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Assigment = Mid

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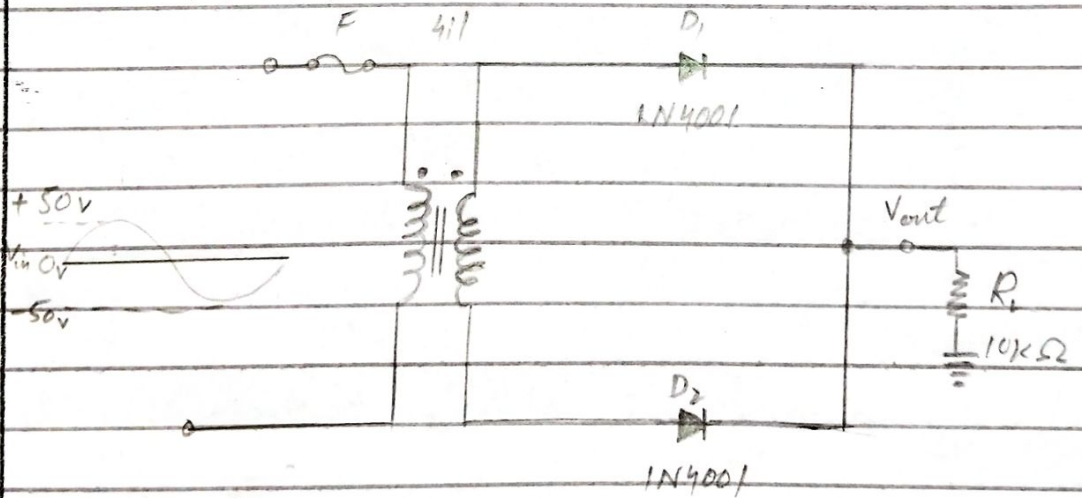
Q1 For the circuit given in Figure 1, answer and solve following problems.

ⓐ What type of circuit is this?
ⓑ What is the total peak secondary voltage?
ⓒ Find the peak voltage across each half of the secondary.
ⓓ What is the peak current through each diode?
ⓔ What minimum PIV rating must the diodes have?



Parts ⓐ.

This is the center-tapped full wave rectifier that uses two diode connected to the secondary of a center-tapped transformer

Parts ⓑ.

The transformer turns

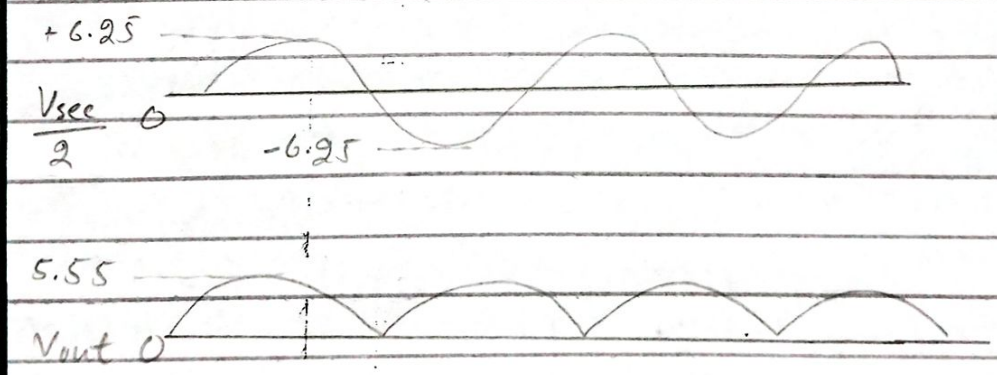
ratio $n = 0.25$. The total peak secondary voltage is,

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

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

part (c) :-

There is a 6.25 peak across each half of the secondary with respect to ground. The output with load voltage has a peak value of 6.25 V, less the 0.7 V drop across the diode.



part (d) :-

peak current through each diode

$$I_f = \frac{\frac{V_{p(sec)}}{2} - 0.7}{R_L} = \frac{5.55V}{10\,k\Omega} = 0.000555$$

$$I_f = 0.555\ mA$$

Part ②.

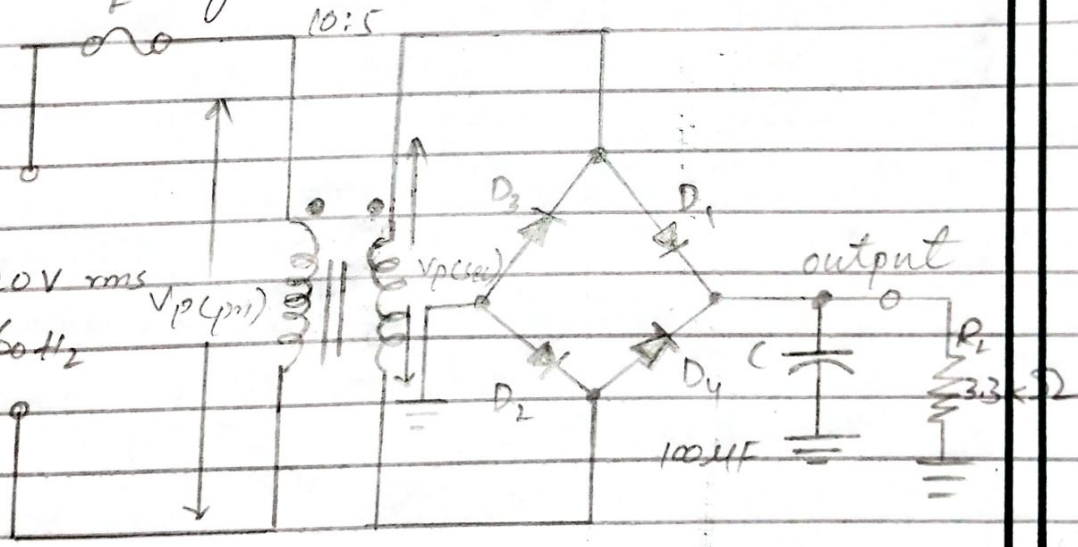
PIV rating must the diode have

$$PIV = 2V_{Pout} + 0.7$$

$$PIV = 2(5.55\,V) + 0.7$$

$$PIV = 11.8\,V$$

Q2:- Determine the ripple factor the filtered bridge rectifer with a load as indicated in Figure 2.



Solution.

The transformer turns ratio is $n = 0.5$. The peak primary voltage is

$$V_{p(pri)} = 1.414\ V_{rms}$$
$$= 1.414\ (120V) = 170V$$

the peak secondary voltage is

$$V_p(sec) = nV_p(pri) = 0.5(170V)$$

$$V_p(sec) = 85.0\,V$$

The unfiltered peak full wave rectified voltage is

$$V_p(rect) = V_p(sec) - 1.4\,V.$$

$$85.0 - 1.4\,V = 83.6\,V$$

The frequency of full wave rectified voltage is 120Hz. The approximate peak-to peak ripple voltage at the out put is

$$V_r(pp) \cong \left(\frac{1}{fR_LC}\right)V_p(rect) =$$

$$\left(\frac{1}{(120Hz)(3300\Omega)(100\,\mu F)}\right)83.6\,V$$

$$= \frac{1}{39600000} = 3.93\,V$$

The approximate dc value of the output voltage is determined as follow

$$V_{DC} = \left(1 - \frac{1}{2fR_LC}\right)V_p(rec) = \left(1 - \frac{1}{(240)(3300)(100)}\right)15.6\,V$$

$$= 1 - \frac{1}{79200000} = 15.5\,V$$

Q3) Determine the output voltage waveform for the circuit given in figure 3.

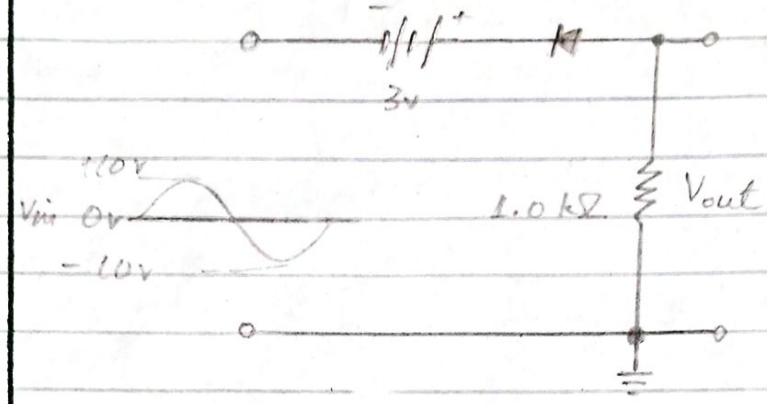
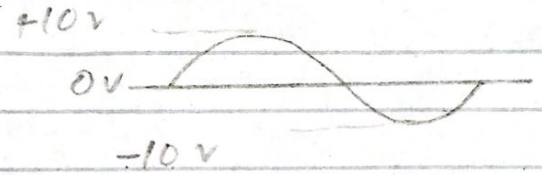


Fig = 3

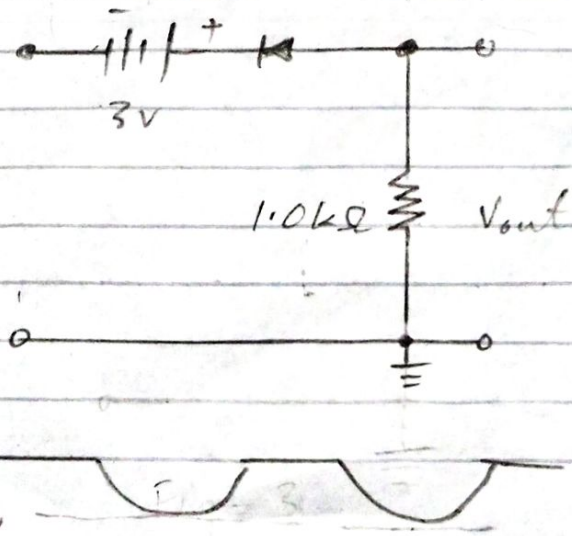
(3) Ans)



$V_S \; V_R - 0.7 + 3V = 0$

$V_R = 10V - 0.7V + 3V$

$V_R = 12.3V$



Q4) Determine the output voltage waveform for the circuit given in Figure 4. Assume of RC time constant is much greater than the period of the input.

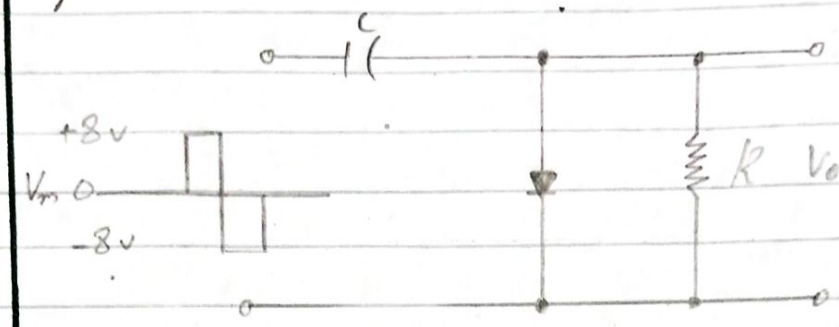
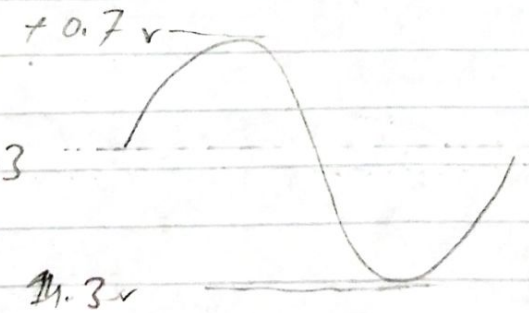


Fig-4

Ans. $V_{DC} = -(V_{pin} - 0.7v) = -(8 - 0.7)$

$V_{DC} = -7.3$

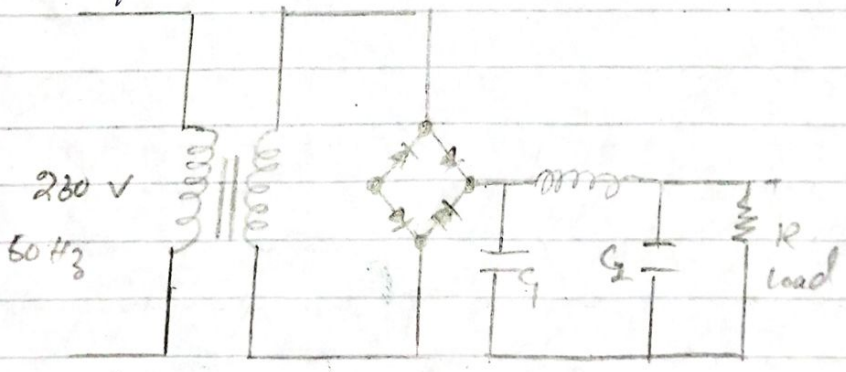


Output wave-form across R_2.

Q5 part (a):-

What is a Power supply Filter? Discuss is operation with help of a circuit diagram.

The output of the transformer is pulsating sinosoidal AC voltage which converted to pulsating DC with the help of a rectifier. This output is given to a filter circuit which reduces the AC ripple and passes the DC component.



part (c).

What is a diode limiter? What is the difference between a positive limiter and a negative limiter.

Ans (c).

A Diode limiter is

an electronic circuit design to clip or limit an alternating current (AC) supply voltage or an audio signal to a present value. This is typically necessary where the supply voltage is larger than needed or power full audio signal require compression to prevent overloads.

⇒ A diode positive limiter (also called clipper) that limits or clips the positive part of the input voltage. As the diode input voltage goes positive the diode becomes forward biased and conduct current.

⇒ The negative limiter the can be modified to limit the output voltage to the portion of the input voltage wave form below V_{Bias}.

part (d).

What component in a clamping circuit effectively acts as a battery?

Ans (d) :-

As V_{in} become neg-

galive the capacitor acts as a battery of the same voltage of Vin. The voltage source and the capacitor countract each other resulting ie a net voltage of zero as seen by the load

part-(e):-

When a 60 Hz sinusoidal voltage is applied to the input of a half-wave rectifier, what is the output frequency?

When a 60 Hz sinusoidal voltage is applied to the input of half wave rectifier. The out put frequency is 120 Hz. There A sinousiodal voltage is twice that off the half-wave.

part (f):-

If the load resistance connected to a filtered power supply is decreased what happen to the ripple voltage?

Ans:-

The ripple voltage amplitude increases when the load resistance decrease.

part (B)

How are n-type and p-type Semi-conductor formed?

Ans N-Type and P-Type Semi-conductor.

- Two types of extrinsic (impure) Semiconductive materials, n-type and p-type, are the key building block for most types of electronic devices.
- Since Semi-conductors are generally poor conductors, their conductivity can be drastically increased by the controlled addition of impurities to the intrinsic (pure) Semi-conductive material. This process, called doping, increase the number of current carries (electrons or holes).
- The two categories of impurities are n-type and p-type.

part (C)

Discuss how diode limiters and diode clampers differ in terms of their function.

Ans) Diode limiter / clipper :-

The clipper is

defined as, that limit or clip the positive input cycle when the input voltage goes positive, the diodd becomes forward bias and conduct the current Point "A" is limited to +0.7 V. The input voltage exceed this value. When the input voltage goes back below 0.7V the diode become reverse bias and diode become revesse bias and appear as open. The output voltage looks like the negative part of the input voltage that the magnitude detelmined by the voltage divider formed by load Rosister

R_1 Eq
R_L

$$V_{out} = \frac{R_L}{R_1 + R_2} (V_{in})$$

R_1 is small compered to R_L, then.

$$V_{out} \cong V_{in}$$