



Power Electronics Laboratory **(EE3P004)**

EXPERIMENT-1

Single Phase SCR Bridge Rectifier

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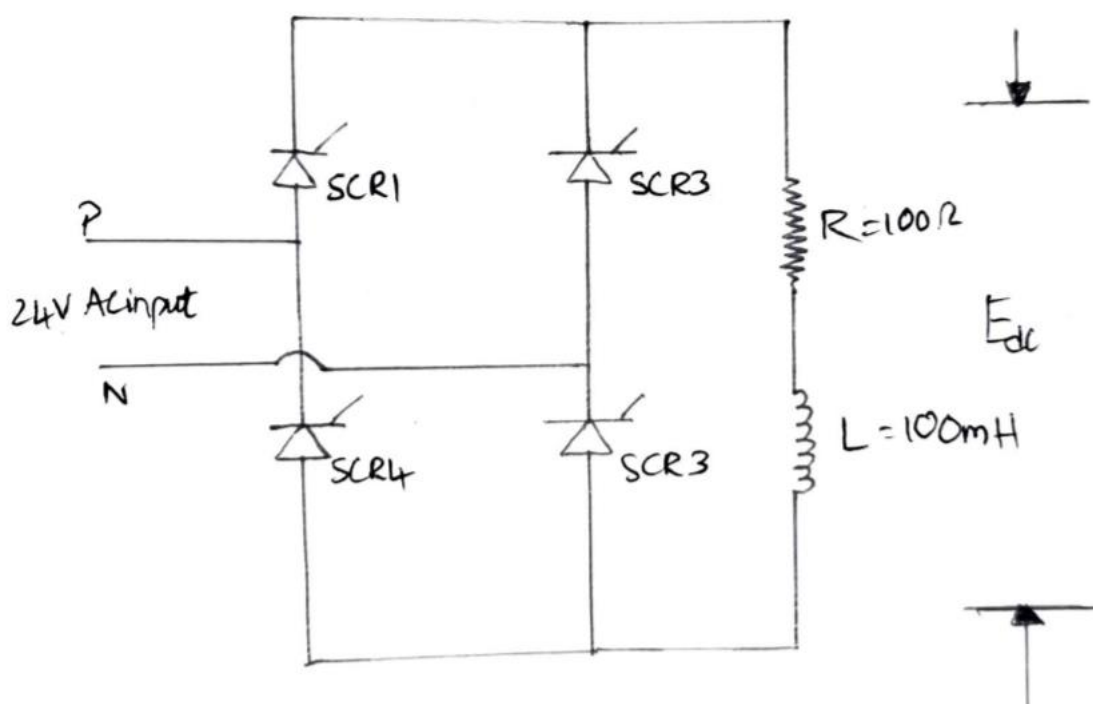
Aim of the Experiment:

To study the operation of a controlled single phase bridge converter with different types of loads.

Apparatus Required:

Sl.No.	Apparatus Required	Specification	Quantity
1	Module (Single Phase Bridge Converter)	4 Channel, 100 MHz, 2Gs/s	1 No
2	DigitalStorageOscilloscope (TDS2014C)	4 Channel, 100 MHz, 2Gs/s	1 No
3	Voltage Probe (TPP0201)	200 MHz, 10 M Ω / <12 pF, 10x	1 No
4	Extension Cord		1 No
5	Patch Cord		16 Nos

Circuit Diagram:



Observations:

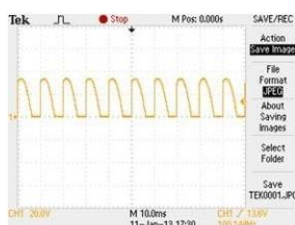
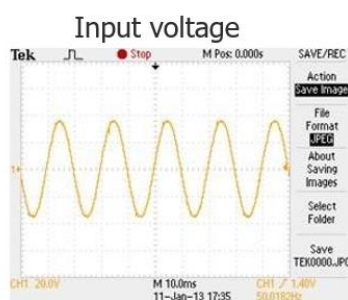
R-Load :

S.No	Firing Angle	Measured output (V)	Calculated
1	18	20.8	20.86
2	54	17.9	16.98
3	90	13	10.7
4	126	5.52	4.40
5	162	1.26	0.535

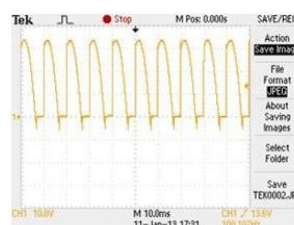
RL-Load :

S.No	Firing Angle	Extinction angle	Measured output (V)	Calculated
1	18	18	20.4	20.33
2	54	18	16.1	16.44
3	90	18	10.4	10.165
4	126	18	3.90	3.88
5	162	18	1.57	0

Waveforms:



(Source and Output Voltage for R-Load)



(Source and output Voltage for R-L Load)

Calculations:

For R-Load \rightarrow

$$V_o = \frac{V_m}{\pi} (1 + \cos \alpha)$$

$$V_m = 33.6 \text{ (observed from oscilloscope in video)}$$

i) $\alpha = 18^\circ$

$$V_o = \frac{33.6}{\pi} (1 + \cos 18) = 20.86V$$

$$\% \text{ Error} = \frac{20.86 - 20.8}{20.86} = 0.28\%$$

ii) $\alpha = 54^\circ$

$$V_o = \frac{33.6}{\pi} (1 + \cos 54) = 16.98V$$

$$\% \text{ Error} = \frac{16.98 - 17.9}{16.98} = -5.4\%$$

iii) $\alpha = 90^\circ$

$$V_o = \frac{33.6}{\pi} (1 + \cos 90) = 10.7V$$

$$\% \text{ Error} = \frac{10.7 - 13}{10.7} = -21.45\%$$

iv) $\alpha = 126^\circ$

$$V_o = \frac{33.6}{\pi} (1 + \cos 126) = 4.40V$$

$$\% \text{ Error} = \frac{4.4 - 5.52}{4.4} = -25.4\%$$

v) $\alpha = 162^\circ$

$$V_o = \frac{33.6}{\pi} (1 + \cos 162) = 0.535$$

$$\% \text{ Error} = -140.8\%$$

For R-L Load \rightarrow

$$V_o = \frac{V_m}{\pi} (\cos \alpha + \cos \beta)$$

i) $\alpha = 18^\circ$

$$V_o = \frac{33.6}{\pi} (\cos 18 + \cos 18) = 20.33V$$

$$\% \text{ Error} = \frac{20.33 - 20.4}{20.33} = -0.3\%$$

i) $\alpha = 54^\circ$

$$V_o = \frac{33.6}{\pi} (\cos 54 + \cos 18) = 16.4V$$

$$\% \text{ Error} = 2.06\%$$

iii) $\alpha = 90^\circ$

$$V_o = \frac{33.6}{\pi} (\cos 90 + \cos 18) = 10.16V$$

$$\% \text{ Error} = -2.3\%$$

iv) $\alpha = 126^\circ$

$$V_o = \frac{33.6}{\pi} (\cos 126 + \cos 18) = 3.88V$$

$$\% \text{ Error} = -0.36\%$$

v) $\alpha = 162^\circ$

$$V_o = \frac{33.6}{\pi} (\cos 162 + \cos 18) = 0$$

CONCLUSION

We have successfully completed the experiment by finding the average voltages of a full wave bridge-controlled rectifier. It can be observed that as the firing angle increase the average output voltage decreases. The main difference between the diode and SCR is that an SCR is a three-terminal device and a diode is a two-terminal device which are used for the switching function and rectification process. In case of controlled full bridge, the average output voltage is decreased as we can see in the waveform till $0 \rightarrow \alpha$ the voltage is 0.