Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

First Year (Semester I) B.Tech.

Basic Electrical and Electronics Engineering

Experiment No : 06

Rectifier Circuit

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Date of performance :10/04/2021

Signature of teacher-in-charge : _____

First Year (Semester I) B.Tech.

Aim:	To design Half wave and full wave rectifier.
Apparatus:	Online simulation tools (Suggested Tinkercad)
Theortical Analysis:	***Half Wave Rectifier*** ***Circuit Diagram***

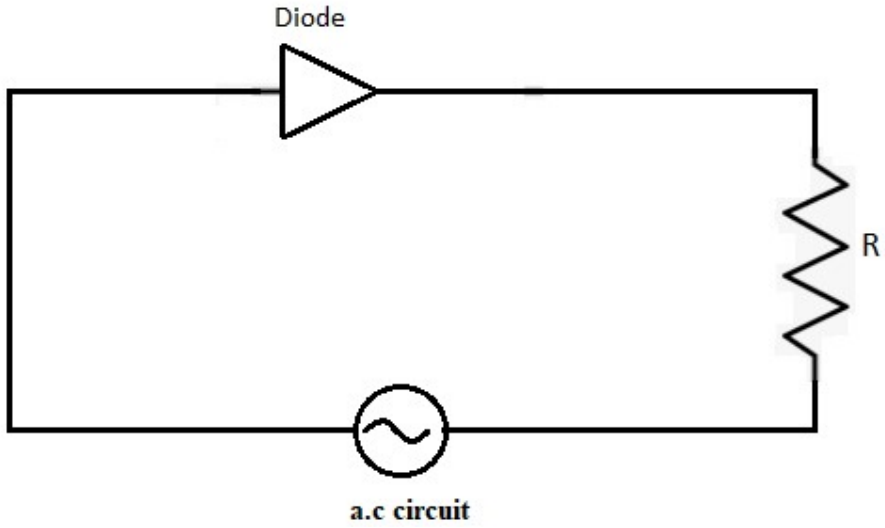
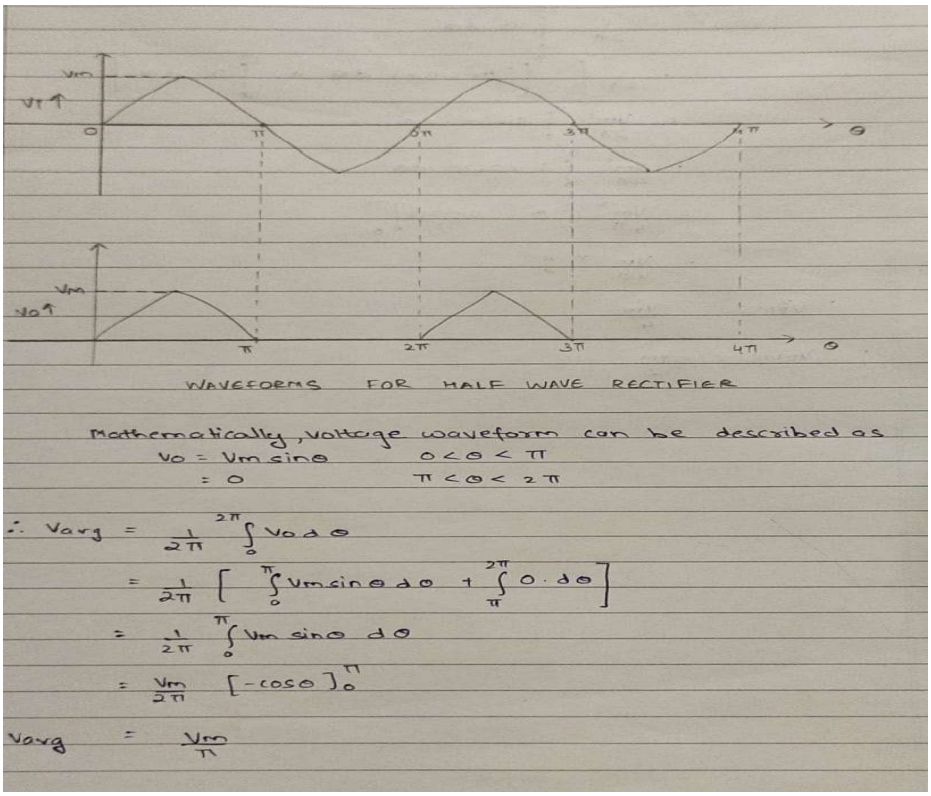


Fig LCR series resonance

Theoretical Calculations:

RMS and Average Value of a voltage (derivation)



$$(V_{RMS})^2 = \frac{1}{2\pi}\int_0^{2\pi} V_o^2\, d\theta$$

$$= \frac{1}{2\pi}\left[\int_0^{\pi}(V_m \sin\theta)^2\, d\theta + \int_{\pi}^{2\pi} 0 \cdot d\theta\right]$$

$$= \frac{V_m^2}{2\pi}\int_0^{\pi} \sin^2\theta \cdot d\theta$$

$$= \frac{V_m^2}{2\pi}\int_0^{\pi} \frac{1-\cos 2\theta}{2} \cdot d\theta$$

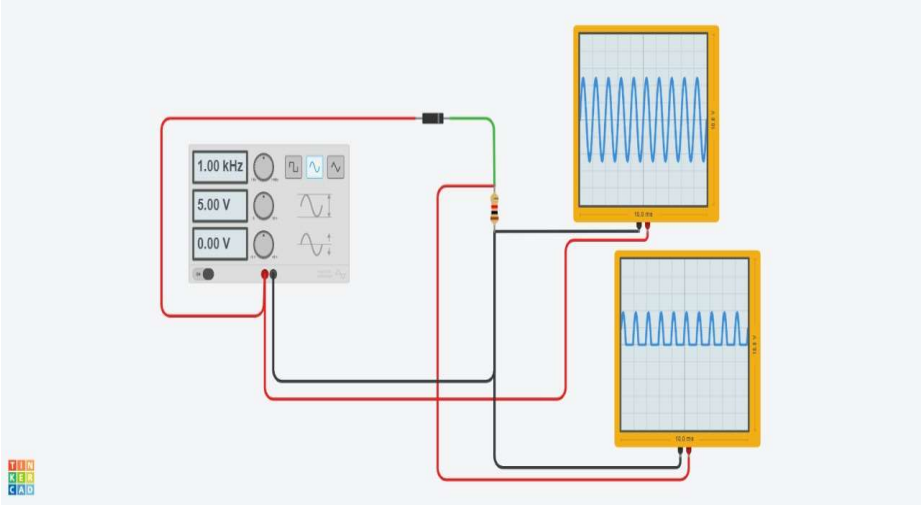
$$= \frac{V_m^2}{4\pi}\left[\theta - \frac{\sin 2\theta}{2}\right]_0^{\pi}$$

$$= \frac{V_m^2}{4\pi} \times \pi$$

$$V_{RMS}^2 = \frac{V_m^2}{4}$$

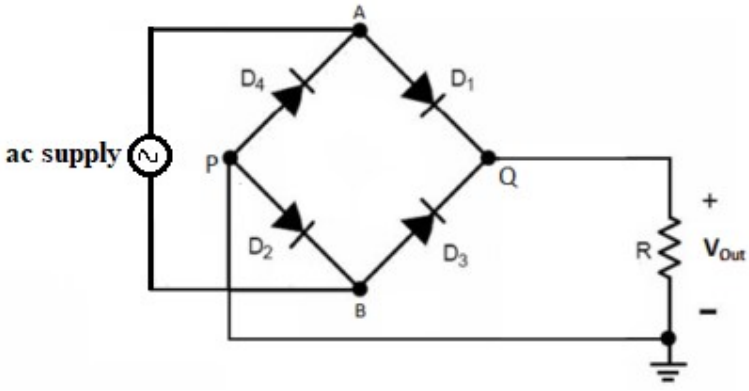
$$V_{RMS} = \frac{V_m}{2}$$

Observation waveform



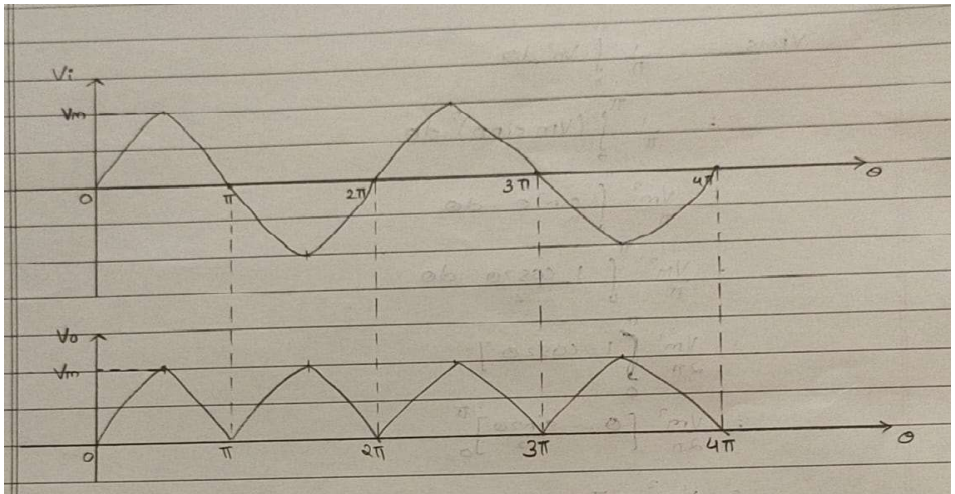
Full wave rectifier

Bridge Rectifier



Theoretical Calculations:

RMS and Average Value of a voltage (derivation)



WAVEFORMS FOR BRIDGE RECTIFIER

Mathematically, voltage waveforms can be described as

$V_o = V_m \sin\theta \qquad 0 < \theta < \pi$

$$V_{avg} = \frac{1}{\pi}\int_0^{\pi} V_o \, d\theta$$

$$= \frac{1}{\pi}\int_0^{\pi} V_m \sin\theta \, d\theta$$

$$= \frac{V_m}{\pi}\left[-\cos\theta\right]_0^{\pi}$$

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

$$V_{RMS}^2 = \frac{1}{\pi}\int_0^{\pi} V_0^2\, d\theta$$

$$= \frac{1}{\pi}\int_0^{\pi} (V_m \sin\theta)^2 \cdot d\theta$$

$$= \frac{V_m^2}{\pi}\int_0^{\pi} \sin^2\theta \cdot d\theta$$

$$= \frac{V_m^2}{\pi}\int_0^{\pi} \frac{1-\cos 2\theta}{2} \cdot d\theta$$

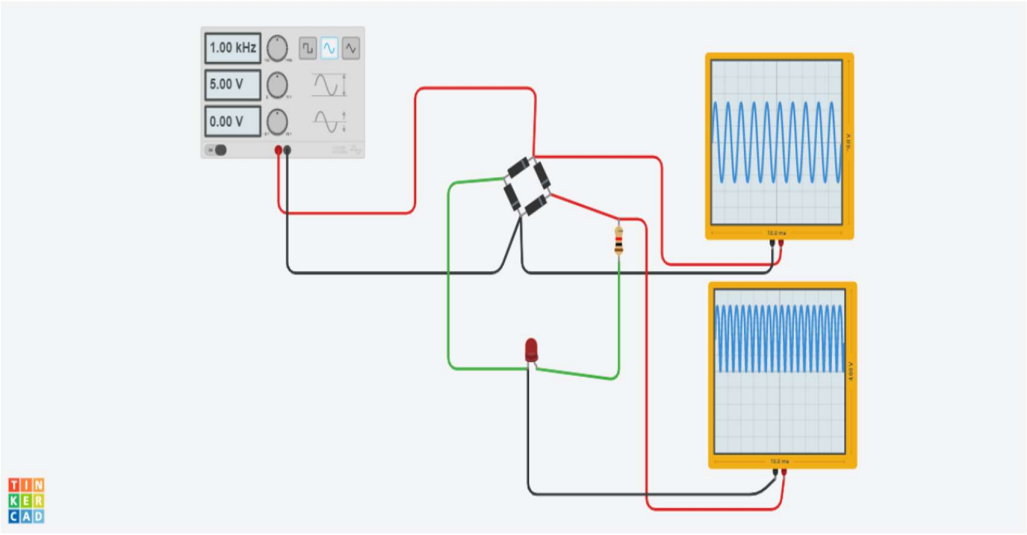
$$= \frac{V_m^2}{2\pi}\left[\theta - \frac{\sin 2\theta}{2}\right]_0^{\pi}$$

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

$$\therefore V_{RMS}^2 = \frac{V_m^2}{2}$$

$$\therefore V_{RMS} = \frac{V_m}{\sqrt{2}}$$

Observation waveform



Conclusion:

- The circuits are made using an online simulation tool, Tinkercad
- This experiment helped us study the waveforms generated by a half wave and full wave (bridge) rectifier by implementing the circuit and making measurements using an oscilloscope.