Mini Project Report On

Rectifiers

Electrical and Electronics Engineering

Submitted by:
Abhijith Kumble (221EE202)
Chaman Changappa H A (221EE202)
Prashanth (221EE202)
Sachin Belle (221EE202)

Under the guidance of
Dr. Ravi Raushan

Department of Electrical and Electronics Engineering
National Institute of Technology, Surathkal

January 2025

0.1 Introduction

0.2 Single Phase Rectifier

0.2.1 Performance Parameters

average value of the output (load) voltage, V_{dc}

average value of the output (load) current, I_{dc}

output dc power, $P_{dc} = V_{dc}I_{dc}$

root-mean-square (rms) value of the output voltage, V_{rms}

rms value of the output current, I_{rms}

output ac power $P_{ac} = V_{rms}I_{rms}$

efficiency (or rectification ratio) of a rectifier $\eta = \frac{P_{dc}}{P_{ac}}$

It is the conversion efficiency which is a measure of the quality of the output waveform. For a pure dc output,the conversion efficiency would be unity.

The output voltage can be considered as composed of two components:

- The dc value and
- The ac component or ripple.

The effective (rms) value of the ac component of output voltage is

$$V_{ac} = \sqrt{V_{rms}^2 - V_{dc}^2}$$

The form factor, which is a measure of the shape of output voltage, is

$$FF = \frac{V_{rms}}{V_{dc}}$$

The ripple factor, which is a measure of the ripple content, is defined as

$$RF = \frac{V_{ac}}{V_{dc}}$$

$$RF = \sqrt{FF^2 - 1}$$

0.2.2 Half wave rectifier

The Ripple Factor,

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

$$V_{dc} = \frac{V_m}{\pi}$$

$$RF = 1.21$$

0.2.3 Half wave rectifier with RC filter

The Ripple Factor,

$$V_{r(p-p)} \approx \frac{V_p}{fRC}$$

$$V_{dc} \approx \{1 - \frac{1}{2fRC}\}V_p$$

$$RF = \frac{V_r(p-p)}{V_{dc}}$$

Ripple factor is minimum at $C = x\,\mu$F

0.2.4 Full wave rectifier

The Ripple Factor,

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

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

$$RF = 0.48$$

0.2.5 Full wave rectifier with RC filter

The Ripple Factor,

$$V_{r(p-p)} \approx \frac{V_p}{fRC}$$

$$V_{dc} \approx (1 - \frac{1}{2fRC})V_p$$

$$RF = \frac{V_r(p-p)}{V_{dc}}$$

Ripple factor is minimum at $C = x\,\mu$F