Experiment No: 04

Name of the Experiment: Clipper and Clamper circuits.

Objective:

Study of Clipper and Clamper circuits.

Theory:

Clipper: Clippers remove signal voltage above and below a specified level. In the experiment no. 2, half wave rectifier can also be called as a clipper circuit. Because it clipped off the negative half cycle of the input signal.

A diode connected in series with the load can clipped off any half cycle of input depending on the orientation of the diode. (Figure 3.1) -

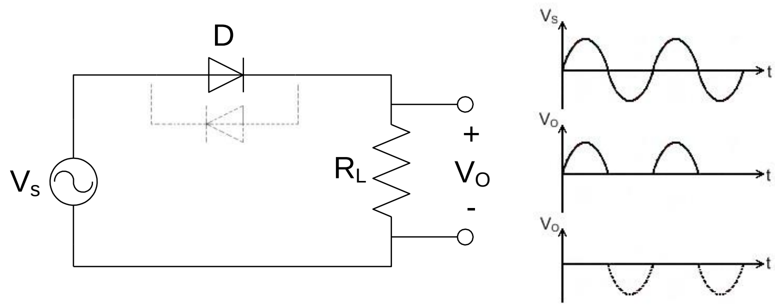

Figure 4.1: Simple Diode Clipper.

It is also possible to clip off a certain part of the input signal bellow a specified signal level by using a voltage source in reverse bias condition with the diode. If a battery of V volts is added to it, then for V_s above (V+0.7) volts the diode becomes forward bias and turns ON. The load receives above this voltage level.

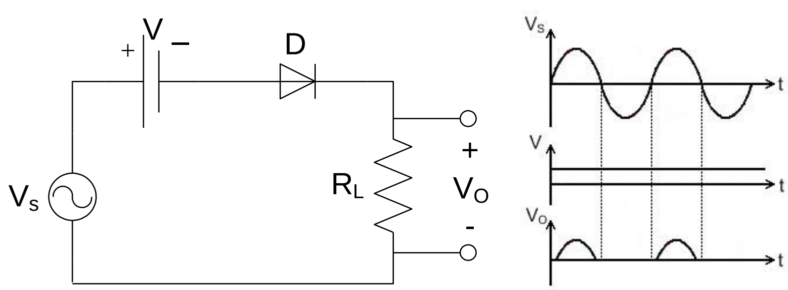

Figure 4.2: Clipper Circuit Using Bias Diode.

A diode connected in parallel with the load can clip off the input signal above 0.7 volts of one half cycle depending on the connection of the diode. Using two diodes in parallel in opposite direction both the half cycle can be limited to 0.7 volts.

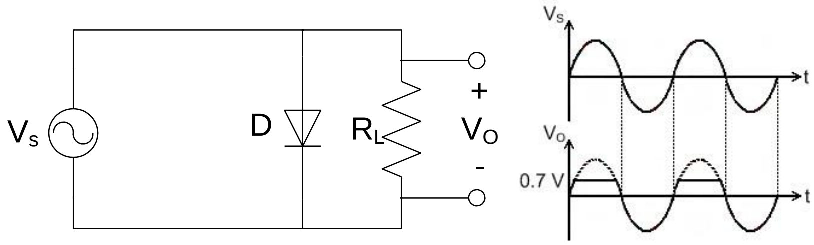

Figure 4.3: Parallel Clipper Circuit.

Using a biased diode it is possible to limit the output voltage to a specified level depending on the attached battery voltage. Either the half cycles or both of them can be clipped off above a specified level.

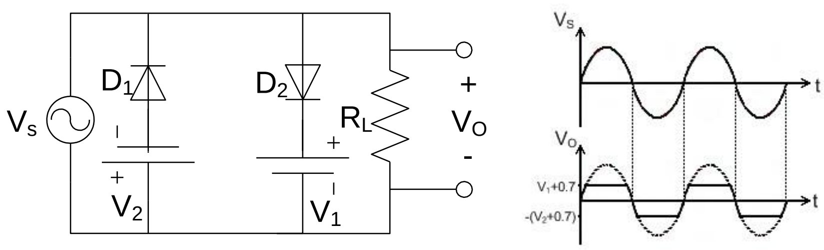

Figure 4.4: Biased Parallel Clipper Circuit.

In practical case for both the series and parallel clippers voltage source is not added. Required voltage levels are maintained by adding more semiconductor diode.

Clamper: A DC clamper circuit adds a DC voltage to the input signal. For instance, if the incoming signal varies from -10 volts to +10 volts, a positive DC clamper will produce an output that ideally swing from 0 volts to 20 volts and a negative clamper would produce an output between 0 volts to -20 volts.

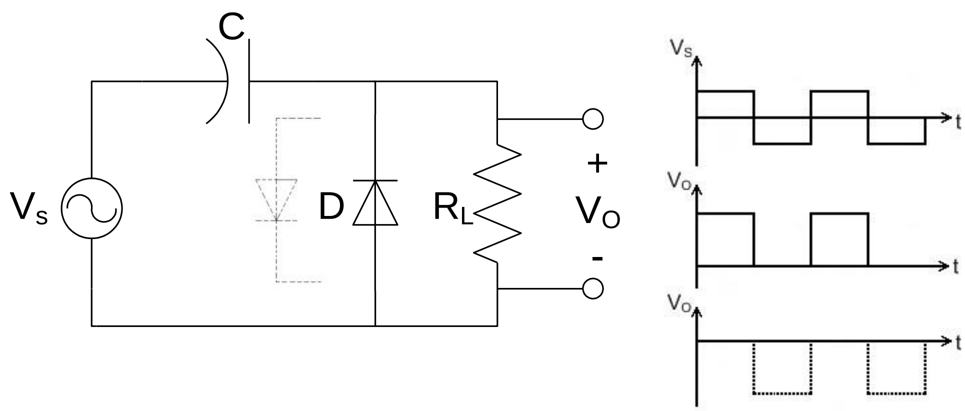

Figure 4.5: Clamper Circuit.

Equipments And Components :

Serial no.	Component Details	Specification	Quantity
1.	p-n junction diode	1N4007	1 piece
2.	Resistor	100KΩ	1 piece
3.	Capacitor	0.1µF	1 piece
4.	Signal generator		1 unit
5.	Trainer Board		1 unit
6.	DC power Supply		1 unit
7.	Oscilloscope		1 unit
8.	Digital Multimeter		1 unit
9.	Chords and wire		as required

Experimental Setup:

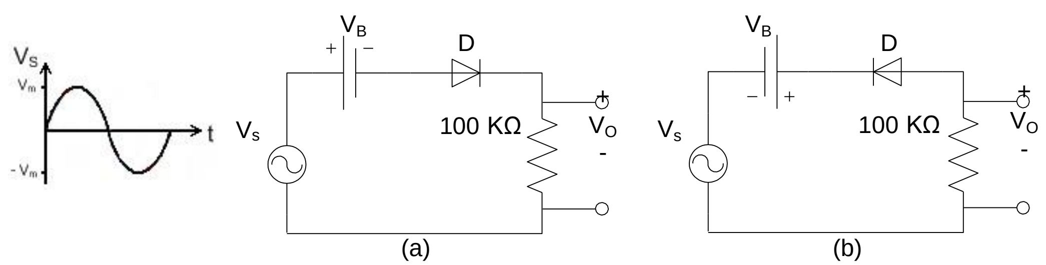

Figure 4.6: Experimental Circuit 1.

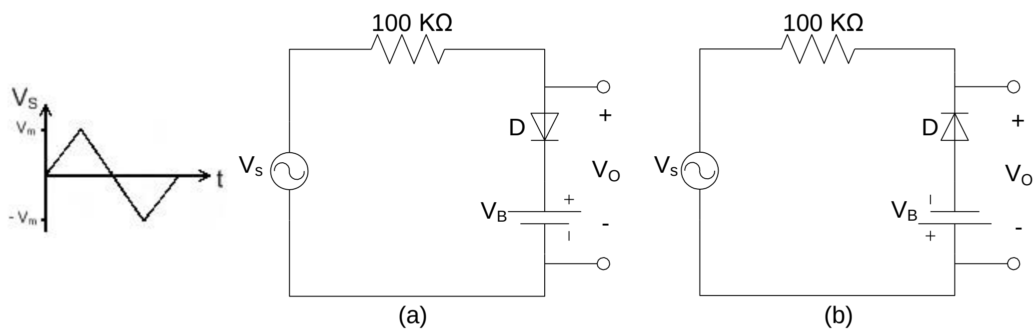

Figure 4.7: Experimental Circuit 2.

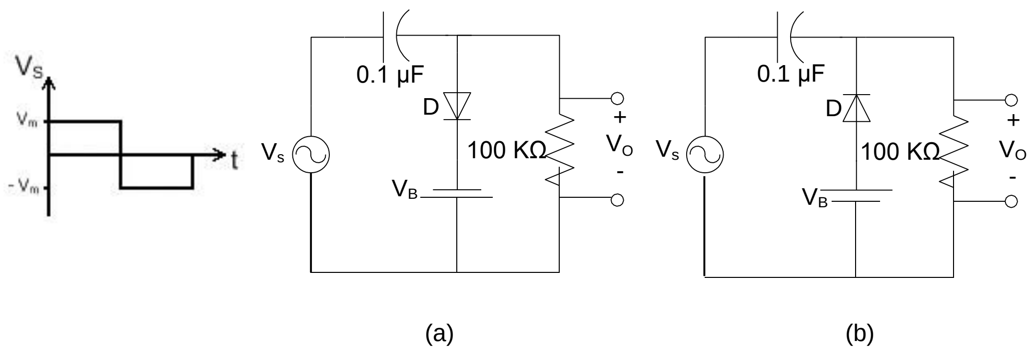

Figure 4.8: Experimental Circuit 3.

Procedure :

1. Connect the circuit as shown in the figure 3.6. Using a sinusoidal voltage source with 5 volts peak (V_m) and 1kHz frequency.
2. Observe the output wave shapes for various values of V_B and draw V_B = 2.5 volts for each circuit.
3. Do the same as in step 1 and 2 for the circuits in figure 3.7 with V_s wave shapes as drawn beside each figure having V_m = 5 volts. Parallel Branch 1 of circuit of figure 3.7(a) and Branch 2 of circuit of figure 3.7(b) and observe output.
4. For the clamper circuits of figure 3.8 do the same steps as step 1 and 2 with V_s wave shapes as drawn beside each figure having V_m = 5 volts.

Report :

1. Sketch all the waveforms observed on the oscilloscope.
2. What role dose the value of capacitor used in the clamping circuit play in order to obtain proper clamping?
3. Add the PSPICE simulation waveforms of all the experimental circuits.