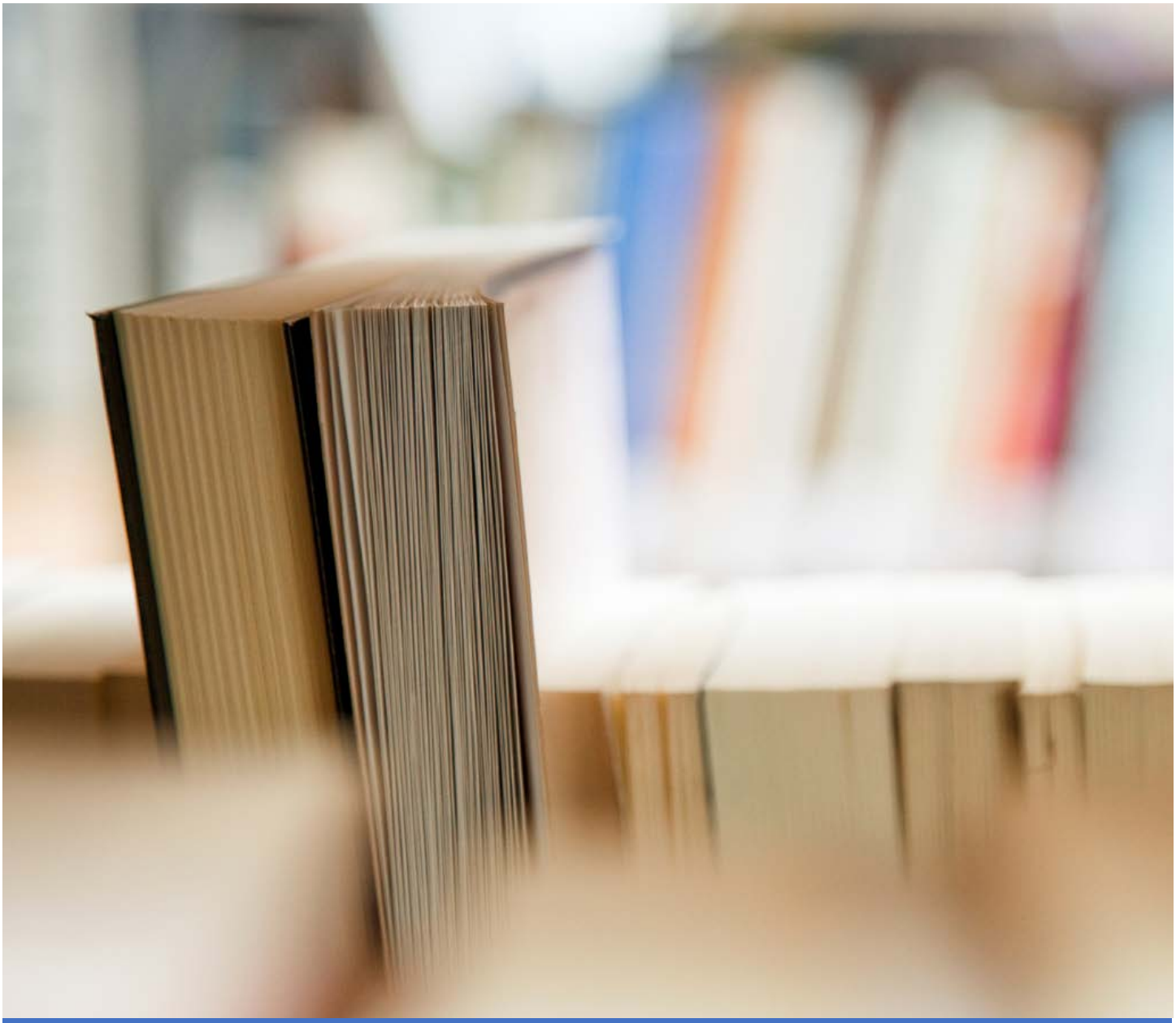


Electronic Second Stage

M.Sc. Zahraa Niema Kamal

Lecture Seven

First course

Lecture Seven

Clippers

1. Introduction

There are a variety of diode networks called clippers that have the ability to clip off a portion of the input signal without distorting the remaining part of the alternating waveform.

2. Series Clippers

The response of the series configuration of Fig. (26 a) to a variety of alternating waveforms is provided in Fig. (26 b). Although first introduced as a half-wave rectifier (for sinusoidal waveforms), there are no boundaries on the type of signals that can be applied to a clipper. The addition of a dc supply such as shown in Fig. (27) can have a pronounced effect on the output of a clipper. There are a few thoughts to keep in mind as you work toward a solution

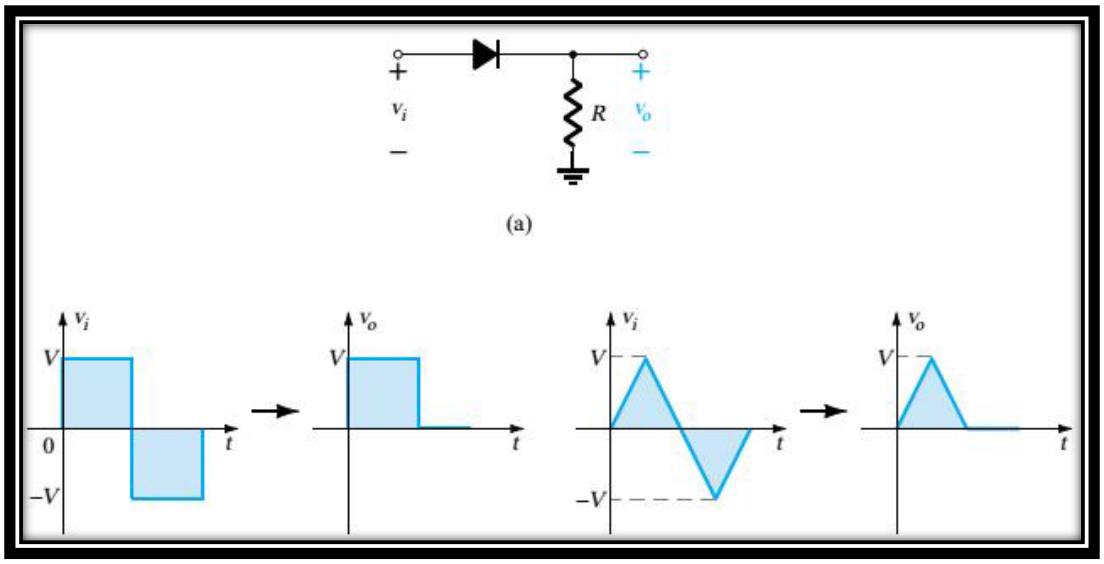
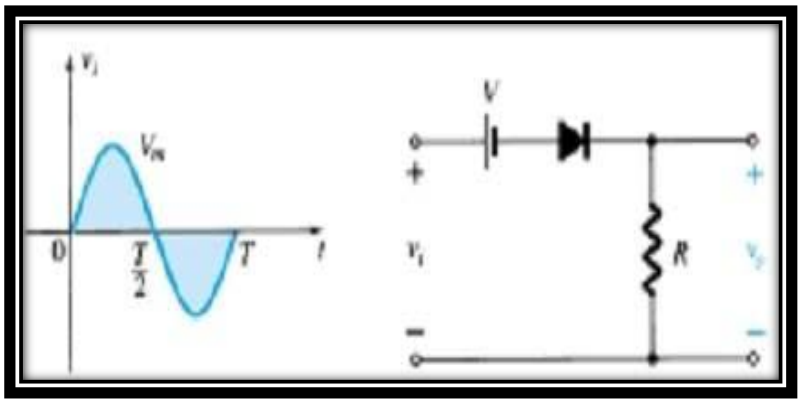


Figure (26) Series Clipper

1. Make a mental sketch of the response of the network based on the direction of the diode and the applied voltage levels.
2. Determine the applied voltage (transition voltage) that will cause a change in state for the diode.
3. apply Kirchhoff's voltage law, and be continually aware of the defined terminals and polarity of vo.
4. It can be helpful to sketch the input signal above the output and determine the output at instantaneous values of the input.



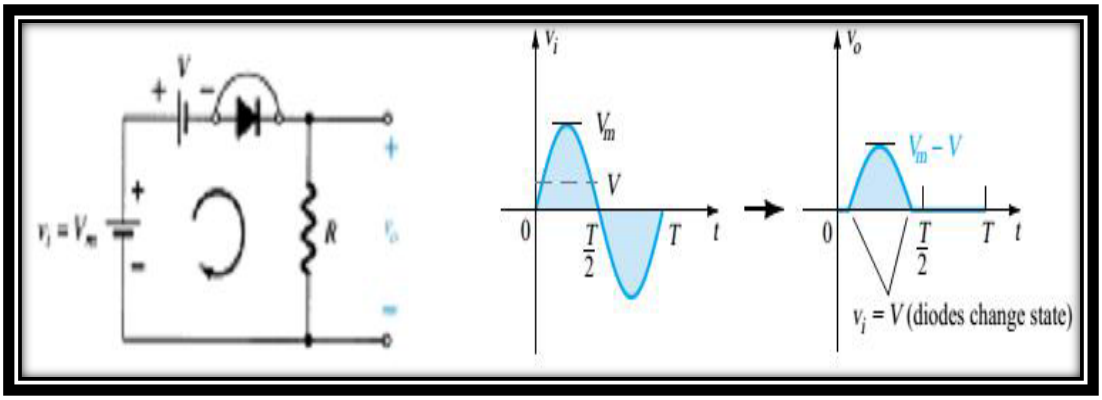
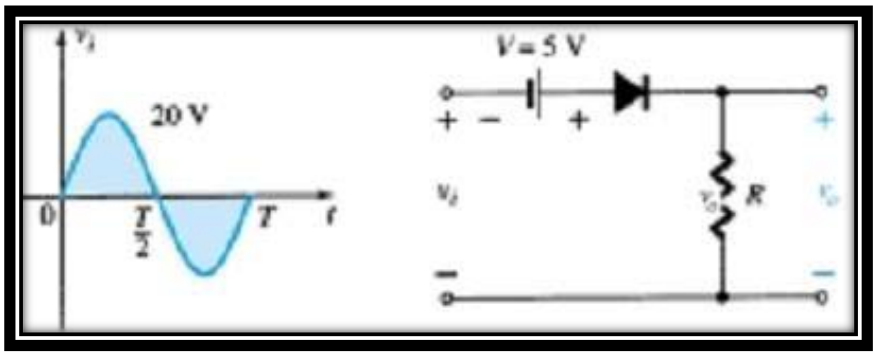


Figure (27) Output of Series Clipper

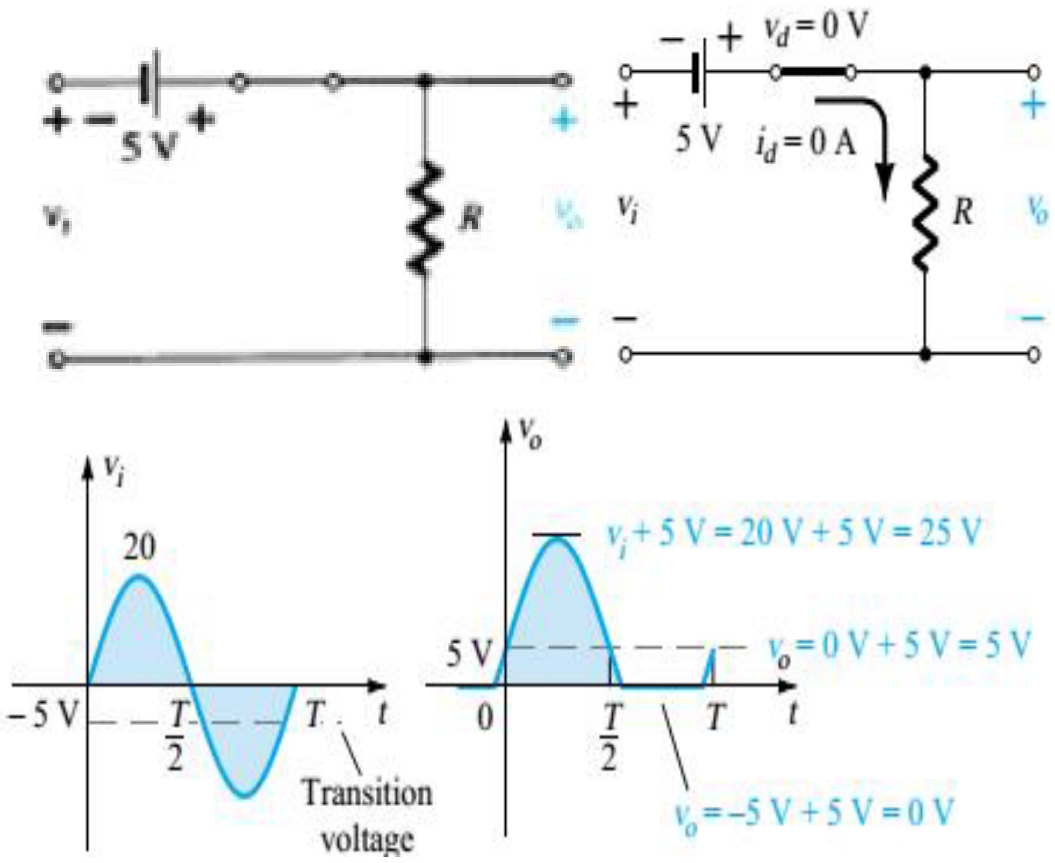
Example 1

Determine the output waveform for the network of Fig. below:

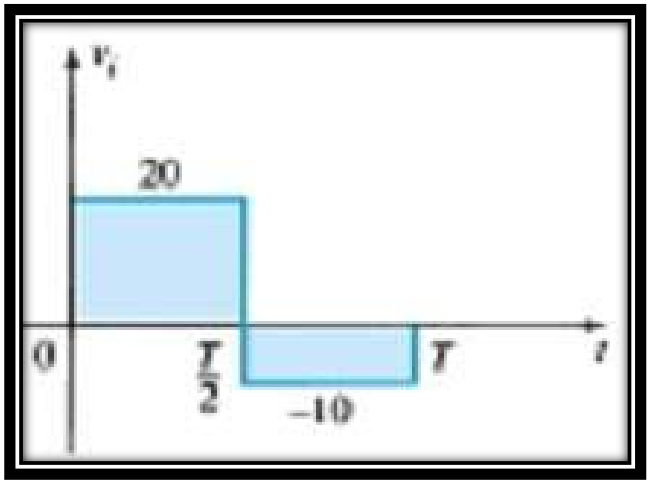


Solution:

Past experience suggests that the diode will be in the **ON** state for the positive region of $\mathbf{v_i}$ especially when we note the aiding effect of **V=5v**. For **vi** more negative than **-5v** the diode will enter its open circuit state, while for voltages more positive than **-5v** the diode is in the short circuit state.



H.W1: Repeat above example for the square-wave input of Fig. below



3. Parallel clipper

The network of Fig. (28 a) is the simplest of parallel diode configurations with the output for the same inputs of Fig. (28 b). The analysis of parallel configurations is very similar to that applied to series configurations.

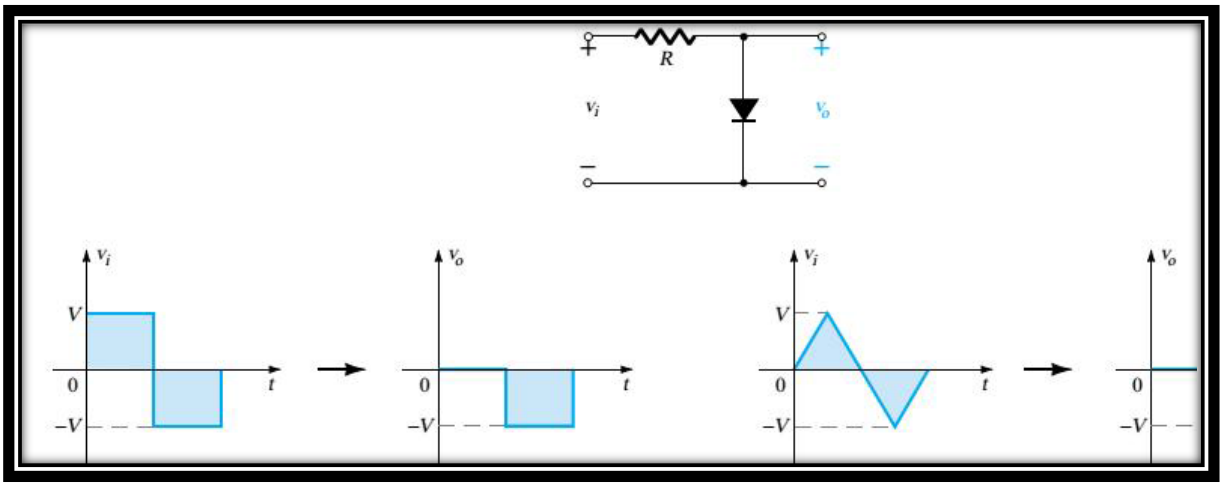


Figure (28) Parallel Clipper

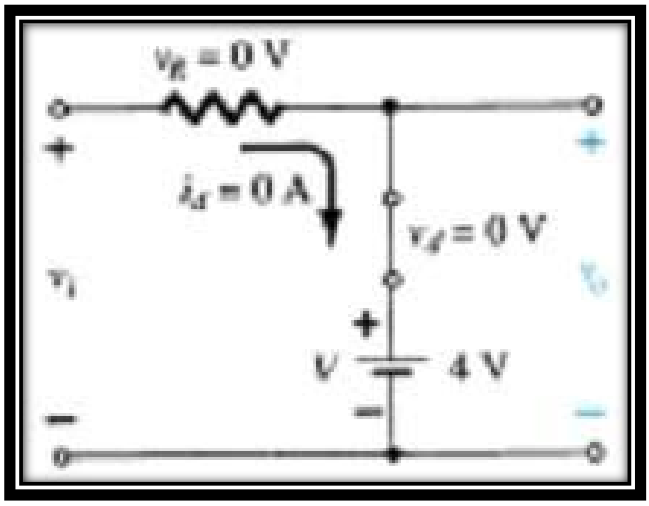
Example 2

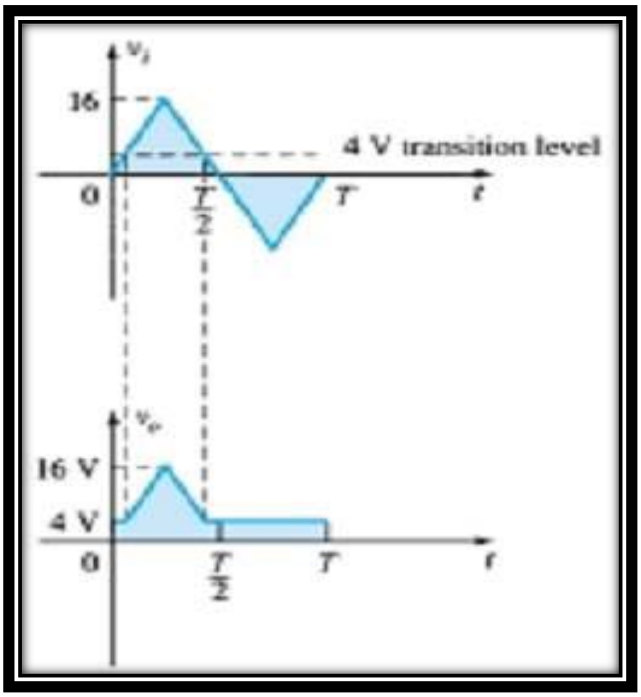
Determine v_o for the network of Fig. below

Solution:

The polarity of the dc supply and the direction of the diode strongly suggest that the diode will be in the **ON** state for the negative region of the input signal.

Since the dc supply is obviously “pressuring” the diode to stay in the short-circuit state, the input voltage must be greater than **4v** for the diode to be in the **OFF** state. Any input voltage less than **4v** will result in a short-circuited diode.





H.W2: Repeat the above example using a ***silicon diode*** with $\mathbf{V_p}$ **0.7 V**.