EXP.NO. (7)

A.C. Circuit with Inductance and Resistance

The aim of experiment:- Measuring the inductance

Theory:-

Electricity plays an important role in medicine. There are two aspects of electricity and magnetism in medicine: electrical and magnetic effects generated inside the body.
For each value of current (I/A) calculate the impedance in ohm**:**

$$\boldsymbol{Z = \frac{V}{I}}$$

$$\boldsymbol{I = \frac{V}{Z} = \frac{V}{\sqrt{R^2 + X^2}} \ldots\ldots\ldots\ldots (2)}$$

Where X_L is the inductive reactance of the coil
Since:

$$\mathbf{Z^2 = R^2 + X^2_L}$$

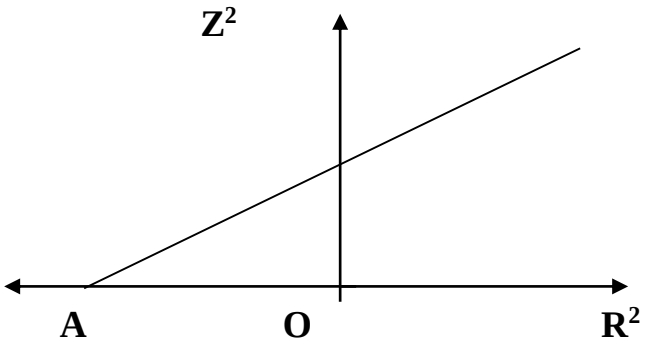
A graph of Z^2 against R^2 will yield a straight line . The intercept (OA) gives the value of X^2_L (see diagram below)

Thus:

$$\mathbf{X^2_L = OA = (2\pi\, f\, L)^2}$$

And from this the inductance (L) of the coil can be determined

$$\boldsymbol{L = \frac{\sqrt{OA}}{2\pi f} \ldots\ldots\ldots\ldots\ldots\ldots Henry}$$



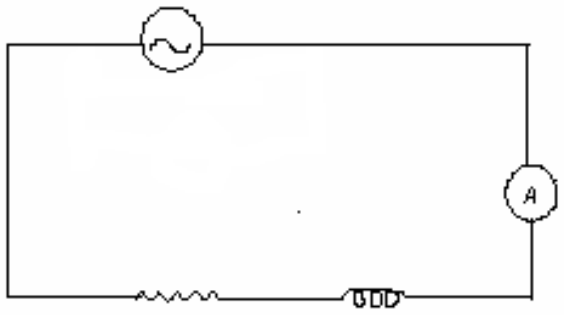
Apparatus:-

Low voltage A.C. source, fixed inductance, Resistance box, A.C. ammeter.

Methodology:-

1-Feed the low-voltage output into the circuit connected as shown in the diagram.

2-Vary R and record the circuit current I as read on the A.C. ammeter at each stage.



3-Tabulate the readings:

V= 6 Volt

R/Ω	I /A	Z=V/I	R^2	Z^2
0 10 30 . .				

4-plot the graph between Z^2 and R^2

5-Find the slope.

Medical application:-

1-handheld blood analyzes, glucose monitors, and blood pressure monitors, which require switching regulators to operate at high efficiency with low –load current.

2- Capacitor series which are used in MRI application.

3- X-ray machines and laser systems, inductance combined with capacitor and resistors in high voltage circuit.