TD 04

Exercise N°01:

Consider a single-phase full-wave mixed rectifier connected to a 45V AC supply, delivering power to an R-L load, where the resistance R=100 Ω and the inductance L=100 mH.

1. Analysis of Circuit Operation

2. Plot the Load Voltage and Current for a Firing Angle α = 60°

3. Plot the Voltage Across Thyristor T2 and Diode D2

4. Calculate the Load Current

5. Compare All-Thyristor and Mixed Circuits

Exercise N°02:

Single-Phase Full-Wave Rectifier (PD2) with R-L Load and Freewheeling Diode Given: A 45V AC supply powering an R-L load (R = 100 Ω, L = 100 mH) through a single-phase full-wave rectifier (PD2). A freewheeling diode is connected in parallel with the load.

Part 1: Influence of Freewheeling Diode

1. Plot the load voltage and current waveforms for a firing angle α = 30°:
    - With a freewheeling diode
    - Without a freewheeling diode
2. Plot the voltage waveform across thyristor T1:
    - With a freewheeling diode
    - Without a freewheeling diode
    - Determine the peak reverse voltage T1 must withstand in each case.
3. Calculate the average and RMS values of the load voltage.
    - Deduce the corresponding load current.
    - With a freewheeling diode
    - Without a freewheeling diode

Part 2: Effect of Increasing Firing Angle

4. What happens when the firing angle α > 90°?
    - Analyze and explain the behavior of the rectifier output.

Part 3: Fault Analysis – Thyristor T3 Burned Out (Open-Circuit)

1. Plot the load voltage and current waveforms with T3 in a faulted (blocked) state.
2. Calculate the average and RMS values of the load voltage.

3. Plot the voltage waveform across thyristor T2.
4. Determine the value of the load current under fault conditions.