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Faculty of Technology
Socle Commun (ST)
First Year (ST-REE-ING), 2nd Semester
Physics practical work II

2nd Practical Work

Electrical Transformer

Date:……../……../……..

Professor:……

First Name	Last Name	Group	Sub-Group	Prep Mark	Final Mark

Academic Year: 2023/2024

1. Purpose of the experiment

The purpose of this experiment is to demonstrate the transformation by raising or lowering voltages.

2. Concepts and preparation

In Figure 1, a schematic representation of a transformer is shown. The parameters on the left side represent the primary, while those on the right side represent the secondary. By applying a sinusoidal voltage to the primary circuit, consisting of a winding of "n" turns, what happens on the secondary side with "n_2" turns?

Let the primary voltage be $\boldsymbol{U_1 sin(wt + \varphi)}$. The current passes through the primary winding around the ferromagnetic core, creating a magnetic flux **Φ** in the iron, which in turn induces an electromotive force (EMF) " EMF " given by the relation:

$$E_{in} = -n_1 \frac{d\Phi}{dt}$$

For an ideal transformer the voltage U_1; of primary is equal to the induced “EMF.”

$$E_{in} = -U_1 = -\boldsymbol{U_0 sin(wt + \varphi)}.$$

For reasons of high efficiency, the iron is made up of a stack of varnished sheets.

Under these conditions the flux **Φ** is completely channelled in the iron and will be recovered in the secondary, where it will create an EMF which, in the case of a no-load transformer, will be equal to the voltage which will be delivered by the secondary winding

$$U_2 = -\boldsymbol{V_0 sin(wt + \beta)}.$$

What's more $U_2 = n_2 \frac{d\Phi}{dt}$

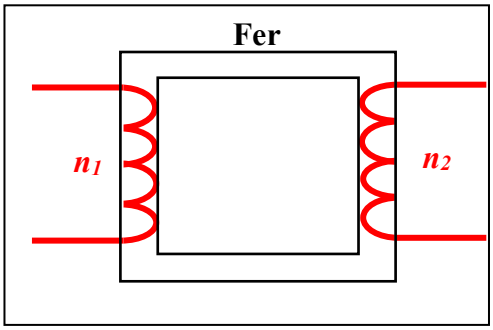

Figure 1

1-Since the flow is conserved. Find the following relationship

$$\frac{U_1}{n_1} = \frac{U_2}{n_2}$$

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Therefore, we find the expression of the output voltage (that of the secondary) given by:

$$U_2 = \frac{n_2}{n_1}.U_1 = m.U_1$$

"m" is the transformation ratio

2-What is the condition on "m" for the transformer to be step-up? m=……

3-What is the condition on "m" for the transformer to be step-down? m=……

4-What is a diode?

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3. Experience

3.1-Carry out the assembly in the figure 2

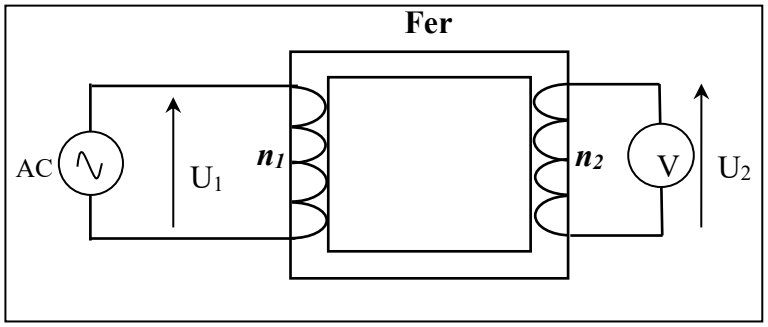

Figure 2

-Power the circuit with a voltage V=…… V, so that it is constant throughout

n_2	14	42	84	112	140
U_2 (Volts)					
Flux (dϕ/dt) (Weber/s)					
U_2/U_1					
n_2/n_1					

A-Complete the table above

B-Compare the voltage ratios and that of the windings

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C-Comments

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3.2

A-Take a fixed primary winding $n_2 = 300$ turns

-Take a fixed secondary winding $n_1 = 42$ turns

-Raise the secondary voltage, $U_2 = \cdots$V, give the value of "m=……. »

B-Now reverse the windings so that the primary becomes the secondary

-Raise the secondary voltage $U_2 = \cdots$V, give the value of "m=……. »

-What do you see in both cases (A and B)?

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4. AC/DC Conversion

To transform the outgoing AC signal into a DC signal, a rectifier is mounted at the output of the transformer, as shown in Figure 3.

. Take a fixed primary winding $n_1 = 300$ turns

. take a fixed primary winding $n_2 = 42$ turns

Using an oscilloscope to view the outgoing signal before and after rectification, observe and plot the signals

Note:  is the electronic symbol for Diode

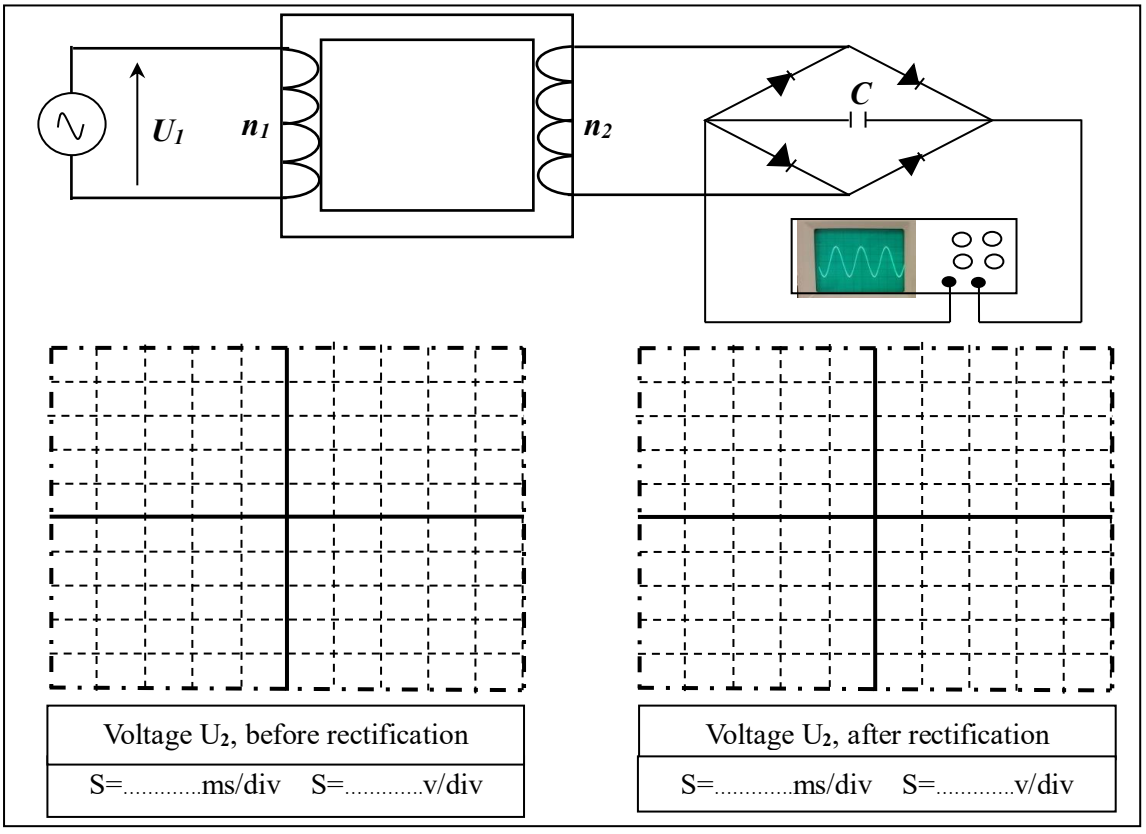

Figure 3 Transformer+rectifier with filtering

5- Conclusion

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