Biased Clippers and Clampers

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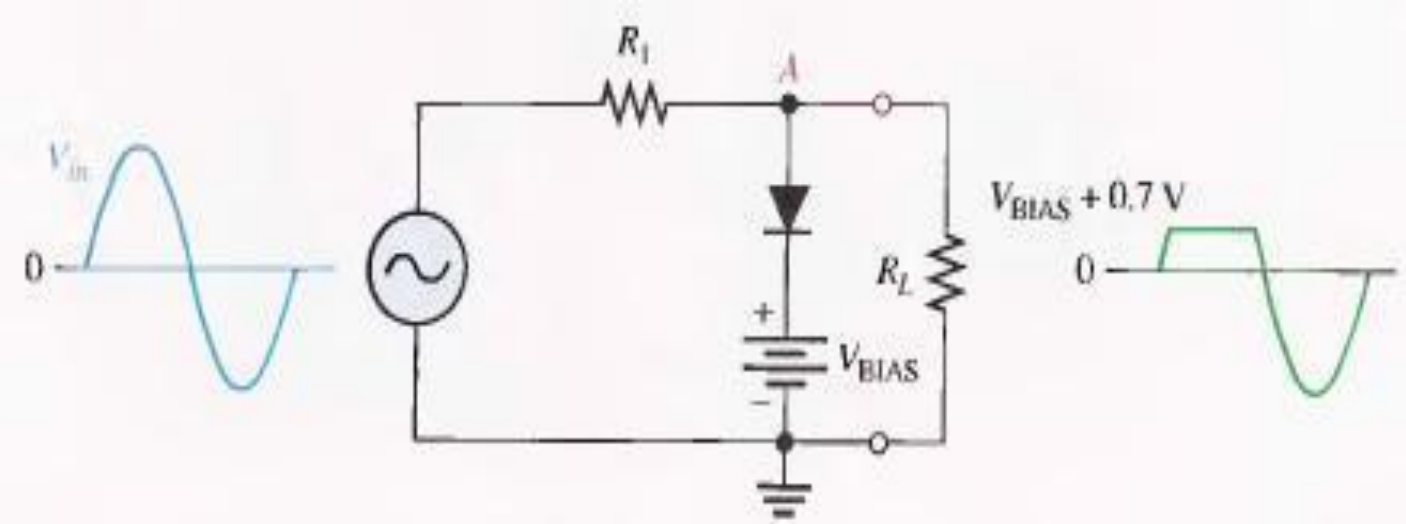
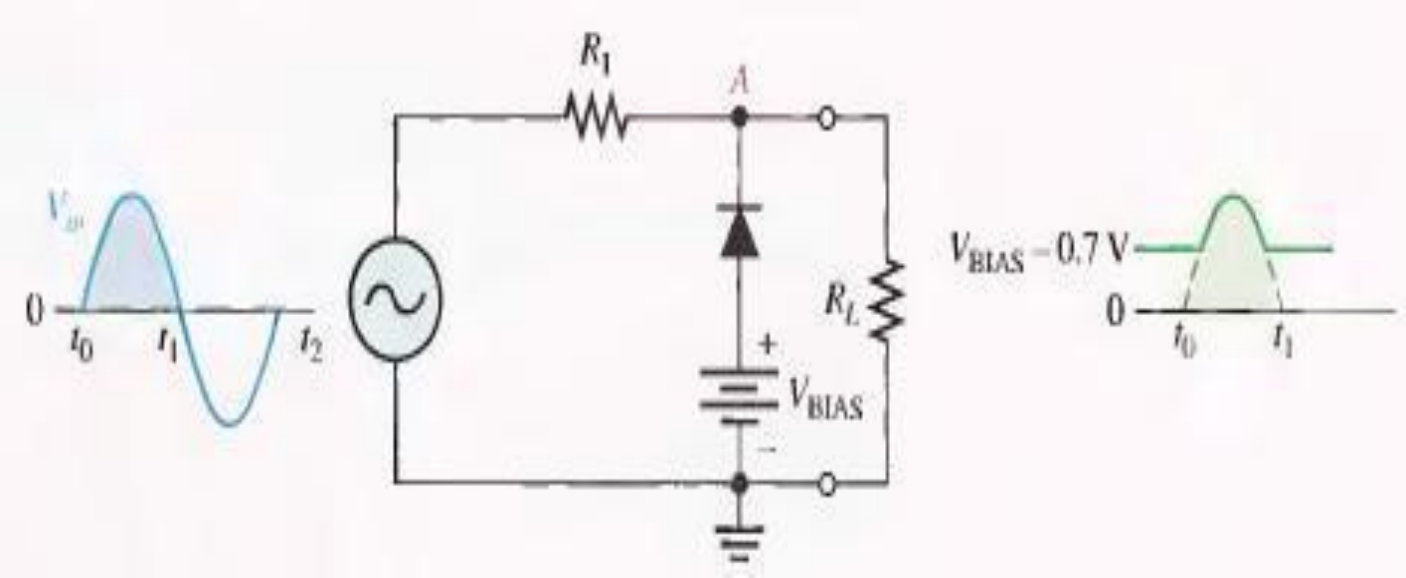
BIASED LIMITERS:

- The level to which an AC signal is limited can be adjusted by adding a bias voltage V_{BIAS} , in series with the diode in the circuit.

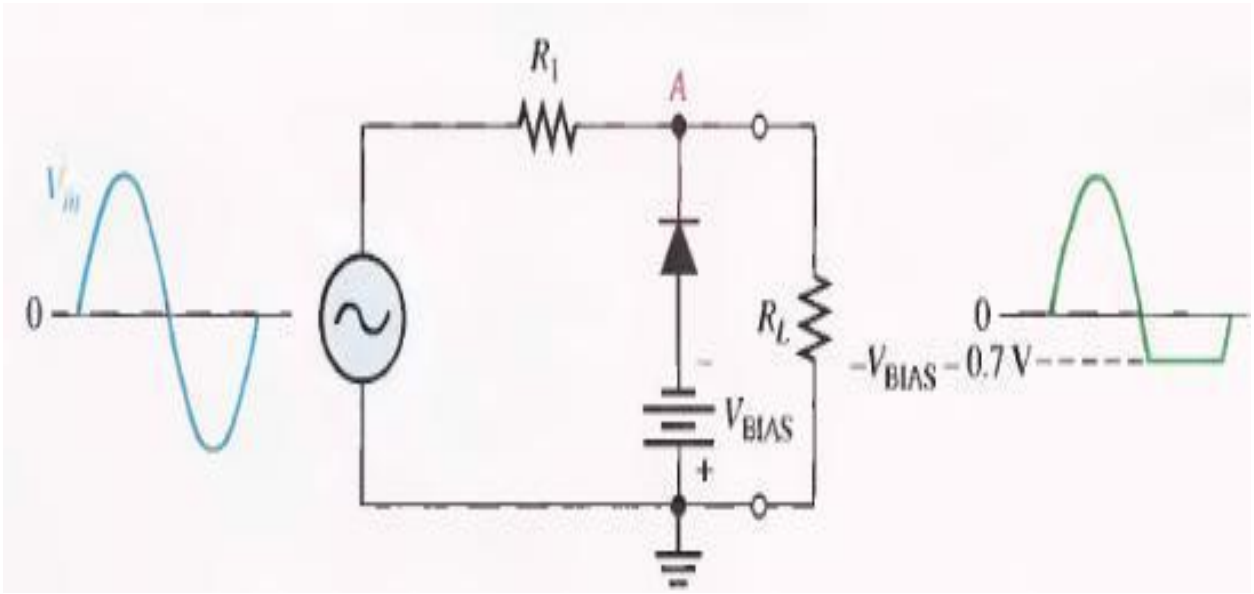
- The series combination of the diode and the bias voltage determines which portion of the input signal will allowed to appear at the output.

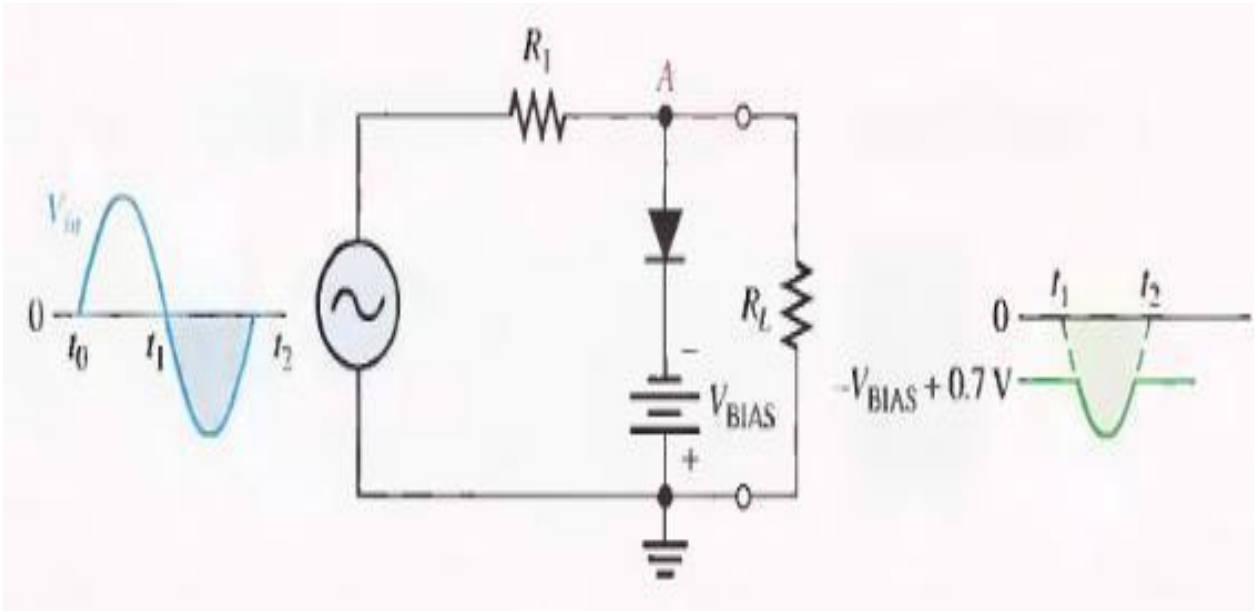
Positive Biased Limiters:



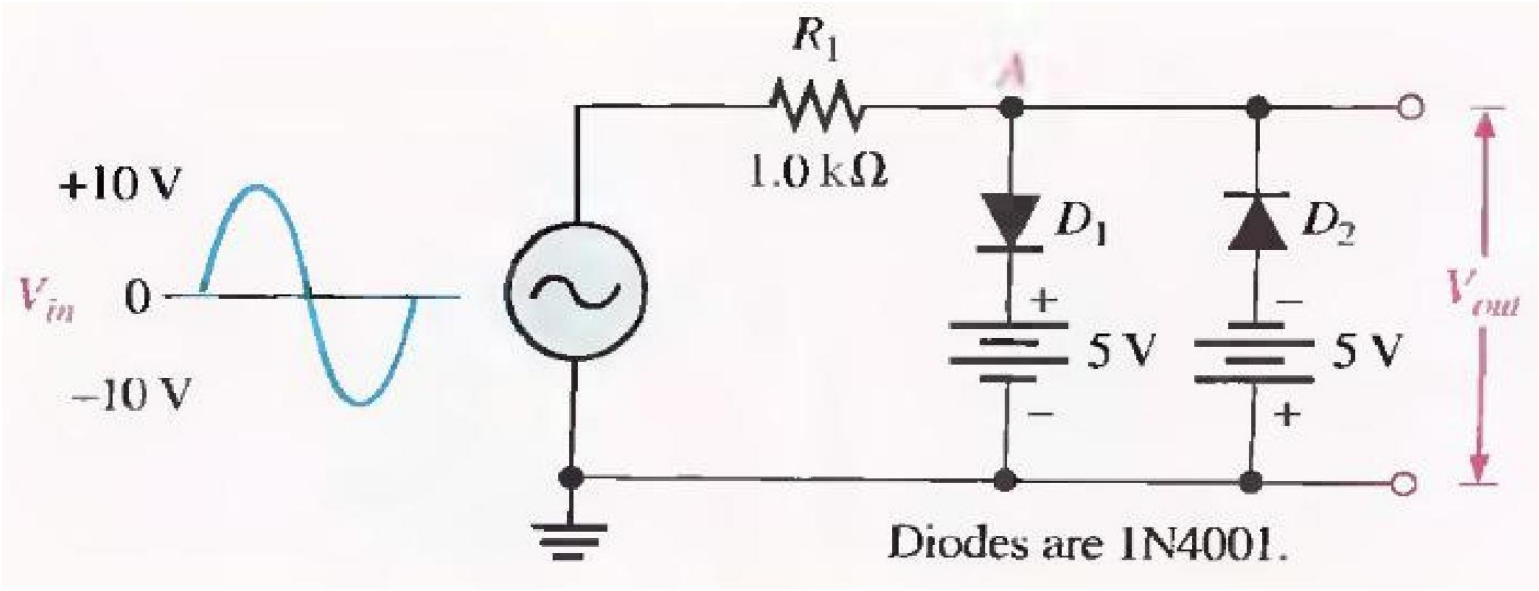


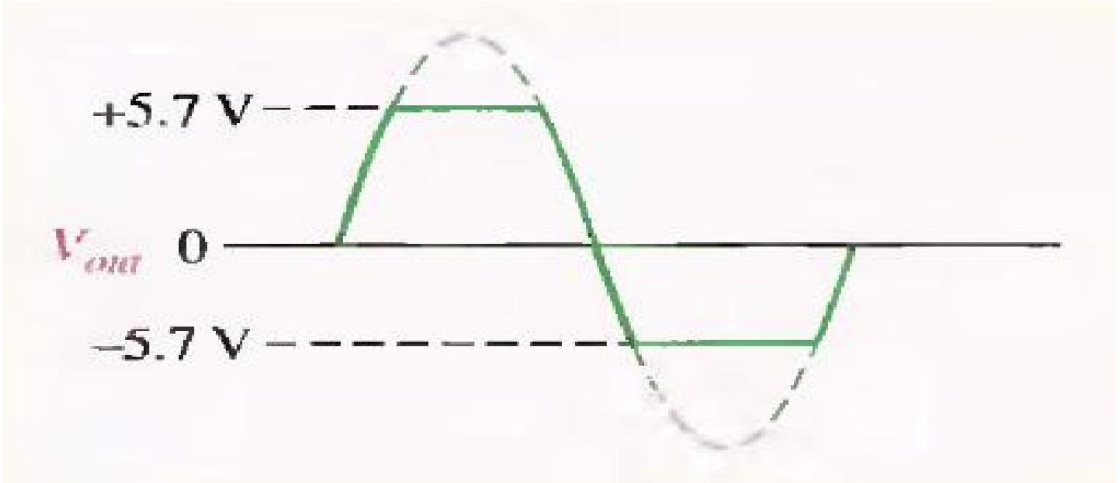
Negative Biased Limiters:

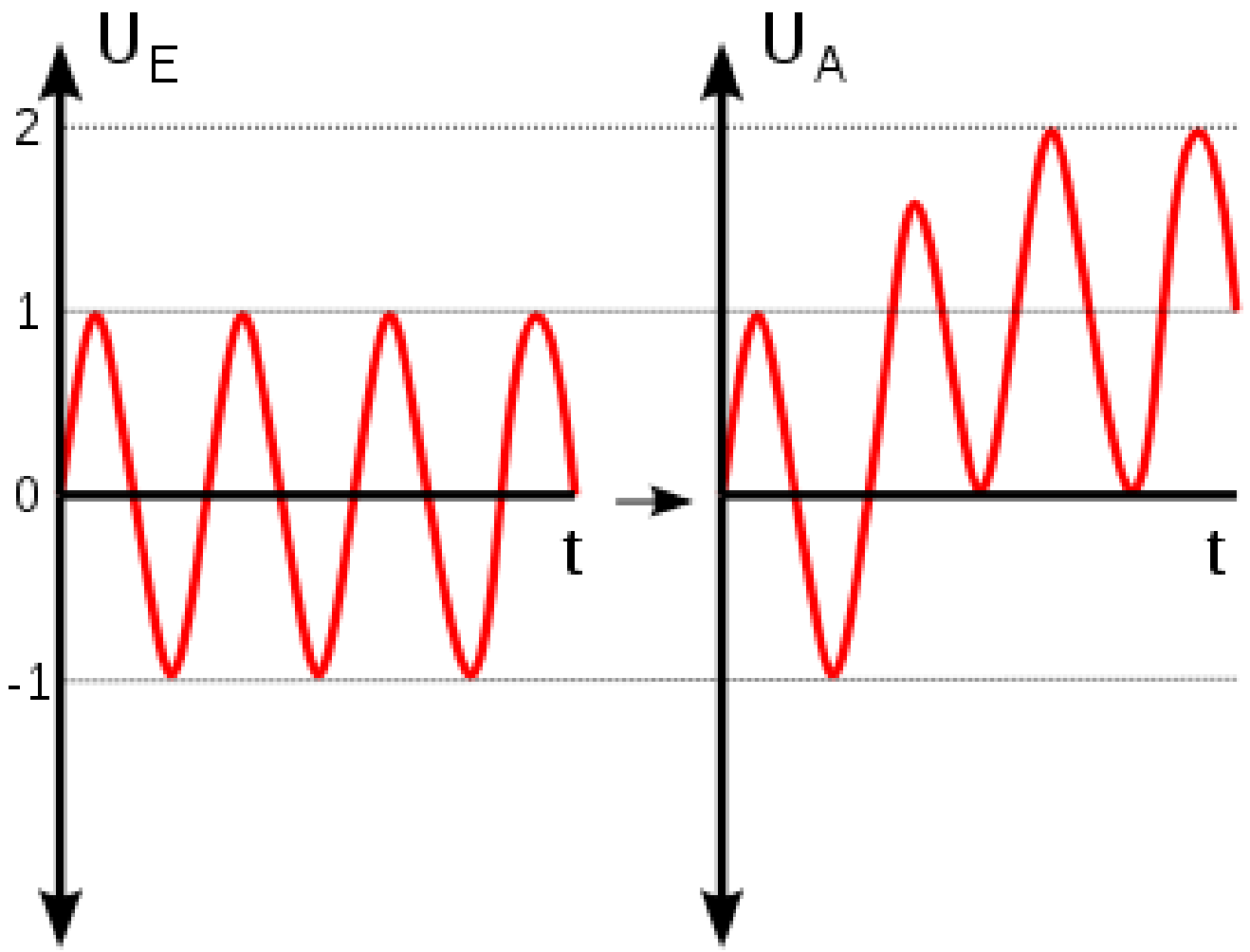




Example:


R_1
1.0 kΩ
+10 V
V_{in}
0
–10 V
D_1
D_2
5 V
5 V
V_{out}
Diodes are 1N4001.

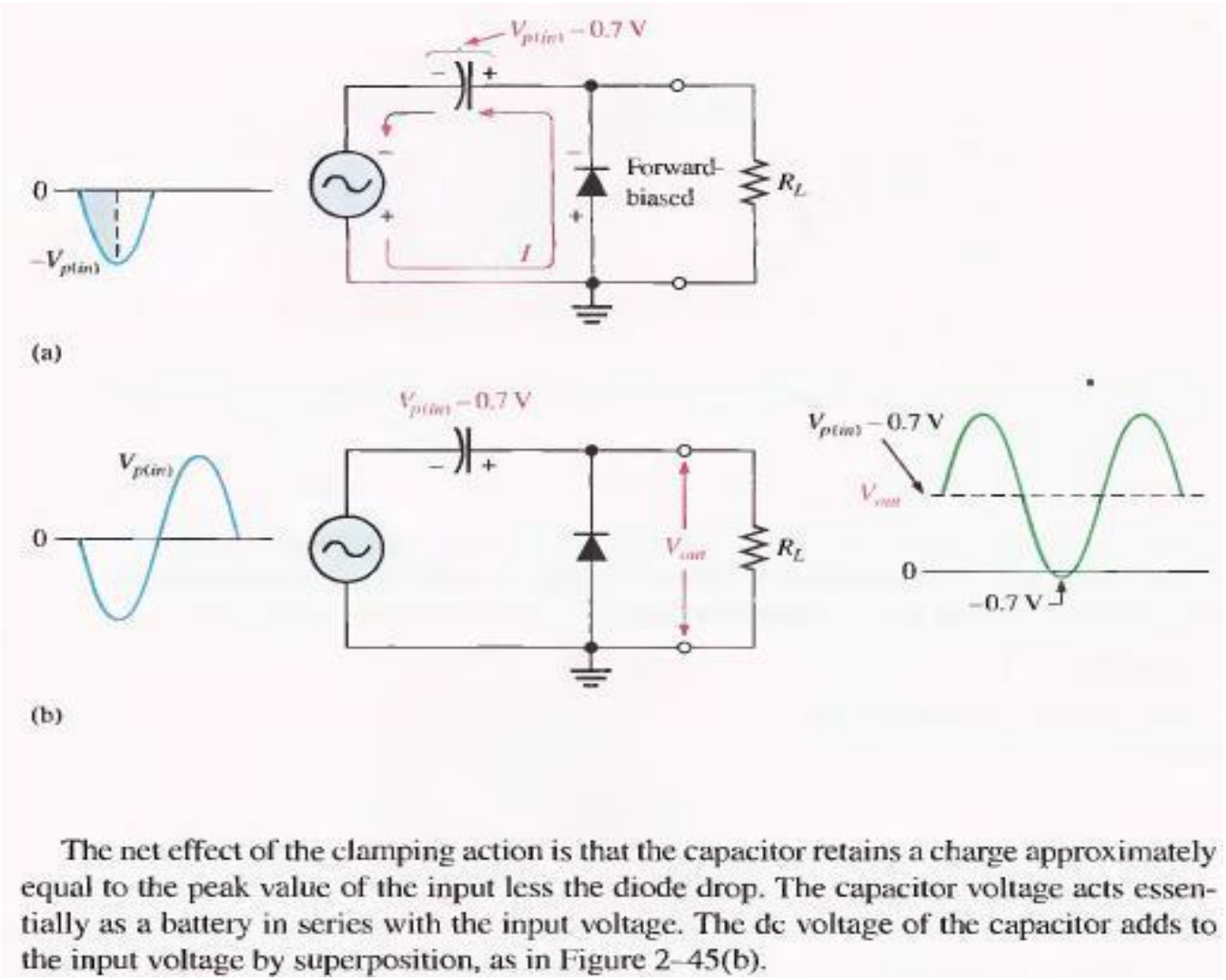

+5.7 V
V_{out}
0
–5.7 V


U E
U A
2
1
0
-1
t
t

DIODE CLAMPERS:

➢Diode Clamper circuits are used to add or restore a DC level to an electrical AC signal.

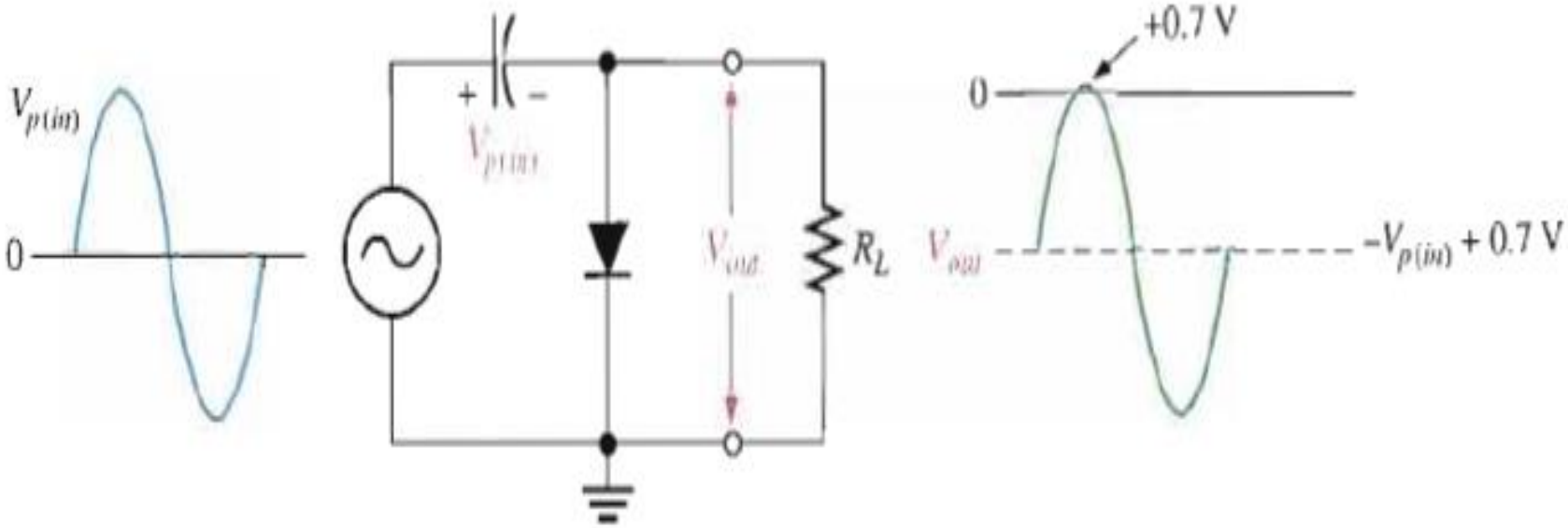
Positive Clampers:



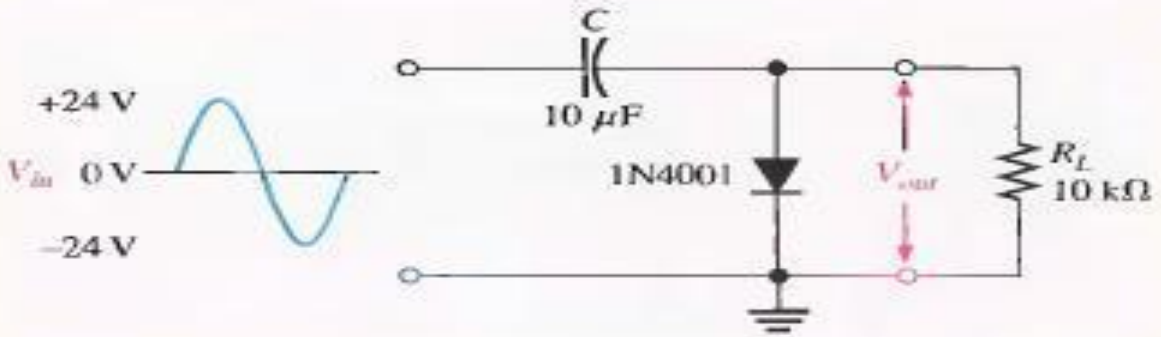
The net effect of the clamping action is that the capacitor retains a charge approximately equal to the peak value of the input less the diode drop. The capacitor voltage acts essentially as a battery in series with the input voltage. The dc voltage of the capacitor adds to the input voltage by superposition, as in Figure 2–45(b).

Negative Clampers:

If the diode is turned around, a negative dc voltage is added to the input voltage to produce the output voltage as shown in Figure 2–46.



Example:



Ideally, a negative dc value equal to the input peak less the diode drop is inserted by the clamping circuit.

$$V_{DC} \cong -(V_{p(in)} - 0.7\text{ V}) = -(24\text{ V} - 0.7\text{ V}) = -23.3\text{ V}$$

Actually, the capacitor will discharge slightly between peaks, and, as a result, the output voltage will have an average value of slightly less than that calculated above. The output waveform goes to approximately +0.7 V, as shown in Figure 2–48.

FIGURE 2–48

Output waveform across R_L for Figure 2–47.