TD N°03

PART 1

Exercise N°01

Consider a single-phase full-wave rectifier (P2) connected to a center-tapped transformer with equal turns on both sides. The primary winding receives an alternating voltage of 90V, while the secondary supplies a load consisting of a resistor (R = 100 Ω) and an inductor (L = 100 mH).

1. Provide a justification for the relationship: $V_2(t)=-V_1(t)$.

2. Draw a circuit diagram of the assembly.

3. Analysis of Circuit Operation.

4. Plot the charging voltage, charging current, and the voltage across diode D2. Determine the maximum voltage that diode D2 can withstand.

5. Derive the expressions for the average and effective values of the load voltage. Based on these values, determine the form factor and the ripple rate.

6. Determine the value of the charging current.

Exercise N°02

Consider an uncontrolled three-phase rectifier (P3) consisting of a switch connected to the most positive terminal (common cathodes). This rectifier is supplied by an alternating voltage of 220/380V and delivers power to an R-L load, where R=100 Ω and L=1000 mH.

1. What are the necessary conditions for obtaining a balanced three-phase voltage system?

2. Plot the waveform of the charging voltage.

3. Plot the voltage across diode D3 and determine the maximum voltage that this diode can safely withstand.

4. Calculate and express both the average and effective (RMS) values of the charging voltage.

5. Calculate the form factor and the ripple factor, and derive their respective values.

6. Determine the charging current value.

7. Determine the current value in the first phase.

During operation, diode D2 becomes damaged (blocked).

8. Plot the charging voltage curve.