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Subject = Electronic ①

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Q2:- for the circuit given in figure 1 answer the following problem?

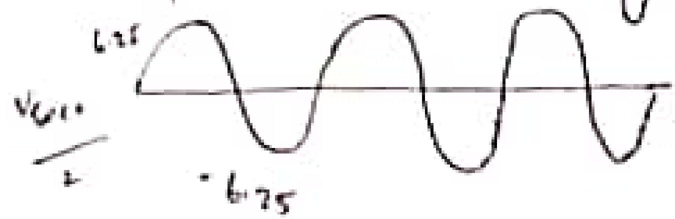
(a) This is a center tapped full wave rectifier.

(b) Total peak Secondary voltage

$V_{p(sec)} = n V_{p(pri)} = 0.25(50) = 12.5V$

$V_{p(sec)} = 12.5V$

(c) Half of the Secondary Voltage



There is 6.25V peak to peak voltage the output voltage has a peak value of 6.25 - 0.7 is diode drop

(d) peak current through each diode

$$I_F = \frac{\frac{V_{P(sec)} - 0.7}{2}}{R_2} = \frac{5.55V}{10K\Omega} = 0.000555 \text{ mA}$$

(c) PIV rating must diode have

$PIV = 2V_{p(out)} + 0.7$

$= 2(5.55V) + 0.7$

$= 11.8V$

Q2: Determine the ripple factor for the filtered bridge rectifier with a load as indicated in figure.

Solution:-

Transformers turn ratio is $n = 0.5$

peak primary voltage:

$V_{p(pri)} = V_{peak} = V_{RMS} \times \sqrt{2}$

$= 120 \times 1.414 = 170V$

The peak secondary voltage

$V_{P(sec)} = (0.5)(170) = 85V$

The unfiltered full wave rectifier voltage is

$V_{P(sec)} = V_{p(sec)} - 1.4V = 85V - 1.4 = 83.6V$

The frequency of full wave rectifier voltage is 120Hz

$V_r(PP) = \left(\frac{1}{fR_L C}\right) V_P(out) = \left(\frac{1}{(120Hz)(3300)(100\mu f)}\right) 83.6$

$V_r(PP) = 2.11$

The approximate dc value of output voltage is determine as follows.

$V_{DC} = \left(1 - \frac{1}{2fR_L C}\right) V_P(out) = 1 - \frac{1}{2(120)(3300)(100\mu f)}\Big) 83.6$

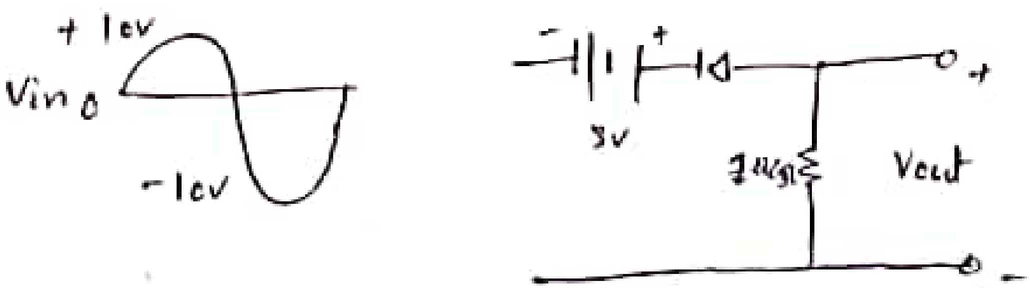
$= 82.544$

resulting ripple factor

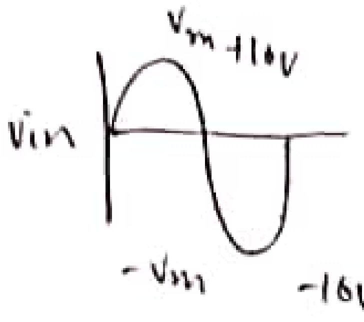
$\gamma = \frac{V_{rpp}}{V_{DC}} = \frac{2.11}{82.544} = 0.02556$

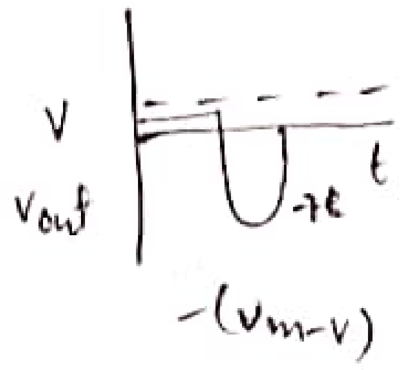
Q3:- Determine the output voltage waveform for the circuit given in figure(3)

Solution:-



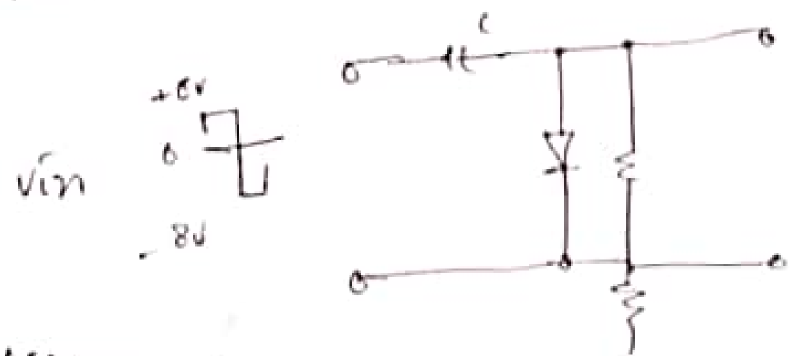
output waveform of clipper circuit -



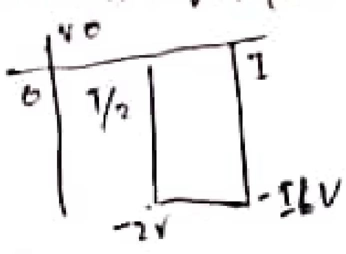


Qu:

Solution:-



Assume the RC time Constant is much greater than period of input
so if we take (5τ discharge $\geq 50 T/2$)
we obtain condition for the Clamping operation
τ discharge $\geq 5T$
so $v_o = v_i - V + V_D(on)$ ∴ T is the Period of input signal v_i



Answer the following question:-

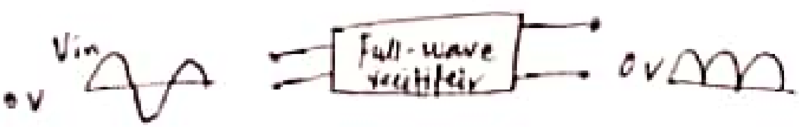
(9) Power Supply Filters:-

A power supply filter ideally eliminates the fluctuation in the output voltage of a halfwave or full-wave rectifier and produces a constant-level dc voltage.

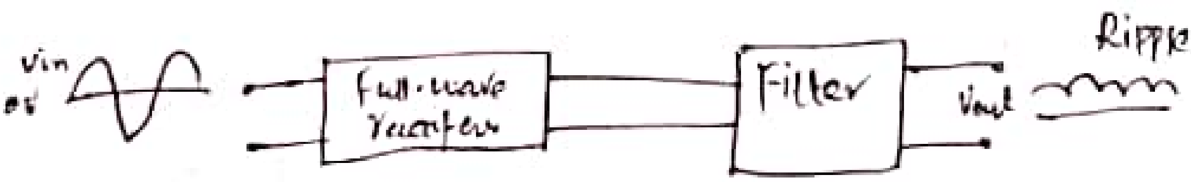
⇒ The 60 Hz pulsating dc output of a half-wave rectifier or the 120 Hz voltage variations.

⇒ The output of a filter is nearly smooth dc output voltage.

⇒ The small amount of fluctuation in the filter output voltage is called ripple.



(a) Rectifier without a filter



(b) Rectifier with a filter.

(b) Two types of extrinsic (impure) Semiconductor material n-type and P-type are the building blocks for most types of electronic devices.

⇒ Since Semiconductor are generally poor conductors their conductivity can be be drastically increased by the controlled addition of impurities to the Intrisic (pure) semiconductor material.

⇒ This process called doping increase the number of current carries (electrons or holes)

⇒ The two categories of impurities are n-type - p-type

⇒ P- Type Semiconductor

⇒ To increase the number of holes in Intrinsic si a trivalent impurity atoms are add.

⇒ As can be seen that each trivalent atom Boron(B) form covalent bond with three adjecent si atom and leaving one hole.

⇒ As trivalent atom can take a electron it is also referred as Acceptor atom

⇒ Since most of the current carries are holes si or Ge doped with trivalent atom is a p-type semiconductor.

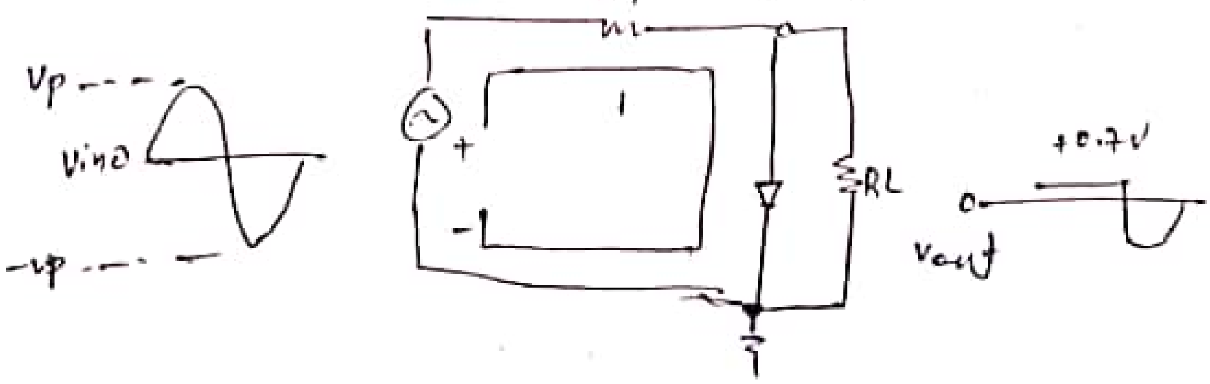
(c) Diode limiters / Clippers

Diode circuit called limiters or clippers are sometime used to clip off portions of signal voltage above or below certain levels.

⇒ Diode positive limiter:-
that limit or clips the positive positive parts of the input voltage.

⇒ As the input goes positive the diode becomes forward biased and conducts current.

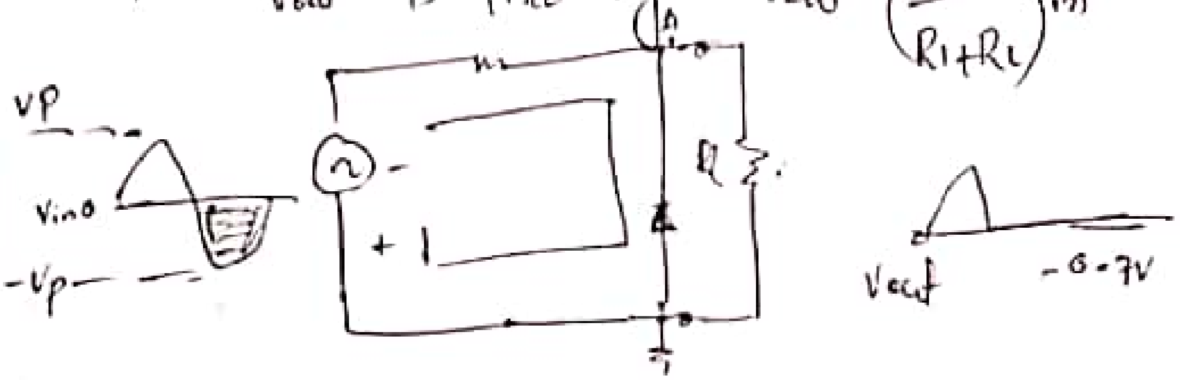
⇒ When the input voltage goes back below 0.7V the ~~dide~~ diode is reverse - based and appears as open blocking current flow through itself and as a result has no effect on the negative half of the sinusoidal voltage which passes to the load, unaltered.



⇒ If the diode is turned around the negative part of the input voltage is clipped off.

⇒ The diode is forward biased during the negative half cycle of the sinusoidal waveform and limit or clips it to – 0.7 Volts.

⇒ The Vout is find by :- $V_{out} = \left(\frac{R_l}{R_1+R_L}\right) V_{in}$



(d) The component in a clamping circuit effectively acts as a battery is capacitor.

⇒ As Vin become negative the capacitor acts as a battery of the same voltage of (Vin) The Voltage source and the capacitor counteract each other. resulting in a net voltage of zero as seen by the load.

(e)
<u>Answer:-</u>

The 60 Hz sinusoidal voltage is applied to Input of a half-wave recetifier the frequency is 120 Hz.

(f) Answers:-

The voltage ripple is smothed by using a capacitor it tries to hold the peak voltage across the load. when the is minimum then load resistance is high and draw a negligible.

⇒ lower the value of the load resistance higher is the load current quicker is the capacitor discharge through this load. that means more slant of the waveform of the ripple voltage instanaeous value towards zero volt. w.r.t time that represents the higher ripple content.

(g) Answers:-

⇒ Key Differences Between Clipper and Clamper:-

① The main difference between Clipper and clamper is their function.
clipper limit the voltage while clamper shift in upwards or downwards.

② The usage of energy storing element also create a key difference b/w clipper and clamper

Clipper dost not require capacitor while clamper circuit cannot be completed without energy storing element i-e capacitor.

(3) The output waveform obtained from clipper circuit appears in the different shape that of input. while the shape of the waveform in the clamper circuit remains exactly same after clamping of the signal.

(4) The clipper is also known as a current delimiter. voltage delimiter or amplitude delimiter while clamper circuit also considered as voltage multiplier circuit.