Experiment No: 04

Name of the Experiment: Clipper and Clamper circuits.

Objective:

To study Clipper and Clamper circuits.

Theory:

Clipper: Clippers remove signal voltage above and below a specified level. In the experiment no. 3, 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 4.1) -

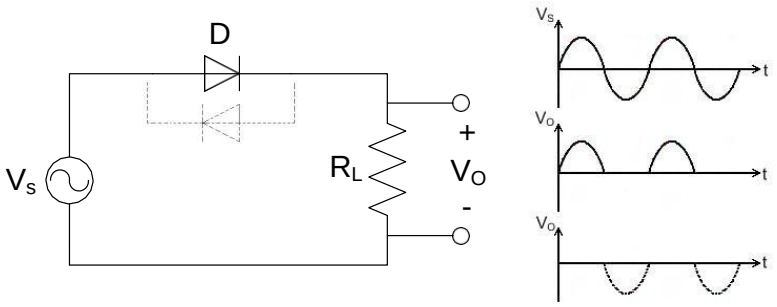


Figure 4.1: Simple Diode Clipper circuit

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.

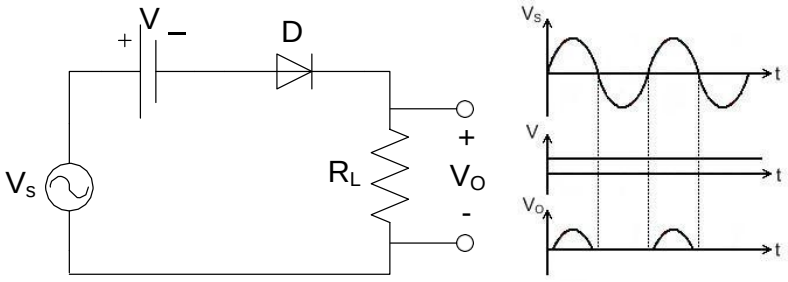


Figure 4.2: Clipper Circuit Using Bias Diode.

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.

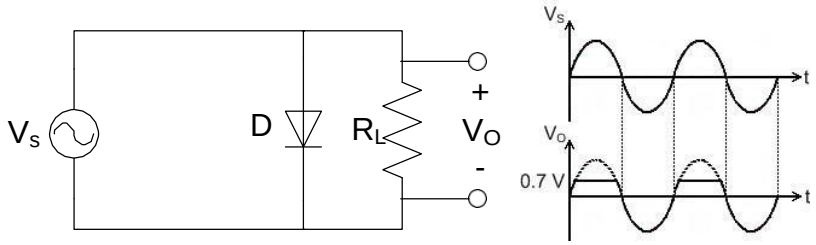


Figure 4.3: Parallel Clipper Circuit.

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.

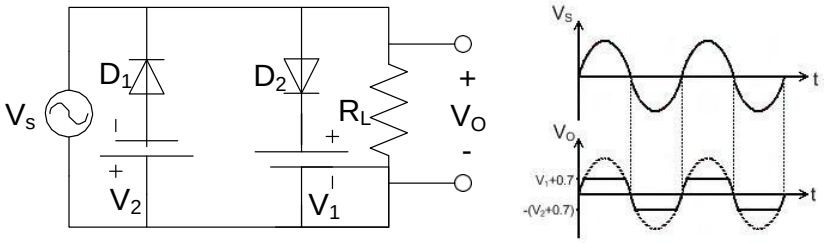


Figure 4.4: Biased Parallel Clipper Circuit.

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 -20volts.

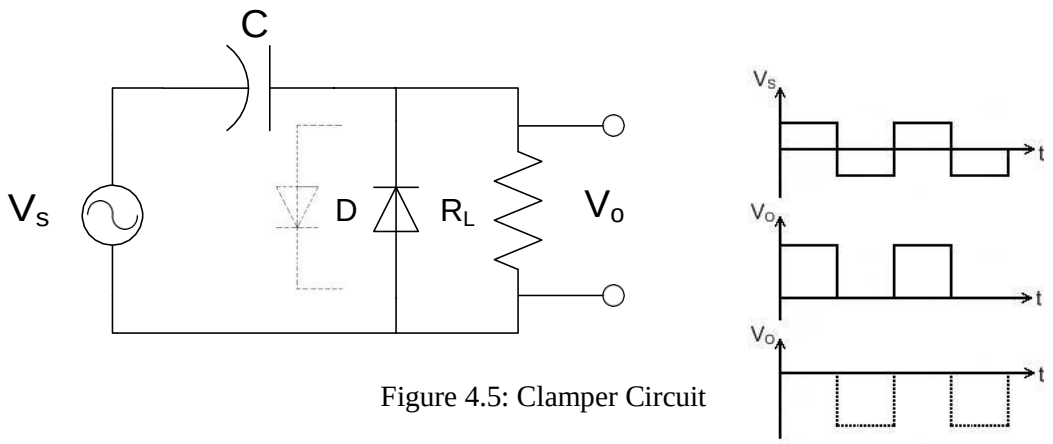


Figure 4.5: Clamper Circuit

Equipment 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:

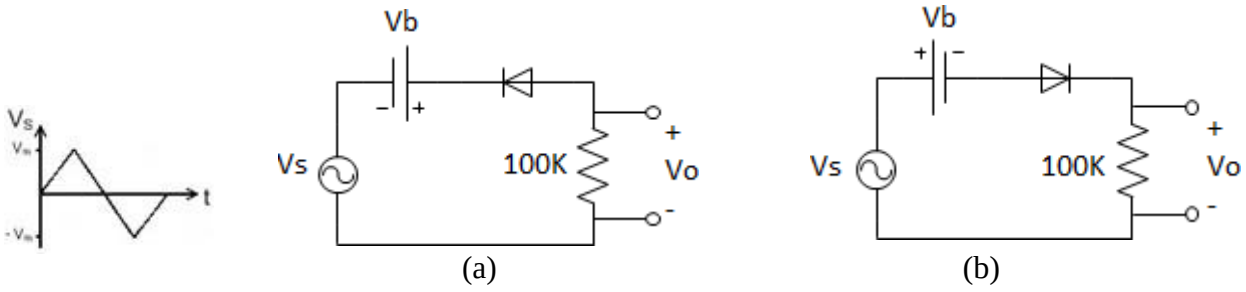


Figure 4.6: Series Clipper Circuit

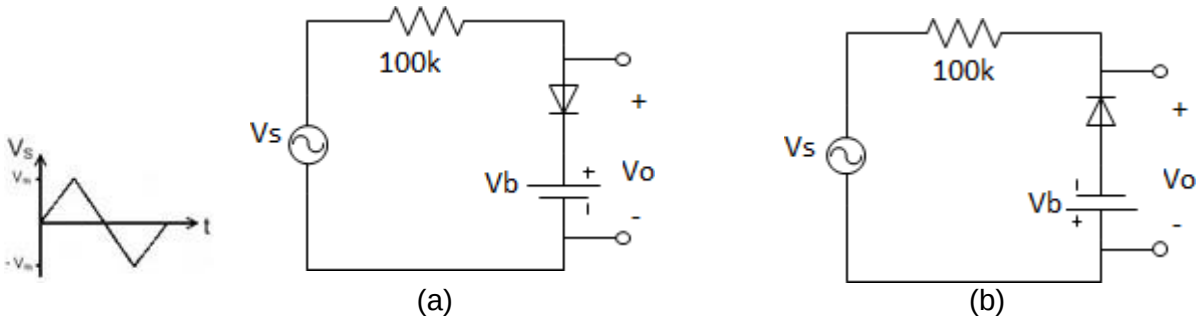


Figure 4.7: Parallel Clipper Circuits

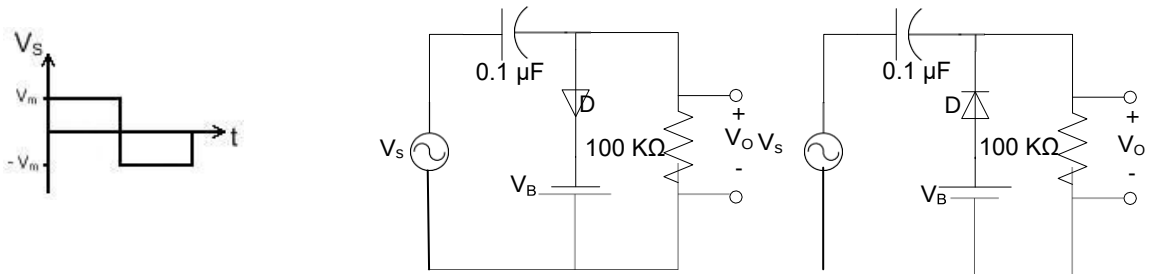


Figure 4.8: Clamper circuit

Procedure:

1. Connect the circuit as shown in the figure 4.6.
2. Using Signal generator, apply a 1kHz $10V_{p\text{-}p}$ sinusoidal voltage source input ($V_m = 5V$)
3. Fix V_b to 2.5V and In the same graph paper, Draw V_s and V_o.
4. Decrease the value of V_b from 2.5V to 0V, and observe the output wave shapes
5. Increase the value of V_b from 2.5V to 5V, and observe the output wave shapes
6. Repeat step 2-4 for figure 3.7 and figure 3.8
7. Record V_{max} and V_{min} for the output wave for the clamper circuit only for V_b=2.5v.

Data Collection: *Signature of instructor:*

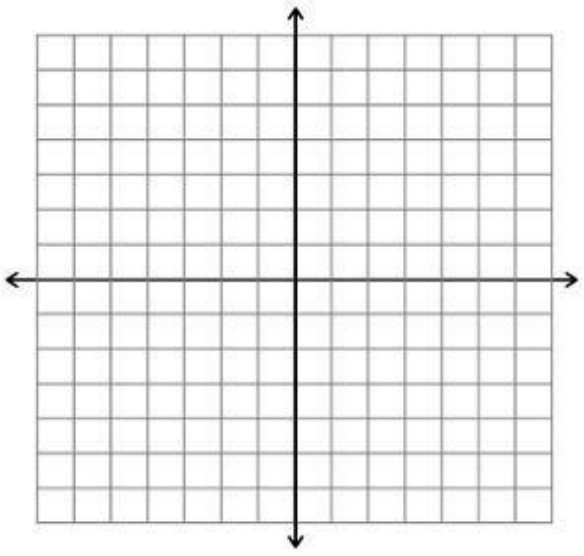
Experiment: 4,
Performed by Group# _____

Theoretical value: R = ___

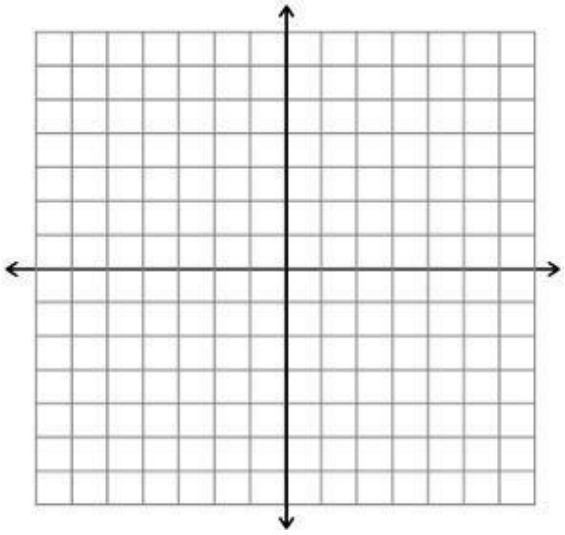
Measured value: R = ____

Vs =_____V(p-p).

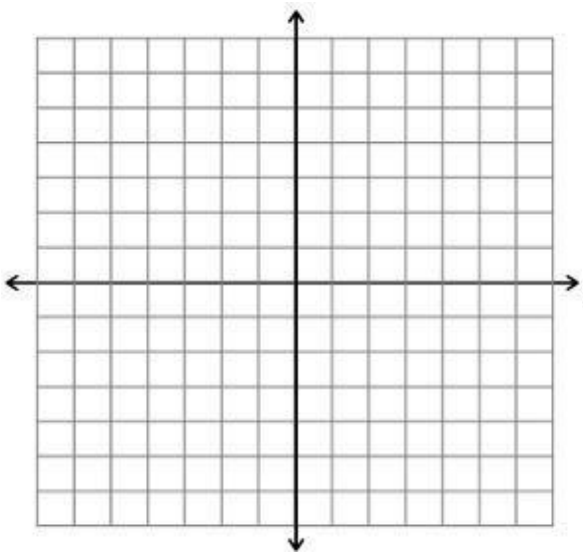
(Vb)	Vo (p-p)					
	Fig 3.6		Fig 3.7		Fig 3.8	
	(a)	(b)	(a)	(b)	(a)	(b)
0						
1						
2						
2.5					V_{max}= V_{min}=	V_{max}= V_{min}=
3						
4						
5						



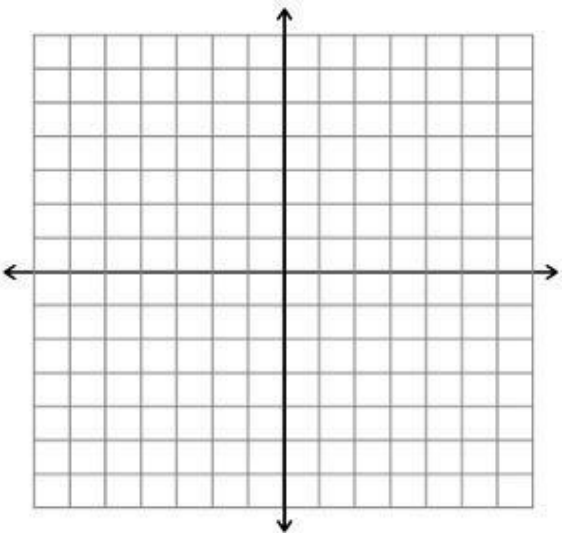
Input-output Fig 4.6 (a)



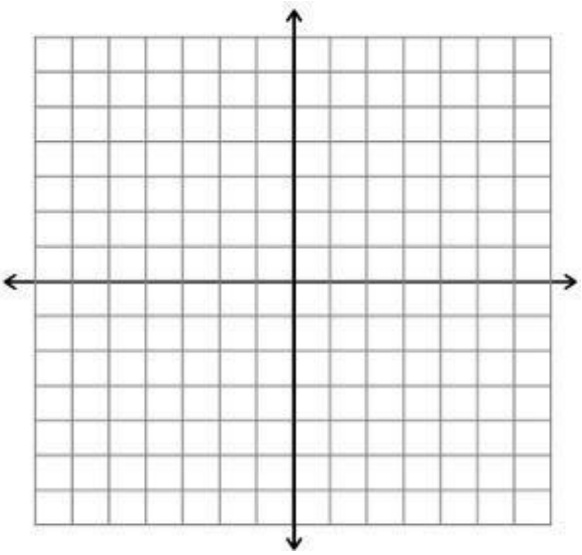
Input-output Fig 4.6 (b)



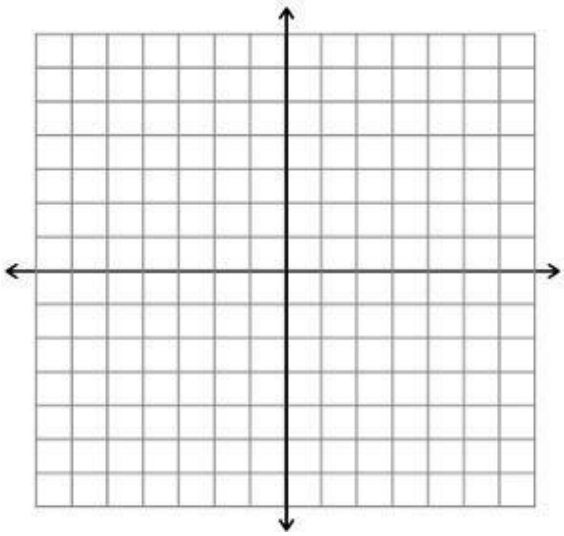
Input-output Fig 4.7 (a)



Input-output Fig 4.7 (b)



Input-output Fig 4.8 (a)



Input-output Fig 4.8 (b)

Report:

1. Using values from your data table, for all the circuit diagrams plot the input-output waveforms observed on the oscilloscope for =2.5V.
2. For Fig 4.6(a &b), Fig4.7 (a & b) and Fig 4.8 (a & b) what change did you observe in the output voltage, in procedure-4? *Explain the reason behind such a change.*
3. For Fig 4.6(a &b), Fig4.7 (a & b) and Fig 4.8 (a & b) what change did you observe in the output voltage, In procedure-5? *Explain the reason behind such a change.*