People's Democratic Republic of Algeria

Ministry of Higher Education and Scientific Research

Mohamed Boudiaf University of M'sila

Faculty of Sciences

Common Trunk of Matter Sciences

1st year - 2nd semester

Practical works - Physics 2

5th Practical Work

Transformer

Experiment date: ………../………./……….……

Corrector professor : ……………………………………………

Report prepared by :

First name	Family name	Group	Sup-group	Preparation mark	Final mark
				/5,00	/20,00
				/5,00	/20,00
				/5,00	/20,00
				/5,00	/20,00
				/5,00	/20,00
				/5,00	/20,00
				/5,00	/20,00

Academic year : 2023/2024

Prepared by : Dr. MEDJBER Salim

1-Purpose of the experiment

The aim of this experience is to highlight the transformation by raising or lowering tensions.

2-Notions and preparation

In Figure -1- a transformer is schematically represented. The parameters on the left side are those of the primary, while those on the right represent the secondary. By applying a sinusoidal voltage to the primary circuit consisting of a winding of “$\boldsymbol{n_1}$” turns, what happens on the secondary of “$\boldsymbol{n_2}$” turns?

Let the primary voltage be $\boldsymbol{U_1 = U_0 \sin(\omega t + \theta)}$. The current passes through the primary winding around the ferromagnet, it will create a magnetic flux Φ in the iron which will in turn induce an electromotive force “e.m.f. »given by the relation:

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

For an ideal transformer, the primary voltage $\boldsymbol{U_1}$ is equal to the “e.m.f. » induced.

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

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

Under these conditions the flow Φ is completely channeled in the iron and will be recovered in the secondary, where it will create an e.m.f. which in the case of a no-load transformer, will be equal to the voltage which will be delivered by the secondary winding.

$$\boldsymbol{U_2 = V_0 \sin(\omega t + \beta)}$$

Moreover

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

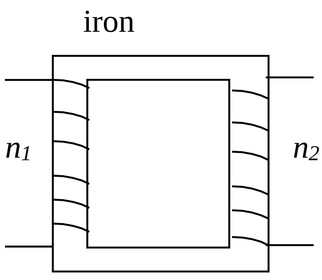

Figure-1

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

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

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

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

“$\boldsymbol{m}$” is the turns transformation ratio.

2- What is the condition on m for the transformer to be step-up? $\boldsymbol{m}$ … … ….

3- What is the condition on m for the transformer to be step-down? $\boldsymbol{m}$ … … ….

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4- What is a diode?

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3-Practical work

3-1-Perform the experimental setup in figure -2-.

-Power the circuit with a voltage V= 5.0V, so that it is constant throughout the experiment.

-For a fixed primary winding of $\boldsymbol{n_1 = 300}$ turns, note the secondary voltage.

n_2 (turns)	14	42	84	112	140
U_2 (Volts)					
$\frac{U_2}{U_1}$					
$\frac{n_2}{n_1}$					

1°- Complete the above table.

2°- Compare the voltage ratios and those of the windings.

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3°- Comment.

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3-2 A- Take a fixed primary winding $\boldsymbol{n_1 = 300}$ turns.

-Take a fixed secondary winding $\boldsymbol{n_2 = 42}$ turns.

-Read the secondary voltage, $\boldsymbol{U_2 = \cdots V}$; give the value of "$\boldsymbol{m = \cdots}$"

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

-Read the secondary voltage, $\boldsymbol{U_2 = \cdots V}$; give the value of "$\boldsymbol{m = \cdots}$"

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

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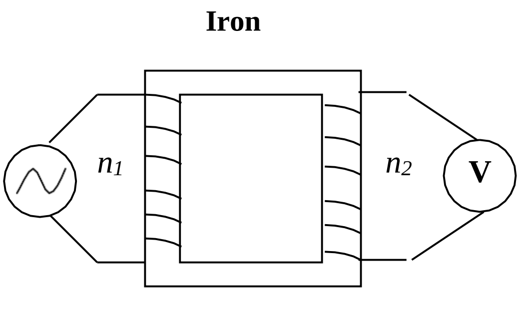


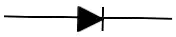
Figure-2

3-3 To transform the output 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 secondary winding $n_2 = 42$turns.

Using an oscilloscope to view the signals at the transformer output (CH1) and the rectifier output (CH2).

Note:  is the electronic symbol for diode.

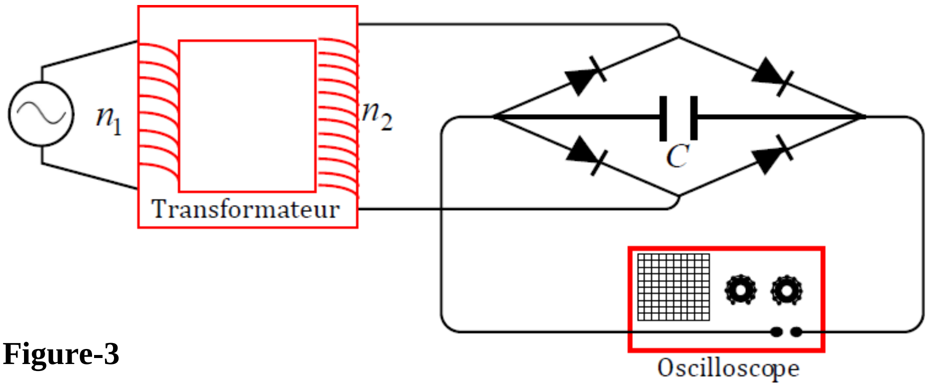
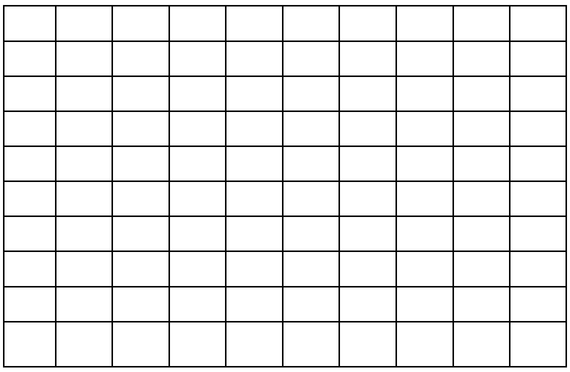
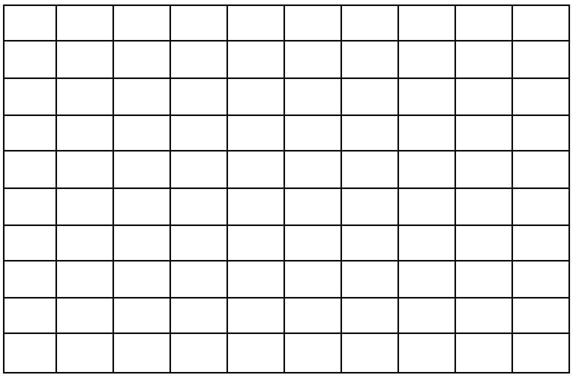


Figure-3



The voltage U_2 ; before rectifying

$S_{h=\cdots}$..............ms/div	$S_{v=\cdots}$..............ms/div



The voltage U_2 ; after rectifying

$S_{h=\cdots}$..............ms/div	$S_{v=\cdots}$..............ms/div

4-Conclusion:

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