Experiment 3: Three Phase Uncontrolled (Diode) Rectifier

Introduction to the Experiment

This experiment is aimed at converting AC (Three phase) to DC using a diode (uncontrolled) rectifier. The circuit is implemented in simulation as well as hardware and the performance is studied.

Learning outcomes:

Operation and analysis of a Three phase rectifier for various loads

A three phase rectifier converts three phase AC to DC. The bridge rectifier consists of six diodes. Fig. 1. The output waveform is as depicted in Fig. 2. The output ripple is less compared to single phase.

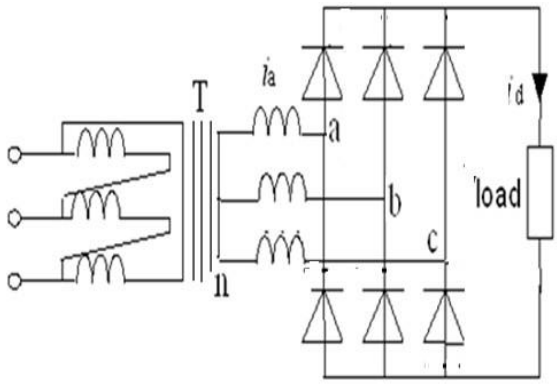


Fig. 1 Three phase uncontrolled rectifier

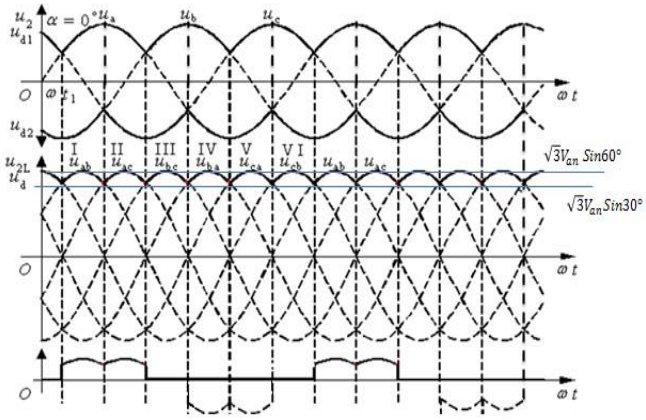


Fig. 2 Three phase output waveform

1 a). Simulation of full wave Three phase diode Rectifier in MATLAB Simulink

Aim: To simulate the Diode Rectifier in MATLAB Simulink

PROBLEM 1:

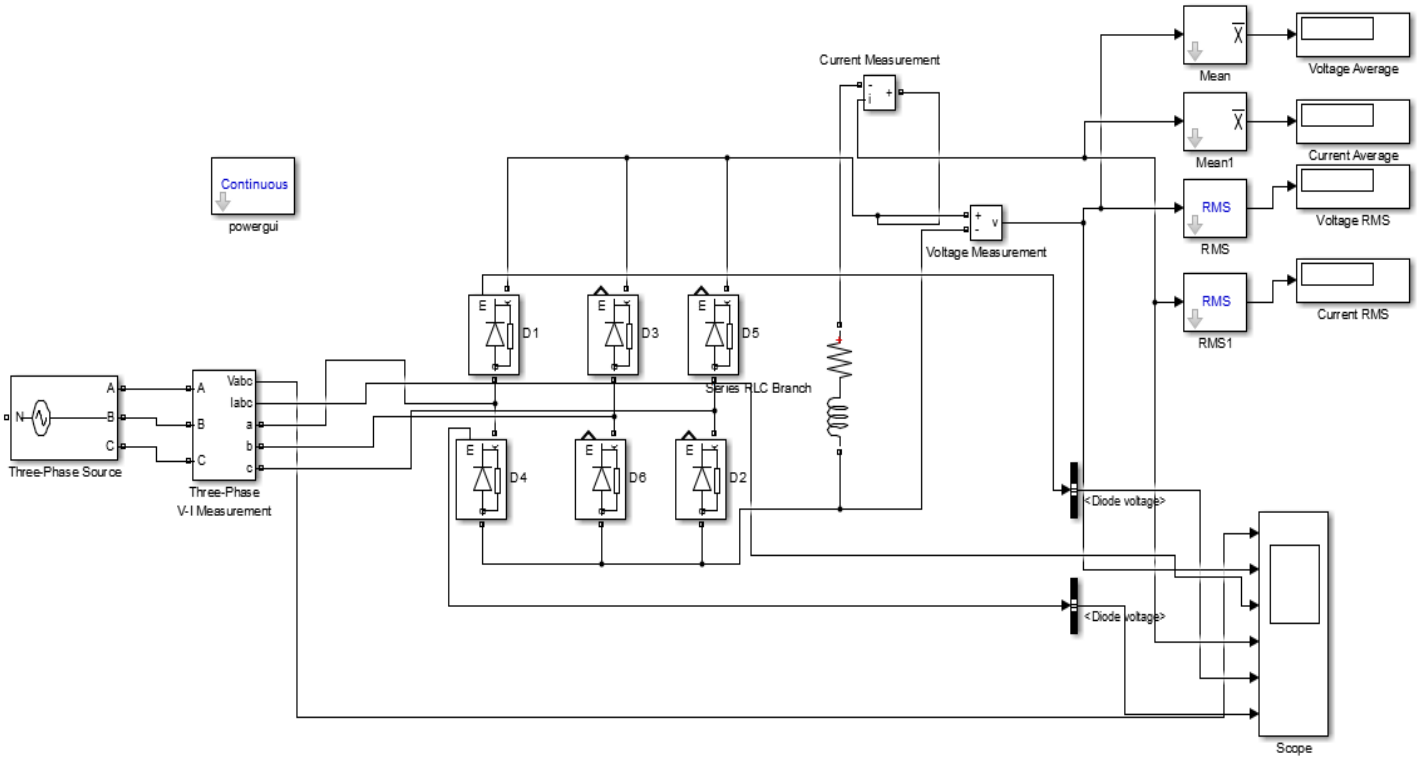
a. Implement the 3-phase *uncontrolled* full wave rectifier with an R load of **100 Ω**. (Input voltage: Phase-to-phase rms voltage (V) = **61.2 V, 50Hz**)

b. To the above circuit add an L load of **6 mH** along with the R load of **100 Ω** and observe the changes in the output voltage waveform and FFT analysis.

CALCULATION

Form Factor = V_{rms}/ V_{dc} =

Ripple Factor = $\sqrt{FF^2 - 1}$ =



b) Hardware Implementation of 3-Phase (R & RL Load)

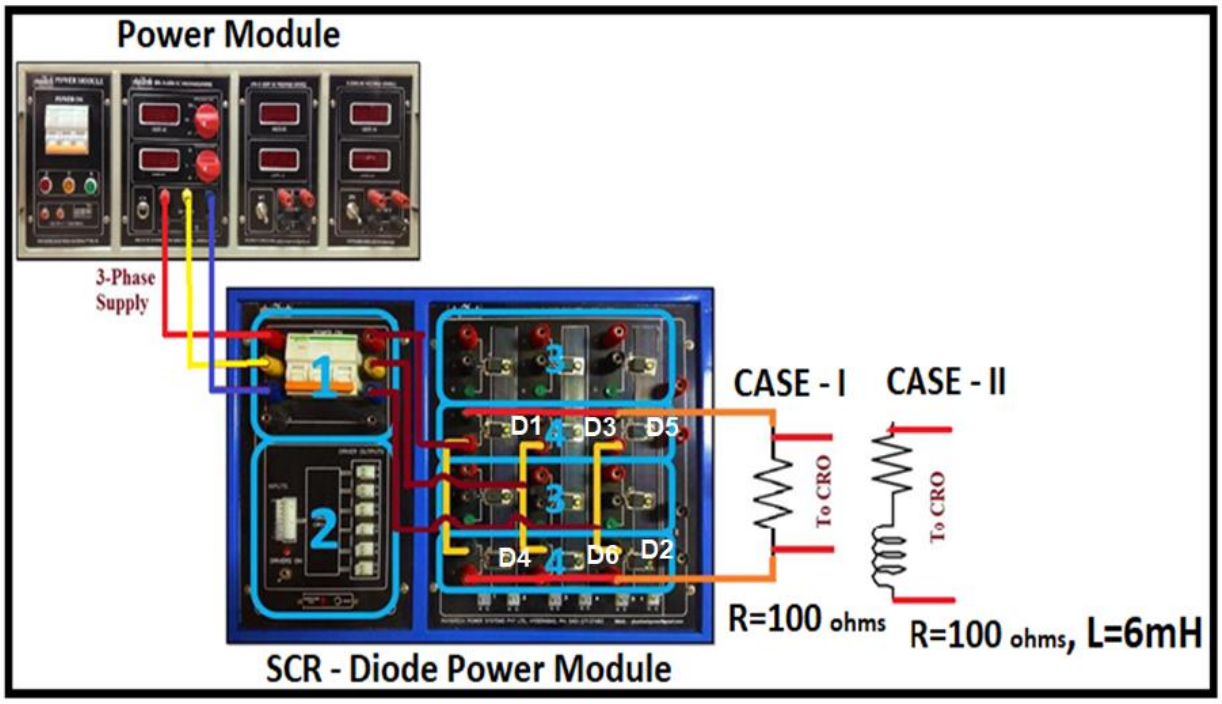


Fig. 3 Hardware implementation of 3-phase diode bridge rectifier

Procedure: **Case 1**

1. Connect the circuit as shown in Fig.3 (R load (**R=100 ohms**) shown as Case - I
2. Switch ON the MCB of 3Ø supply on the Left hand side of your Experimental Table.
3. Switch ON the MCB on the POWER MODULE kit.
4. Switch ON the MCB on the SCR-Diode Power module and slowly increase the Voltage to reach up to **61.2 V in RMS** using **+** symbol Push Button in the Power Module kit.

   Note: The Voltage Adjustment Controls are a pair of push buttons to finely adjust the voltage to required value.
5. Connect CRO probes across the **R** load to measure the output voltage.
6. Observe the Output voltage waveforms and the FFT plot in the CRO.

Case 2

1. Connect the circuit as shown in Fig. 3(RL load (**R=100 ohms, L=6mH**)) shown as Case - II,
2. Switch ON the MCB of 3Ø supply on the Left hand side of your Experimental Table.
3. Switch ON the MCB on the POWER MODULE kit.
4. Switch ON the MCB on the SCR-Diode Power module and slowly increase the Voltage to reach up to **61.2 V in RMS** using **+** symbol Push Button in the Power Module kit.

Note: Unless the MCB is ON, the displays in the supply modules will not reflect the voltage adjustments.

5. Connect CRO probes across the **RL** load to measure the output voltage.
6. Observe the Output voltage waveforms and the FFT plot in the CRO.

.**Conclusion:** Obtain the results as per "Exp3_Part B.doc" file.