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Mohamed Boudiaf University - M'sila



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 "n₂" turns?

Let the primary voltage be $U_1 \sin(\omega t + \varphi)$. 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."

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

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

$$U_2 = -V_0 \sin(\omega t + \beta).$$

What's more

$$U_2 = n_2 \frac{d\Phi}{dt}$$

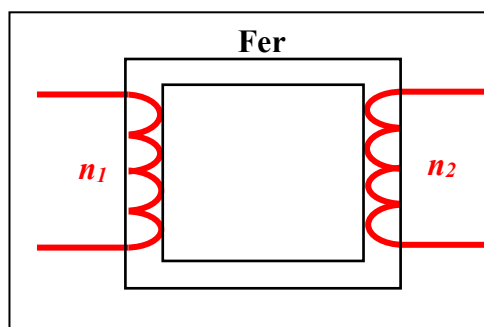


Figure 1

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

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

.....

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

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

“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?

.....

3. Experience

3.1-Carry out the assembly in the figure 2

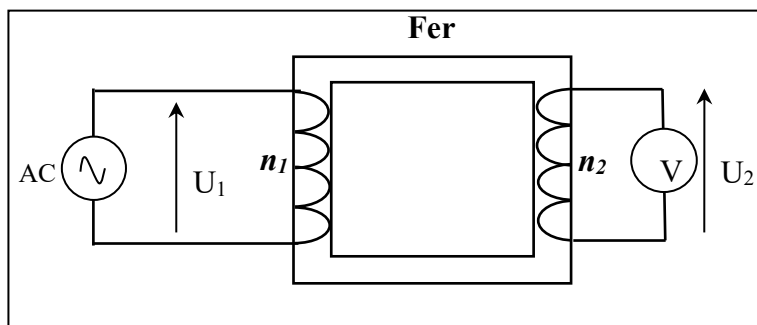


Figure 2

-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 ($d\phi/dt$) (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

.....

C-Comments

.....

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, $U_2 = \dots$ V, give the value of “m=..... »

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

-Raise the secondary voltage $U_2 = \dots$ V, give the value of “m=..... »

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

.....


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

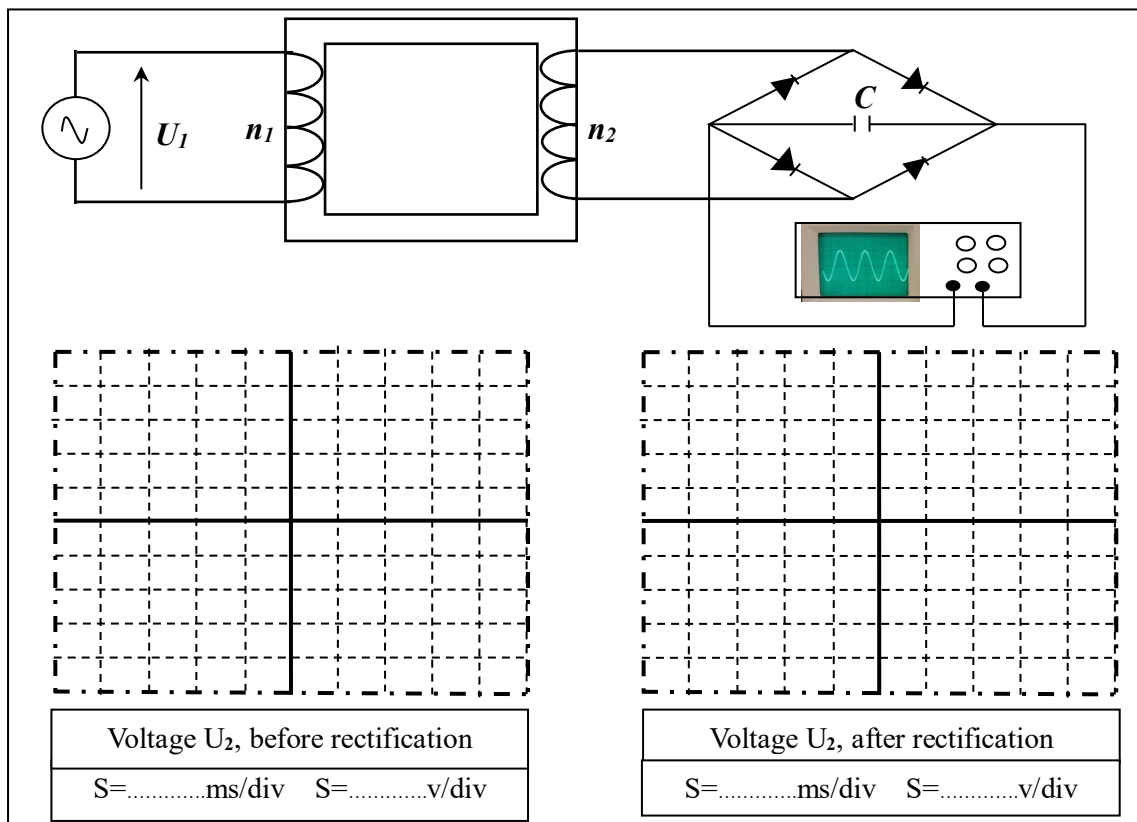


Figure 3 Transformer+rectifier with filtering

