Electronics-1

Lab Report # 3

Course Code:

EEE231

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Registration No:

FA21-BEE-053

Submitted To:

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$V_{out} = \frac{2.38\,mA}{1000 \times 1.1} \quad 4.75\ V$

0.23

$I = 0.19\,A$

$V = \frac{0.19}{1000 \times 10 \times 10^{-6}} = 19$

$V_{ripple} = \frac{I_{load}}{f \times C} \qquad \frac{0.50\,A}{1000 \times 10 \times 10^{-6}}$

$V_{out} =$

$\frac{0.40\,mA}{1000 \times 10 \times 10^{-6}}$

$\frac{4.98 - 4.75}{4.98} \times 100$

$\boxed{0.04}$

96 —

$5 - 0.02$

4.98

$\frac{4.78}{4.98} \times 100$

$\frac{3.805 - 2.7}{2.70} \times 100 \qquad 2.7$

$V_{ripple} = \frac{I(load)}{f \times C} = \frac{2.25\,mA}{(1000)(10 \times 10^{-6})} \quad 2.25 \times 10^{-3}$

(c) $V_{out}(DC) = 10 - 0.5 V_r$ $\quad 0.225\,A$

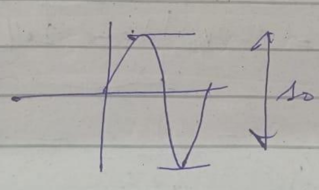
$-\,0.5 \times 0.225$

$\frac{2.25 \times 10^{-3}}{10 \times 1000 \times 10^{-3} \times 10^{-5}}$

10

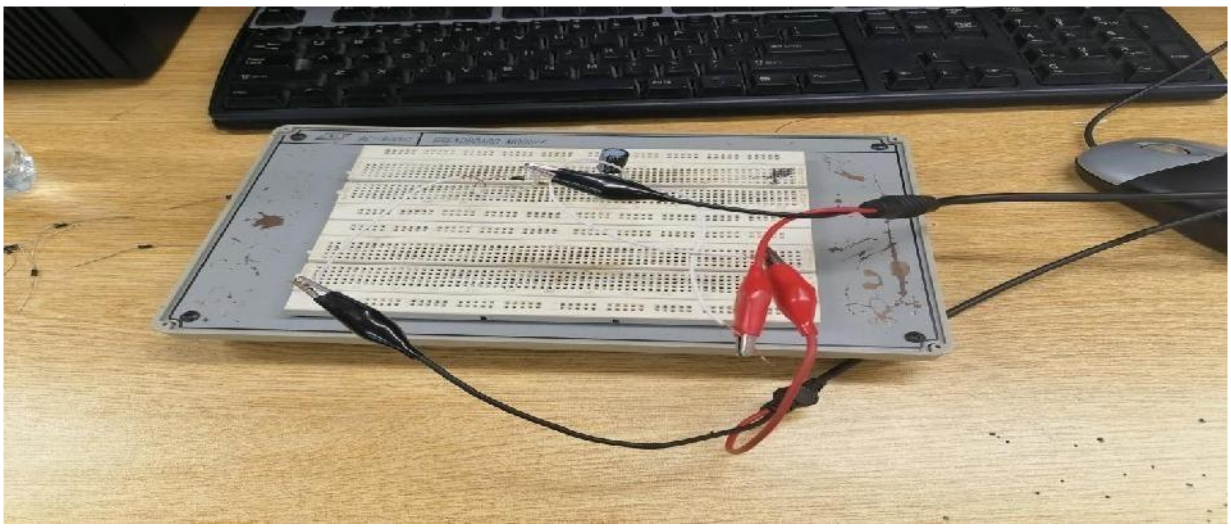
$\frac{2.25}{10} \quad \boxed{0.225}\ V_r$

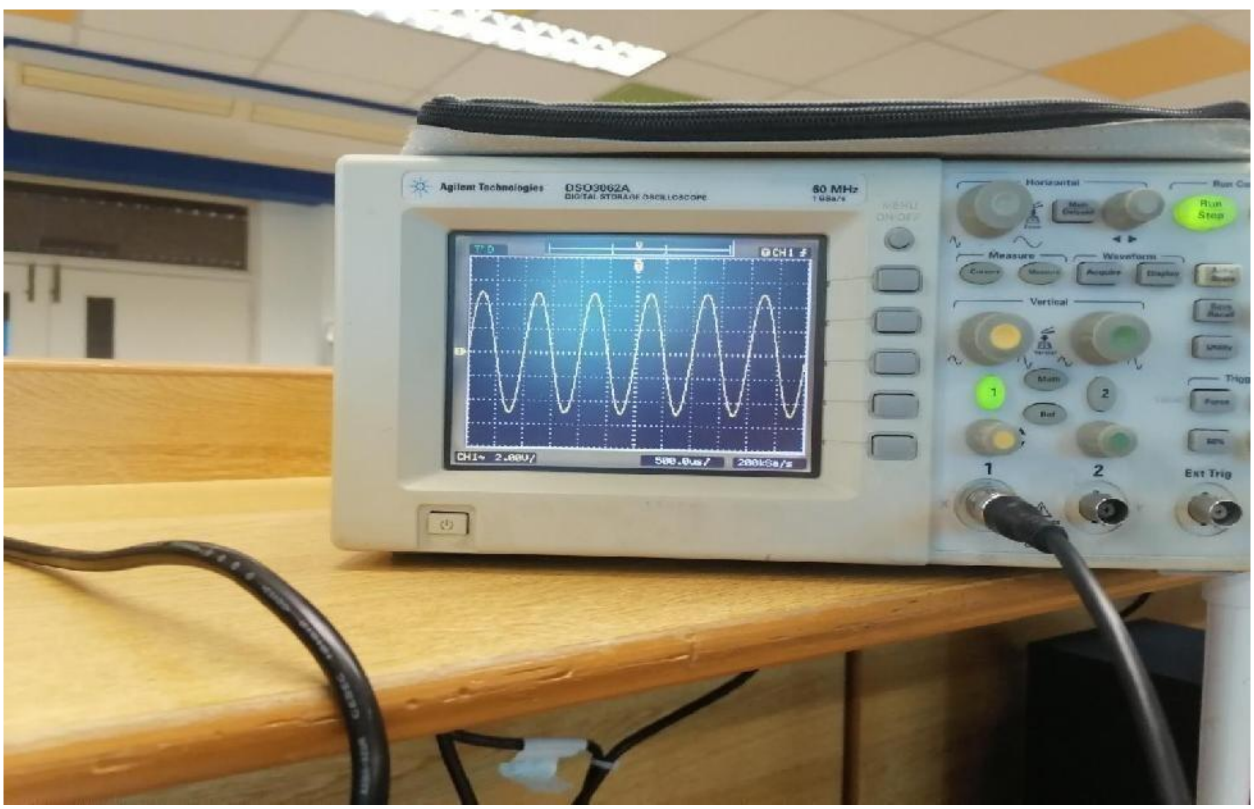
$\boxed{10 - 0.1125} = 9.8875$



In-Lab

Half Wave Rectifier:

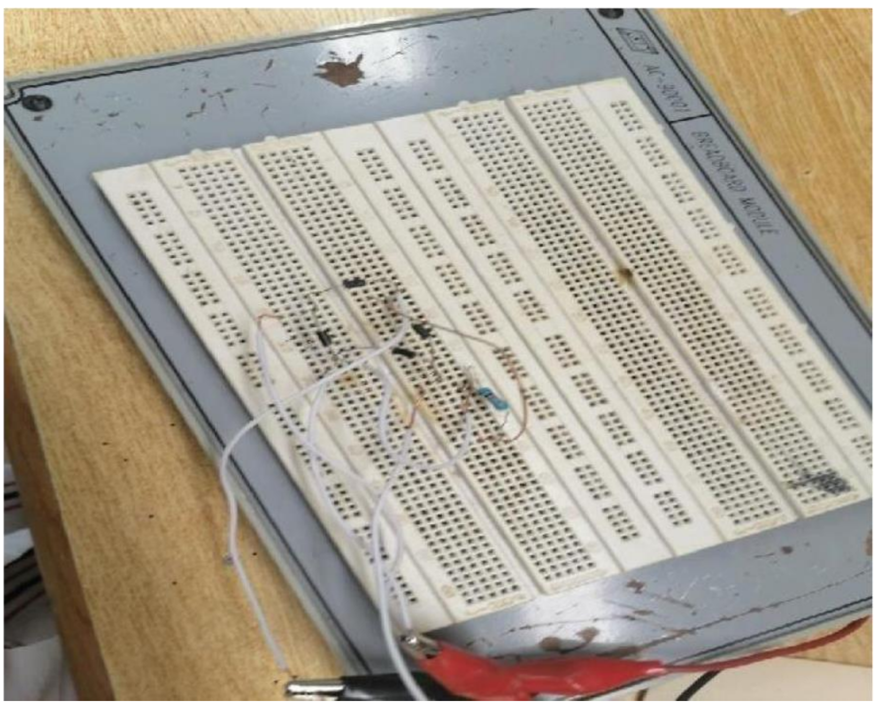




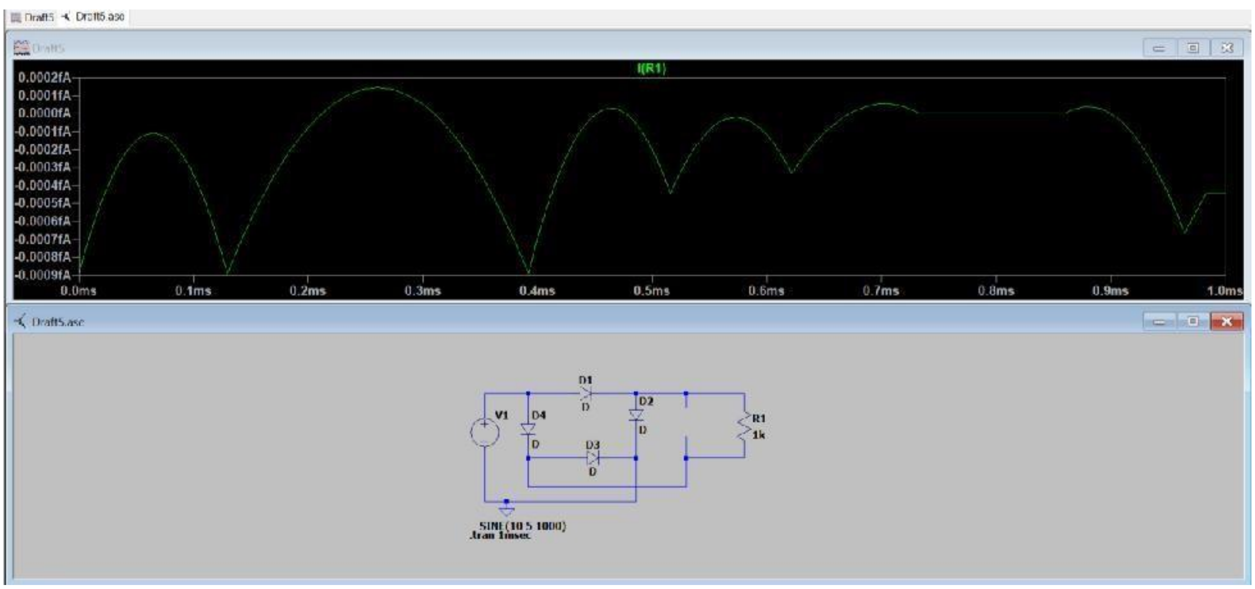
$$Vr = (1 / f*R_L*C)*Vp$$

R	**1kHz**
C	**10uF**
Vr	**0.5V**
Xc	**15.9ohm**
Vout(Dc)	**4.5 V**
I (load)	**3.91mA**

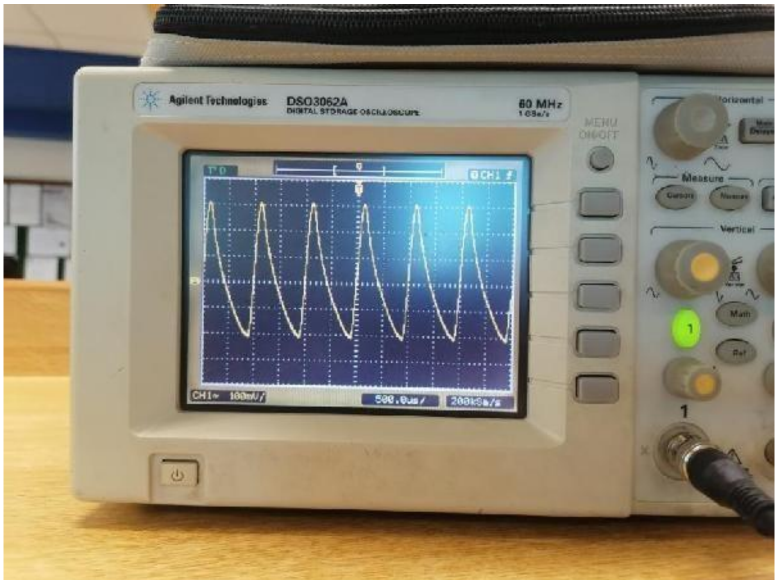
Full Wave Rectifier:

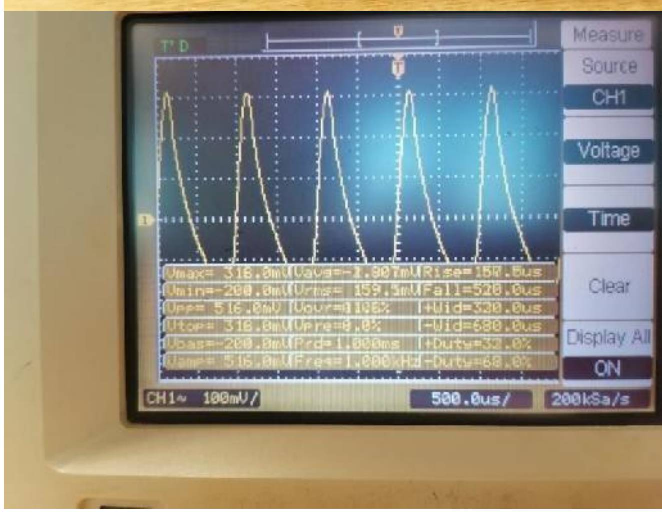


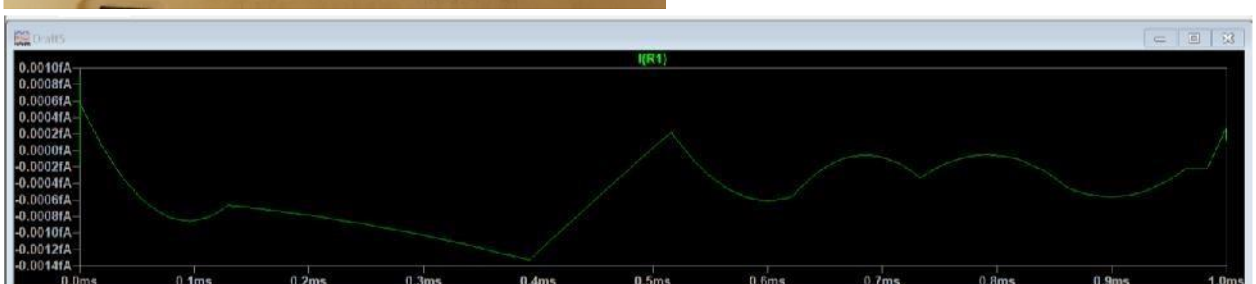
Without Smoothing Capacitor:

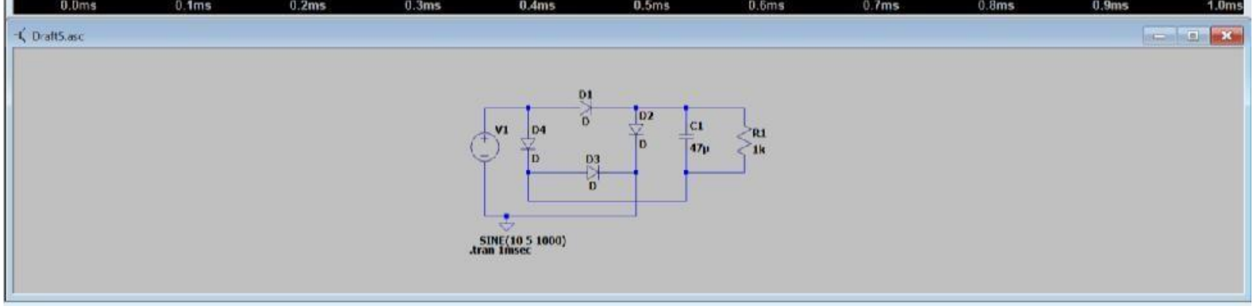


With Smoothing Capacitor:







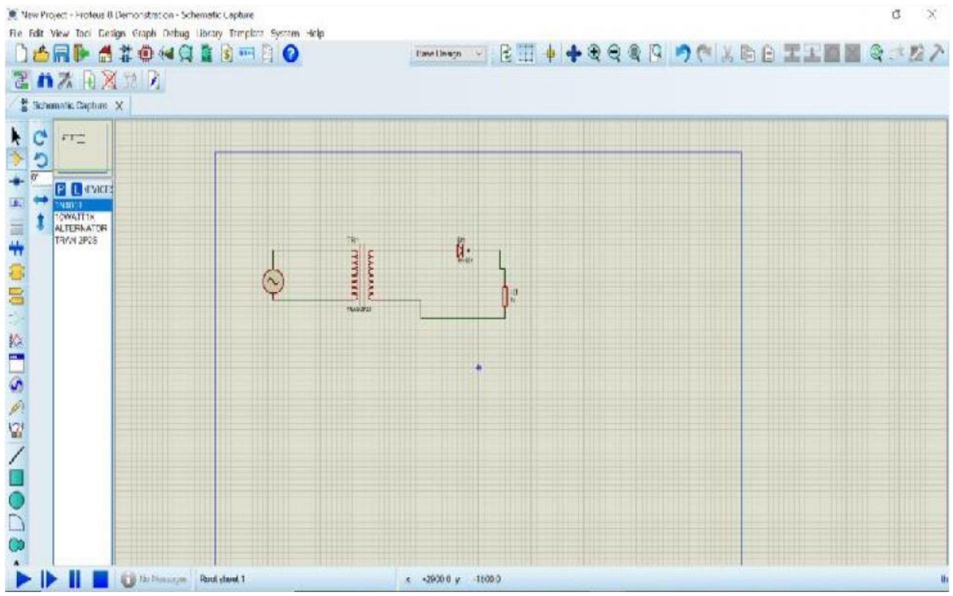


F	**1000 Hz**
C	**47uF**
Vr	**0.106V**
Xc	**3.38ohm**
V out	**4.94V**
I (load)	**0.24mA**

Parameter	**Calculated Value**	**Measured Value**
$V_{out\ (DC)}$ (Half Wave Rectifier)	4.5V	4.42V
$I_{out(DC)}$	3.82mA	3.91mA
$V_{out(DC)}$ (Full Wave Rectifier)	4.94V	4.23V
$I_{out\ (DC)}$	0.24mA	0.56mA

Design Problem:

1. Design and Calculate the Vdc voltage for a single-diode half-wave rectifier that has an input voltage of 120 volts ac rms (including the 0.7 volt drop for the diode).



$$V_{rms} = 120\ V$$

$$V_{pp} = V_{rms} * 2.82$$

$$V_{pp} = 120 * 2.82$$

$$V_{pp} = 338.4V$$

$$V_p = V_{pp} / 2$$

$$V_p = 338.4 / 2$$

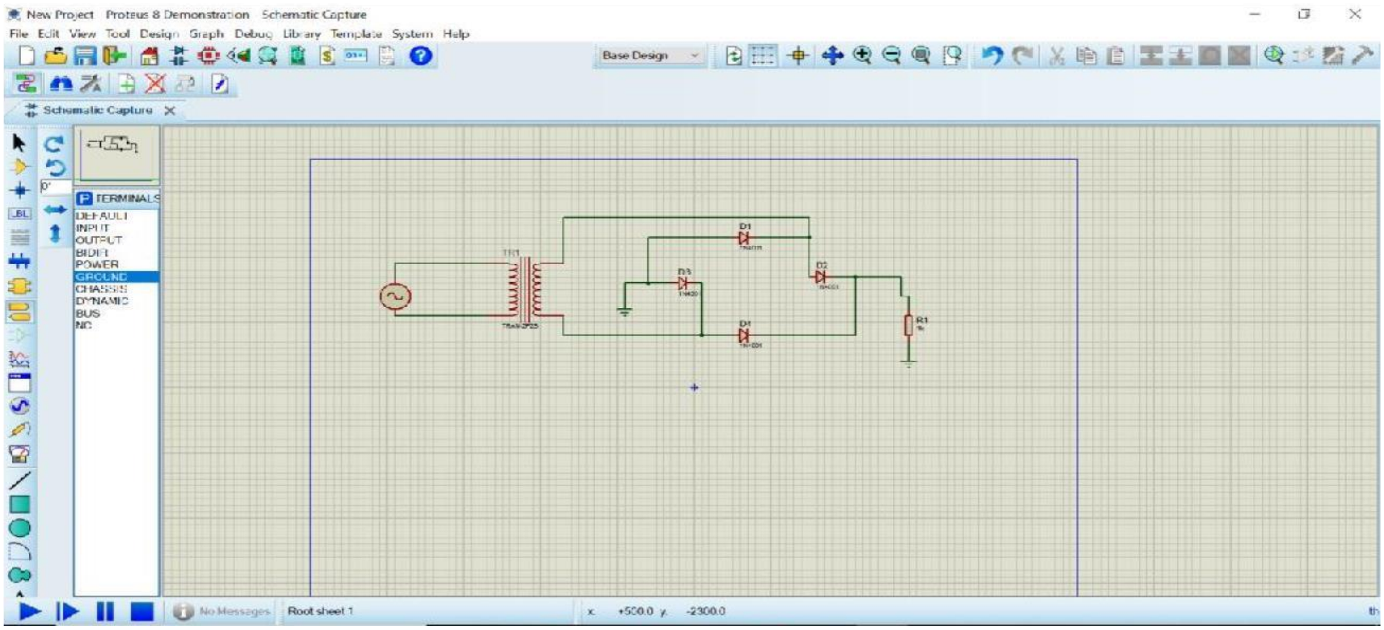
$$V_p = 169.2V$$

$$V_{dc} = (V_p - 0.7) / pi$$

$$V_{dc} = (169.2 - 0.7) / 3.14$$

$$V_{dc} = 53.66V$$

2. Design and Calculate the Vdc for a four-diode full-wave rectifier that is connected to the secondary of a transformer that provides 120 volts ac rms. (Remember to include the 1.4 volt drop through the diodes.)



Vrms=120v

Vp=(Vrms*1.4)-1.4

Vp =(120 * 1.4) – 1.4

Vp = 166.6V

Vdc = (2 / pi) * Vp

Vdc = 106.11V

Critical Analysis:

I learnt and observed the following in this lab :

1. In half wave Rectifier , When rectification is used to provide a direct voltage power supply from an alternating source, the amount of ripple can be further reduced by using larger value capacitors but there are limits both on cost and size.
2. In practice, the half-wave rectifier is used most often in low-power applications because of their major disadvantages . The output amplitude is less than the input amplitude, there is no output during the negative half cycle so half the power is wasted and the output is pulsed DC resulting in excessive ripple. To overcome these disadvantages a number of Power Diodes are connected together to produce a Full Wave Rectifier .
3. The full-wave bridge rectifier gives us a greater mean DC value (0.637 Vmax) with less superimposed ripple while the output waveform is twice that of the frequency of the input supply frequency. We can therefore increase its average DC output level even higher by connecting a suitable smoothing capacitor across the output of the bridge.
4. The smoothing capacitor converts the full-wave rippled output of the rectifier into a smooth DC output voltage.