Experiment: DIODE CLAMPER CIRCUIT

Aim

a) To design a clamper circuit for various clamping values

b) To observe the output waveforms on the oscilloscope.

d) To plot the input and output waveforms on a graph sheet to scale.

Equipment and Components: Cathode Ray Oscilloscope (CRO), Signal generator, Multimeter, DC power supply, Breadboard, Probes, connecting wires; Diode (e.g., 1N4007), Resistor (R), and Capacitor (C)

Theory: Clamping circuits are used to change the dc levels of an alternating waveform without changing the shape of the waveform, one more application of diodes.

Operation: Consider the input waveform shown in fig. 1. The input waveform is described by (1).

$$V = V_{max} sin(\omega t) \tag{1}$$

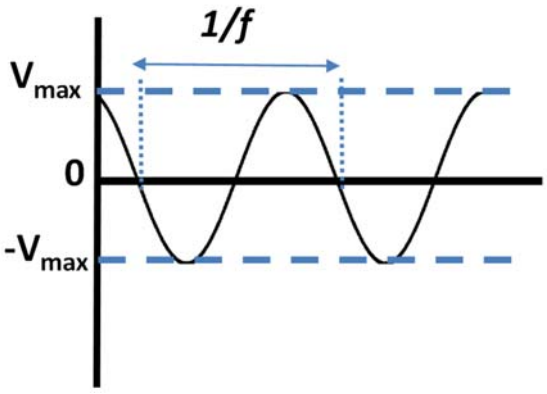

Fig. 1: Input signal waveform

Consider the circuit shown in fig. 2(a). When an input given by (1) is applied to the circuit, during the first positive cycle of the input waveform, the diode conducts thus charging the capacitor to the maximum value of the input. The voltage across the capacitor is $-V_{max}$. During the negative cycle, the diode if OFF and the voltage across the resistor is now $-V_m-V_m\sin\omega t$. Note that the time constant in this state is very large and the capacitor voltage is almost constant. During the next positive cycle, the voltage across the resistor is $-V_m+V_m\sin\omega t$. The diode remains OFF for rest of the time. The output waveform is shown in fig. 2(b). This circuit is called a negative clamper. As observed from the output waveform in fig. 2(b), the positive the peak of the input signal coincides with the zero level.

Clamper Circuit	Output Waveform
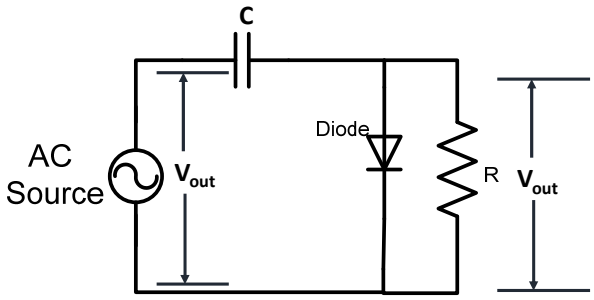	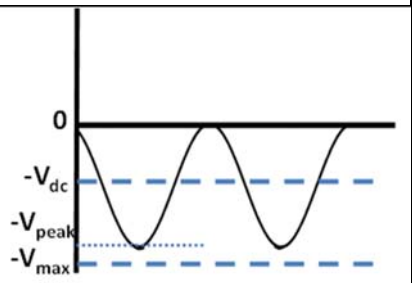
Fig. 2(a)	**Fig. 2(b)**
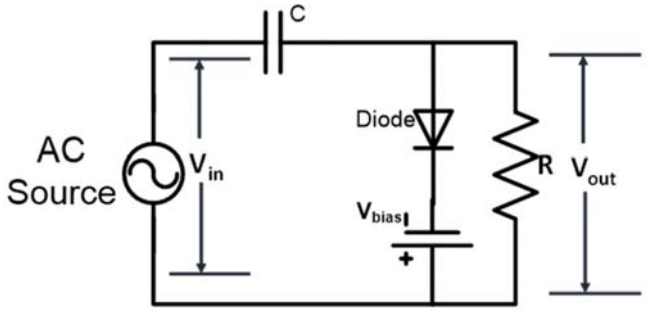	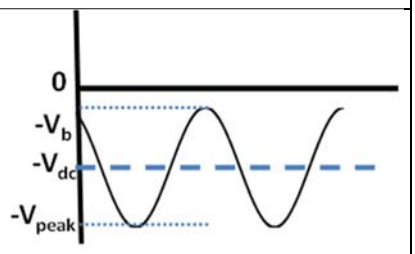
Fig. 3(a)	**Fig. 3(b)**
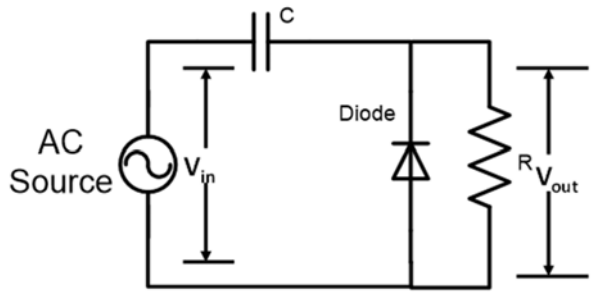	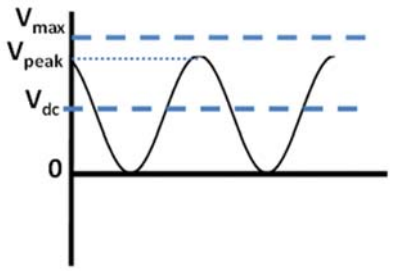
Fig. 4(a)	**Fig. 4(b)**
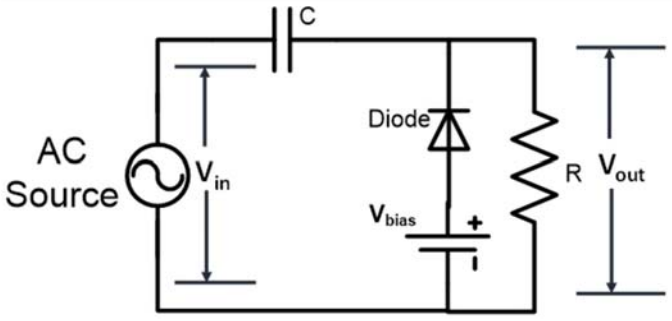	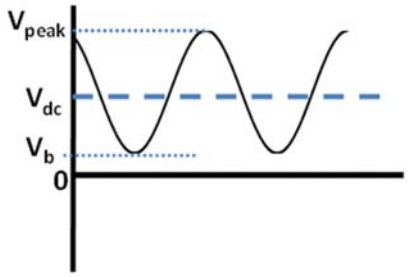
Fig. 5(a)	**Fig. 5(b)**

Fig. 2-5: Various diode clamper circuits and their corresponding output waveforms

When a bias voltage, V_{bias}, is applied in series with the diode to the circuit as shown in fig. 3(a), the capacitor initially charges to a value of $-V_{max}-V_{bias}$. Rest of the operation is similar to the

circuit in Fig. 2(a).

The circuit is shown in fig. 4(a) and 5(a) are called positive clamper the signal is shifted upward by the circuit. When the signal shifts upward, as shown in fig. 4(b), the negative peak of the signal coincides with the zero level.

Experiment Procedure

1. Connect the circuit shown in fig. 2(a) on the breadboard.
2. Apply a sinusoidal signal of a with frequency f and amplitude Vmax using a signal generator. Observe the waveform using an oscilloscope in channel 1. Note the values of the signal and trace the curve on a graph sheet as per scale.
3. Connect the output of the circuit to the second channel of the oscilloscope.
4. Trace the output waveform on the graph sheet as per scale.
5. Draw the input waveform and output waveform on the same graph sheet
6. Using the XY plot, trace the input vs. output on the graph sheet.
7. Repeat steps 1 through 6 for circuits shown in Fig. 3(a), 4(a) and 5(a).

Conclusion: