and

$V_{out} = V_{pi} \sin \omega t \; ; \; 0 \leq t \leq T$

$V_{out} = -V_{pi} \sin \omega t \; ; \; T/2 \leq t \leq T$

where, $V_{pi} = V_p - V_f$

Objectives:

By the end of the experiment, I will be able to demonstrate full-wave rectification by using a full-wave bridge rectifier circuit. I will verify your results with an oscilloscope and a multi-meter.

Equipment and Components:

i) Semiconductor circuit board (Diodes, resistor and transformer).
ii) Digital multi-meter.
iii) Oscilloscope
iv) Function generator

Introduction:-

In the third experiment of EE 311 which was about full wave diode bridge rectification As I learned in the previous lab how diode can be used to convert AC voltage to DC

Theory:-

The conversion of Ac into Dc is called Rectification. Electronic device can convert Ac power into Dc power with high efficiency. A drawing of a full-wave rectifier is given below. The bridge is composed of four diodes in a dimond shape. During the positive half-cycle of input voltage with the terminal 'A' is at positive potential with respect to the terminals 'B' and because if this diodes D_1 and D_2 are forewoard biased whereas diodes D_3 and D_4 are reverse biased. The current therefore flows through diodes D_1, D_2 and load resistance R_L. During the negative half-cycle of input voltage waveform, on the other hand, the diode D_3 and D_4 are forewoard biased whereas the diodes D_1 and D_2 are reverse biased. As a consequence, current flows through diodes D_3 and D_4. The input and output voltage waveform may be analytically written as:

$$V_{in} = V_p \sin \omega t, \quad 0 \leq t \leq T$$

iii) Channel 1 of the oscilloscope was connected to observe the AC input to the circuit. And channel 2 of the oscilloscope connected across the output of the transformer.

iv) The function generator was adjust to 20 V_{pk-pk} and 100 Hz sine wave.

v) Channel 2 of the oscilloscope was moved to the output side of the bridge.

vi) The multi-meter was set to DC volts, and the output of the circuit was measured.

vii) Channel 2 oscilloscope probe was moved to the top terminal of the transformer secondary.

viii) Channel 2 reference line was moved to the middle line of the oscilloscope graticule and common lead of channel 2 probe was moved to the positive side of the bridge.

Results and Analysis:

i) The purpose of the resistor in the circuit is to act as load.

ii) By comparing the two waves on the oscilloscope, the transformer has a step up voltage relationship.

iii) To ensure that the output amplitude of the transformer equal $20\ V_{pk\text{-}pk}$, the input amplitude set to $7.75\ V_{pk}$ before channel 2 of the oscilloscope was moved to the output side.

iv) The two alternations of the input wave are observed on the oscilloscope.

v) Figure 2 the output amplitude of the rectifier equal $8.6\ V_{pk\text{-}pk}$ and the different between it and input of the rectifier due to forward voltage drop.

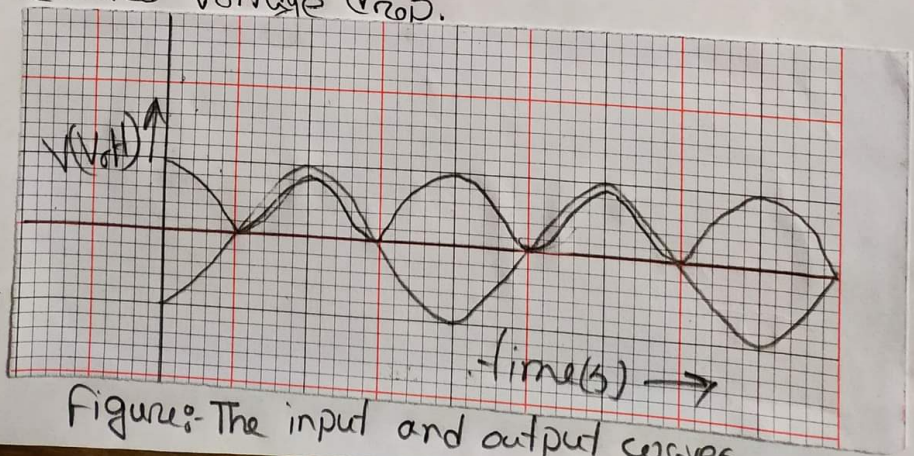

Figure: The input and output waves.

voltage by half wave rectifier, in this lab the conversion is by a full wave bridge rectifier. The full wave rectifier converts the whole of the input waveform to one of constant polarity at its output. Full-wave rectification converts both polarity of the input waveform to pulsating. Four diodes in a bridge configuration and any AC source

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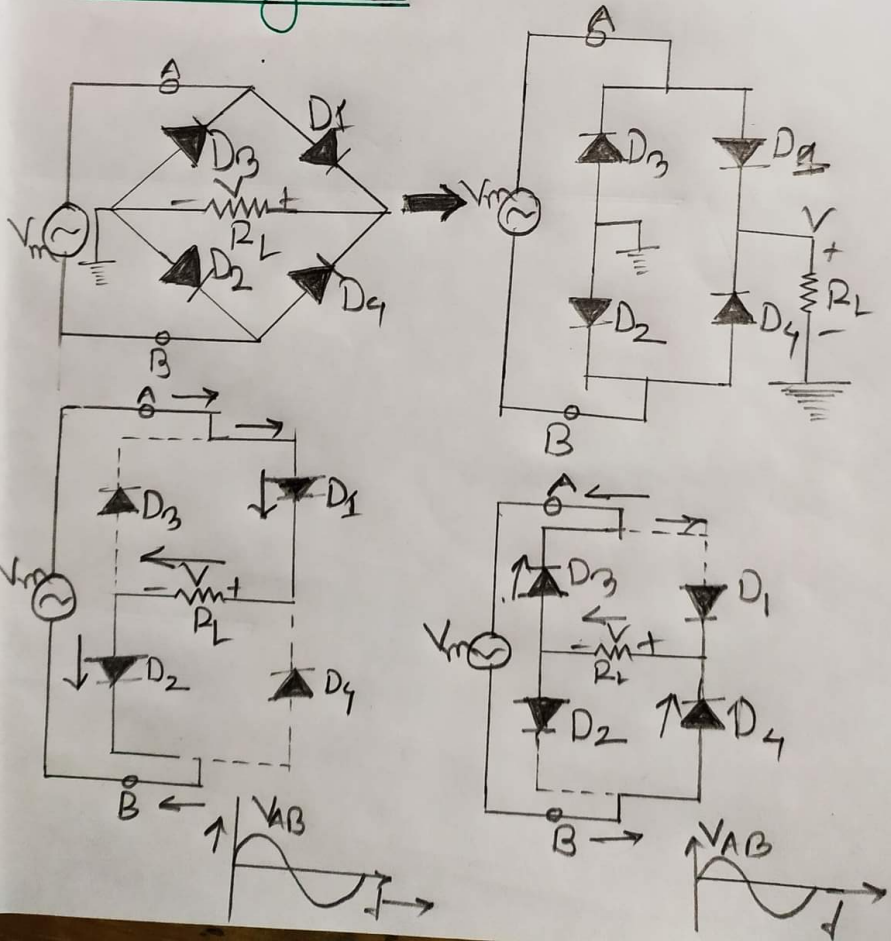
Circuit Diagram:-



the average (dc) value of full wave rectified sine wave voltage is represented by

$$V_{av} = V_{dc} = \frac{1}{T}\left[\int_0^{T/2} V_m \sin\omega t \, d(\omega t) + \int_{T/2}^{T} 0 \cdot d(\omega t)\right]$$

$$= \frac{2V_m}{\pi}$$

Rms voltage of the load resistance can be calculated as,

$$V_{rms} = \sqrt{\frac{1}{T}\left[\int_0^{T/2} V_m \sin\omega t \, d(\omega t) + \int_{T/2}^{T} V_m^2 \sin^2\omega t \, d(\omega t)\right]}$$

$$= \frac{V_m}{\sqrt{2}}$$

Procedure:-

i) The power source was adjusted to ±10 V_{DC}, the semiconductor circuit board was inserted into the base unit.

ii) Full wave rectification circuit block was connected as shown in figure (1)

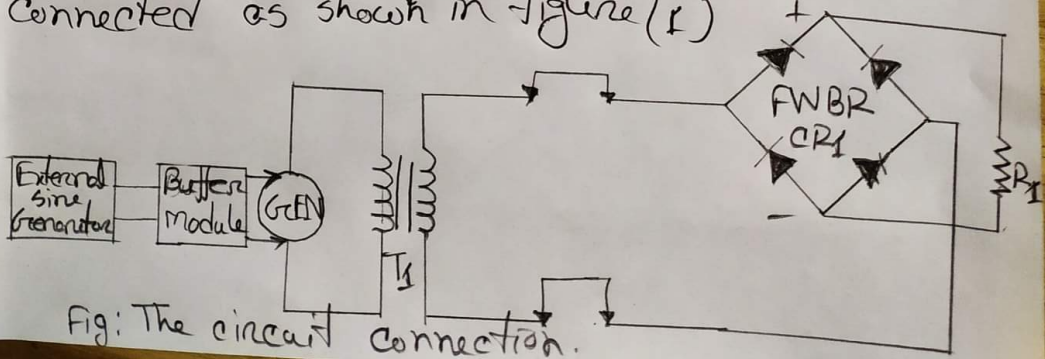


Fig: The circuit connection.

vi) The frequency of the output:

$T = 2 \times 2.5\,ms = 5\,ms$, $F = \frac{1}{T} = \frac{1}{5 \times 10^{-3}} = 200\,Hz$

vii) The calculated and measured DC average voltage.

calculated: $V_{avg} = V_{pk} \times 0.636 = 9.2 \times 0.636$

$= 5.8512\,V$

measured: $V_{avg} = 5.427\,V$

which they almost equal with error equal .7%

viii) In step 7 and figure 3, the diode is forward biased in the negative half cycle and reverse biased in the positive half cycle. The forward voltage drop equal 1.4V, which is equal 0.7V for each diode

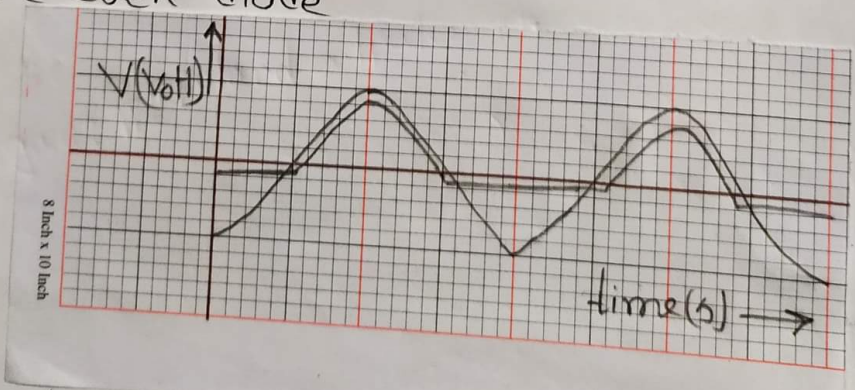


figure3: The curve form of step (vii)

ix) In step 8 and figure 4, the diode is forward biase in the positive half cycle and reverse biased in the negative half cycle The forward voltage drop equal 1.4 V. which is equal 0.7V for each diode.

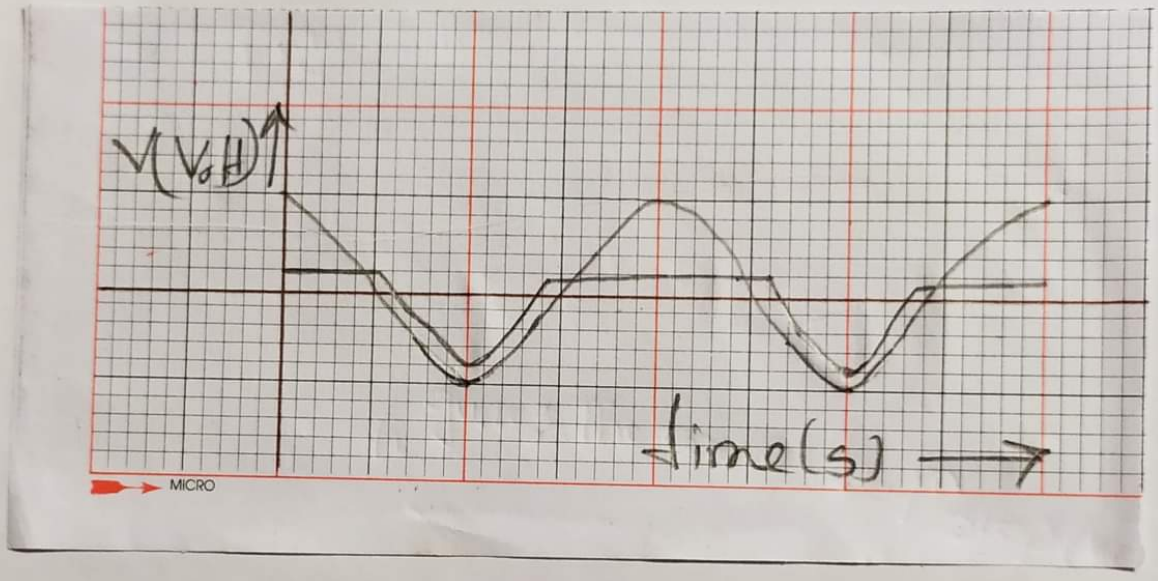


Figure: The wave form of step (viii)

Conclusion:-

By the end of the lab report, it was a great experiment for me to know how the full wave rectifier convert AC to DC voltage and the different between the half wave and full wave rectifier. Also in this experiment, I learned how to calculate

the voltage drop and knew how the freque ency increased when Ac converted to the voltage drop and knew DC. The last thing I learned is how the output across the diode look in forword and reverse biase which is almost zero in forward biase and has a value in reverse biase

References:-

i) http://en.wikipedia.org/wiki/Rectifier.

ii) http://www.circuitstoday.com/half-wave rectifier

iii) http://studylib.net/doc/half-wave-rectifiers.

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