ANALOG ELECTRONICS

LECTURE NO. 5

CLAMPER

The clamping network is to "clamp" a signal to a different dc level. Also known as dc restorers. The clamping ckt is often used in TV receivers as a dc restorer.

- The network consists of:

a) Capacitor

b) Diode

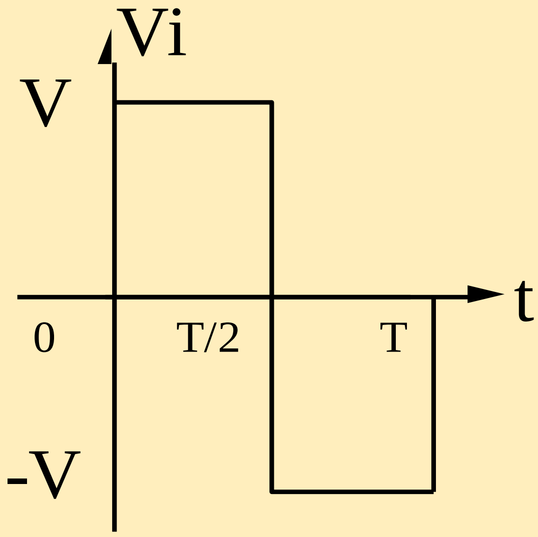
c) Resistive element

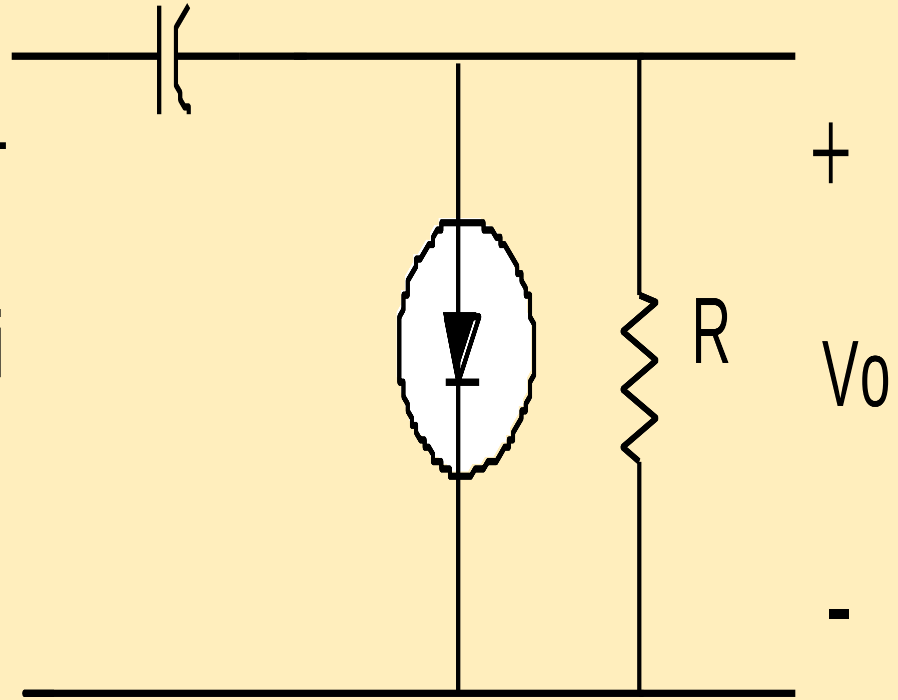
d) Independent dc supply (option)

- The magnitude of R and C must be chosen such that the time constant

τ = RC is large enough to ensure that the voltage across the capacitor does not discharge significantly during the interval the diode is non conducting.

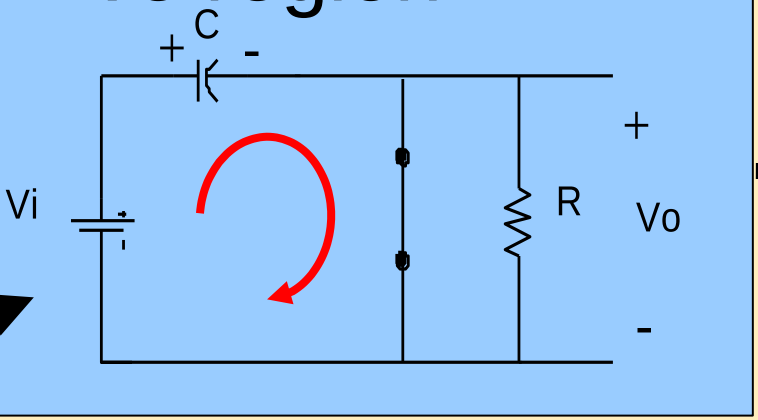
- Our analysis basis that all capacitor is fully charge and discharge in 5 time constant.


Vi
V
t
0
T/2
T
-V

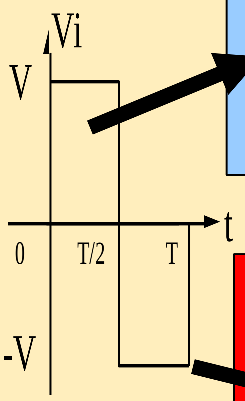

+
Vi
-
R
+
Vo
-

OPERATION OF CLAMPER

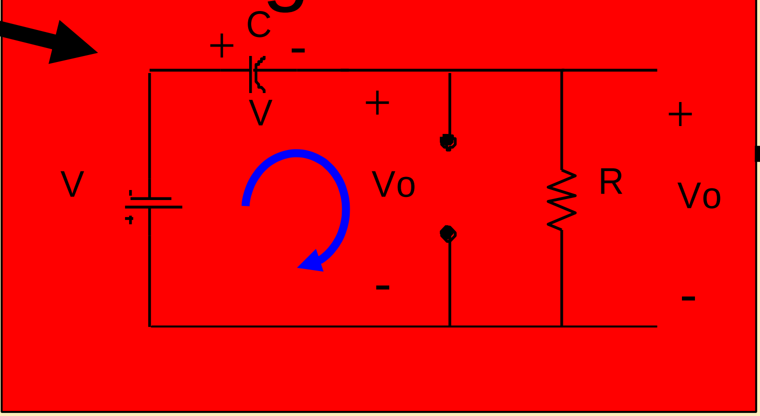
+ ve region



- 0 - T/2: Diode is ON state (short-cct equivalent)
- Assume RC time is small and capacitor charge to V volts very quickly
- Vo=0 V (ideal diode)



- ve region

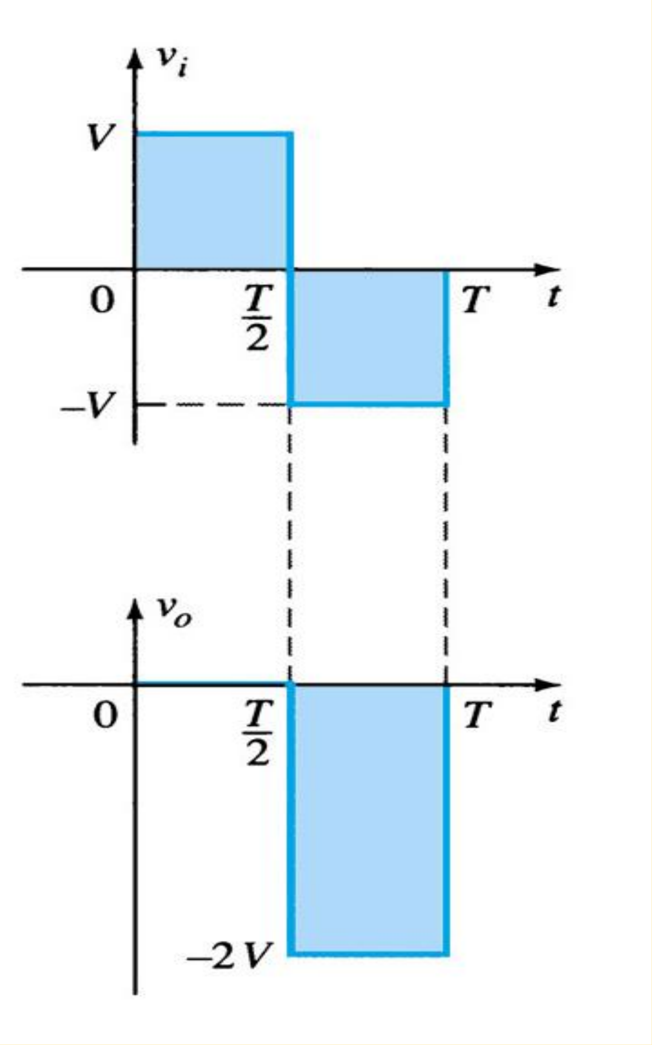


- T/2 📫 T: Diode is OFF state (open-cct equivalent)
- Both for the stored voltage across capacitor and applied signal current through cathode to anode
- KVL: - V- V- Vo = 0 and

  Vo = -2V

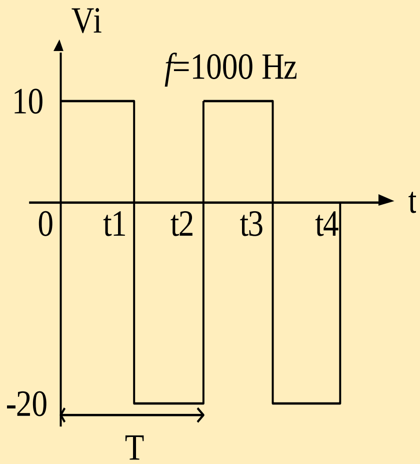
Tips : Clamping network

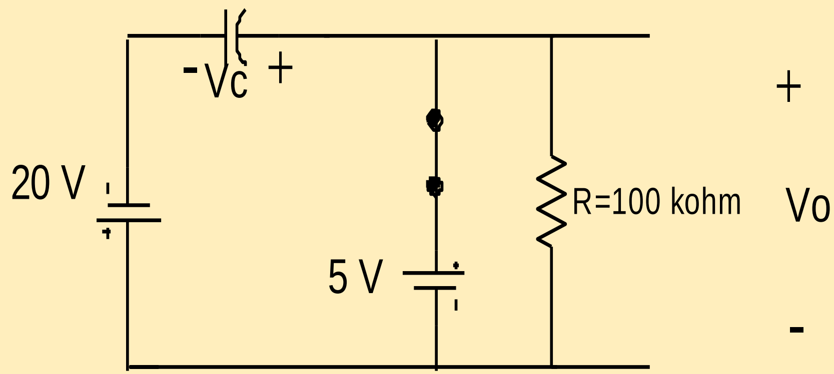
Total swing o/p signal = the total swing i/p signal



Solution:

Step 1: *Consider the part of i/p signal that will forward bias the diode. From network (t1 -   t2:-ve region)*





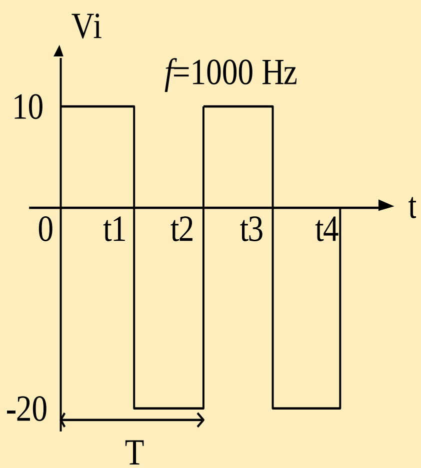
Step 2: *During ON state assume capacitor will charge to a voltage level determined by the network. Find the store voltage capacitor & obtained Vo*

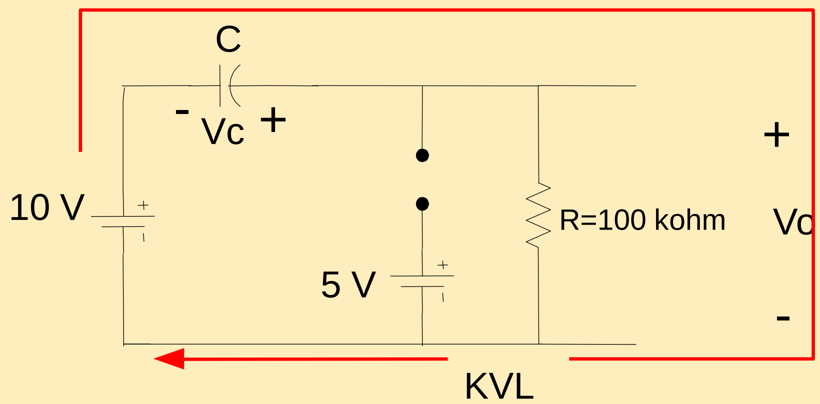
KVL: $-20 + V_c - 5 = 0$

$V_c = 25v$

$V_o = 5$

Step 3: *During OFF state assume capacitor will hold on its established voltage level. From network (t2 - t3:+ve region)*





Step 4: *Obtained Vo*

KVL: 10 . Vc Vo 0

10 . 25 . Vo 0

Vo 35V

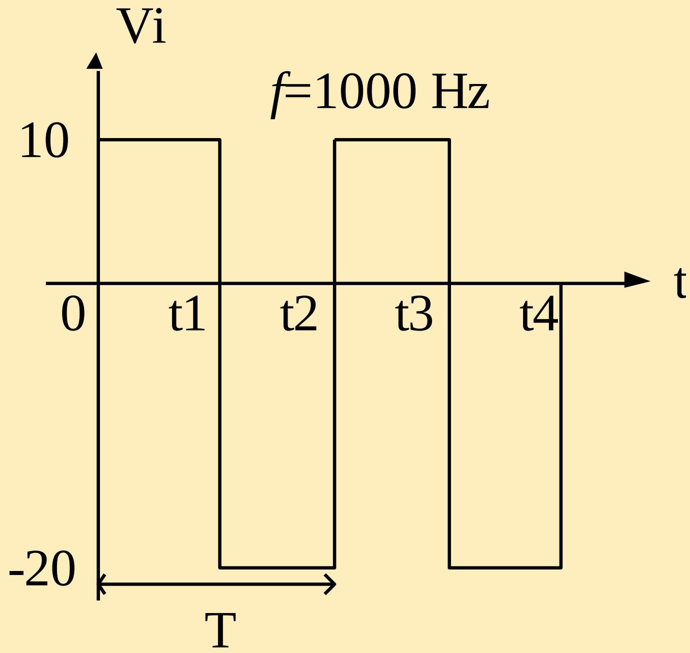
Time constant of discharging is determined

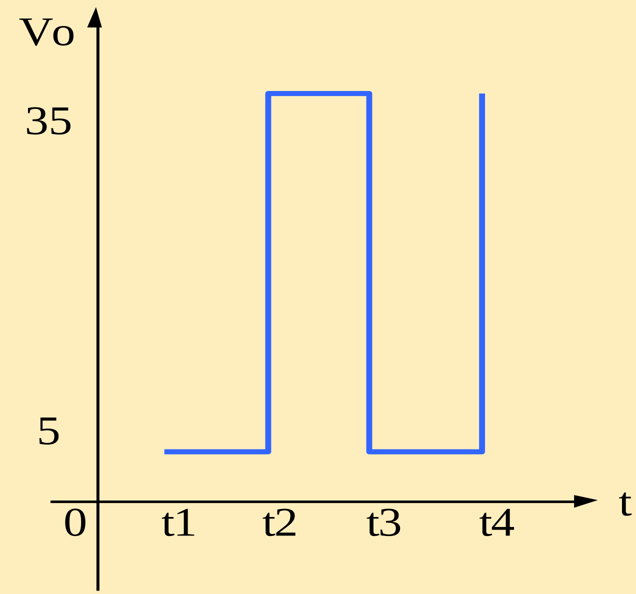
by : . RC . (100k)(1u) . 100 ms

The total discharge time is 5 5(100ms) 500 ms

Solution (cntd):

Step 5: *Checking!!! total swing o/p signal = total swing i/p signal*
From network (t2 -   t3: +ve region)





SUMMARY OF CLAMPER CIRCUITS