltage will be equal to the sum of the applied input voltage and the charge stored in the capacitor during reverse bias. The output waveform is same as input waveform, but shifted below 0 volts.

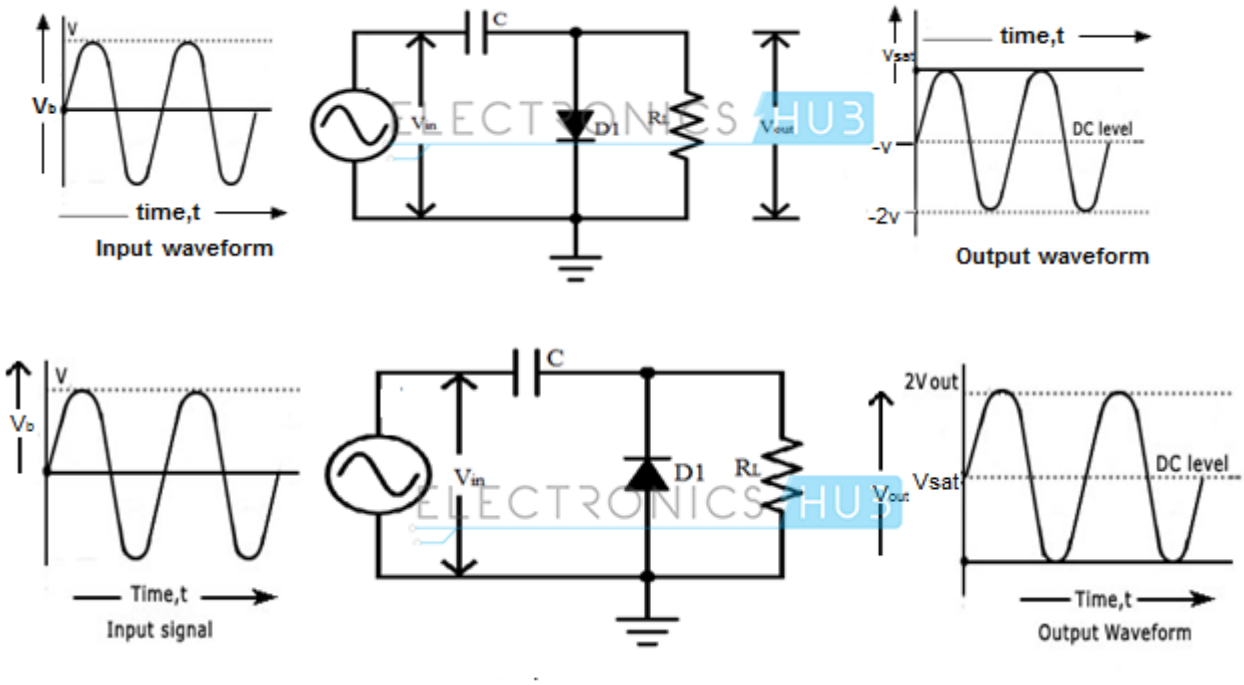

FIG 6.2

NEGATIVE CLAMPER WITH POSITIVE REFERENCE VOLTAGE

The circuit arrangement is very similar to the Negative clamper circuit, but a DC reference supply is connected in series with the diode. The output waveform is also similar to the Negative clamper output waveform, but it is shifted towards the positive direction by an amount equal to the reference voltage at the diode.

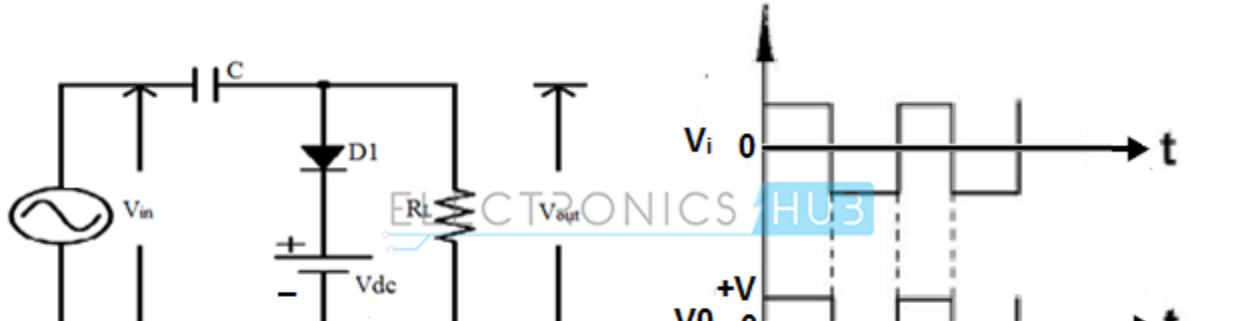

Fig 6.3

NEGATIVE CLAMPER WITH NEGATIVE REFERENCE VOLTAGE

If the reference voltage directions in the above case are reversed and connected to the diode in series, then during the positive half cycle the diode starts conducting current before applying input voltage. Since the cathode has a very small negative reference voltage less than zero volts, the waveform is shifted away from the 0 volts towards the negative direction by an amount of the reference voltage.

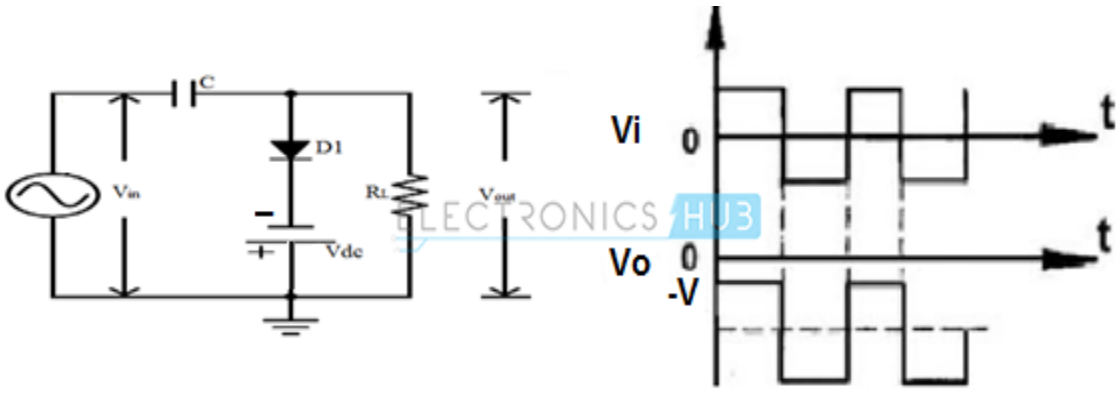

Fig 6.4

POSITIVE CLAMPER WITH POSITIVE REFERENCE VOLTAGE

A positive reference voltage is connected in series with the diode in the positive clamper circuit such that the positive terminal of the reference voltage is connected in series with the anode of the diode. During the positive half wave cycle of the input sinusoidal waveform, the diode starts conducting, because initially the supply voltage is less than the diode's anode positive reference voltage.

If once the cathode voltage is greater than anode voltage, the diode stops conduction of electric current. During the negative half cycle, the diode conducts and charges the capacitor very quickly.

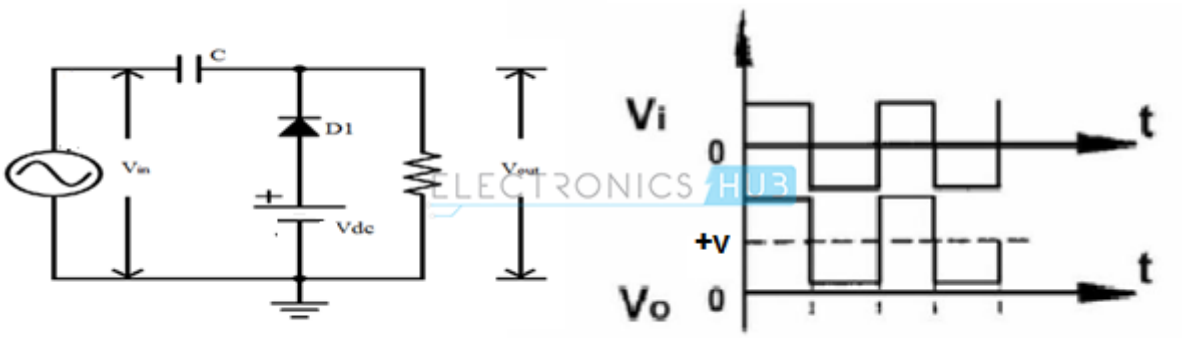

Fig 6.5

POSITIVE CLAMPER WITH NEGATIVE REFERENCE VOLTAGE

The direction of the reference voltage is reversed in this case such that the negative terminal of the reference voltage is connected in series with the anode of diode reflecting it as a negative reference voltage. During the positive half wave cycle of the input waveform, the diode does not conduct, as a result the output is equal to voltage stored in the capacitor and applied input voltage.

During the negative half cycle, the diode starts conducting current solely after the cathode voltage value is less than the anode voltage.

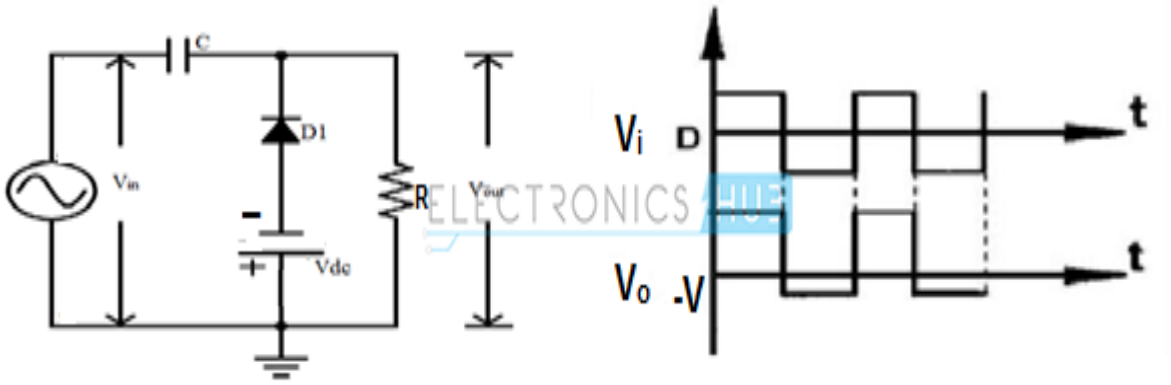

Fig 6.6

PROCEDURE FOR CLAMPER

1. Connect circuit as shown in figure below

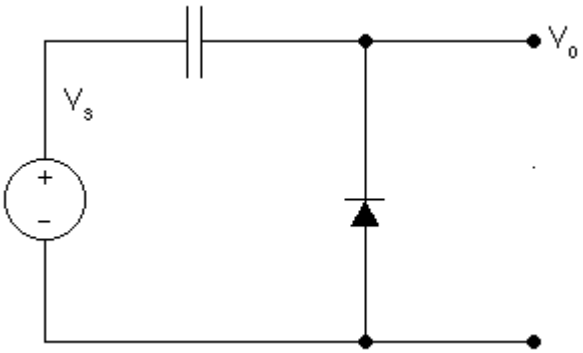

FIG 6.7

2. Set oscilloscope at 1 kHz, 10v peak to peak square wave position.

3. Set oscilloscope at dc position. Observe and record output waveform and mark dimensions.

4. Reverse diode, observe and record waveform.