Experiment Date : 25-10-‘22

Experiment No: 02

Experiment Name : Measurement of inductance by using Watt-meter ,Ammeter and Voltmeter.

Theory :

The inductance of the inductor will be measured by using a Wattmeter , Voltmeter and Ammeter.

Wattmeter will measure the active power across the inductor. And voltmeter will measure the voltage drop and ammeter will measure the current flowing through the inductor.

Now by using the formula ,

R=$\frac{W}{I^2}$; we will measure the resistance of the inductor. Point to be noted here that the wattmeter only measure the active power. So by using the equation we will get the value of the resistance , not the impedence.

The voltmeter will measure the voltage drop across the inductor. The ammeter will measure will measure the current across inductor.

Now from ohm’s law we know that , the impedence across any element is equals to,

Z=$\frac{V}{I}$; using this formula we can figure out total impedence of the inductor.

Now we have impedence and resistane value in our hand. So it will be very easy to measure the inductance.

We know the formula , Z^2= $\sqrt{X^2 + R^2}$

So we can write the formula X=$\sqrt{z^2 - R^2}$

From this formula we can easily find out the value of the reactance of the inductor.

Now we know another formula to find out the inductance of the inductor.,

L=$\frac{X}{2*\pi*f}$

By using this formula we can get the inductance . as frequency we are going to use 50Hz as in our country the frequency is always kept 50Hz. So this is the idle value for the experiment.

Required Apparatus :

Name	Specification	No .
1. Watt-meter	0-240V 0-5A	1
2.Voltmeter	0-450V	1
3.Ammeter	0-10A	1
4.Inductor	0-10A	
5. Variac		1
6.AC Power Supply	220V,200V,180V	1
7. Wires		

Circuit Diagram :

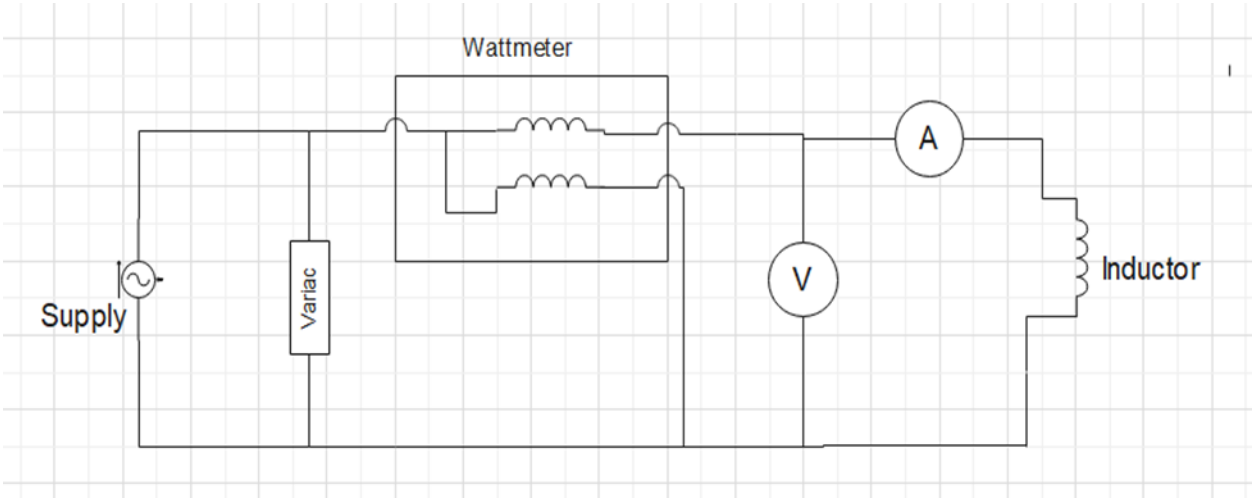

Fig. 2.1 : Circuit arrangement for measuring inductance

Data Table:

SL	Voltage (V)	Current (A)	W	R=$\frac{W}{I^2}$	Z= $\frac{V}{I}$	X=$\sqrt{z^2 - R^2}$	L=$\frac{X}{2*\pi*f}$
1	220	1	16	16	220	219.417	0.698
2	200	0.9	12	14.815	222.222	221.728	0.705
3	180	0.8	10	15.625	225	224.456	0.715

Calculation :

$L_1=\frac{X}{2*\pi*f}$

$=\frac{219.417}{2*3.1416*50}$ = 0.698

$L_2=\frac{X}{2*\pi*f}$

$=\frac{221.28}{2*3.1416*50}$ = 0.705

$L=\frac{X}{2*\pi*f}$

$=\frac{224.456}{2*3.1416*50}$= 0.715

Discussions :

We did the experiment for three different values of voltage . Each time the value of inductance were found to be very close to each other . Each time we decreased the voltage gradually but the change in inductance value was very small. Hence we can say that the inductance that we measured was pretty correct. If we increase the number of voltage variation , and find the inductance for each corresponding voltage and figure out the average value of the inductance values then we can get a value of inductance very close to exact value.

One point must be kept in mind that , as the value of inductance depends on the frequency , we must not change the frequency . .

Conclusion :

The accuracy of this experiment is fully dependent on the accuracy of wattmeter , voltmeter and ammeter we used . The more accurate measurement they give us, the more accurate the calculation will be. The ammeter we are going to use should be able to measure value of current below 1A accurately.

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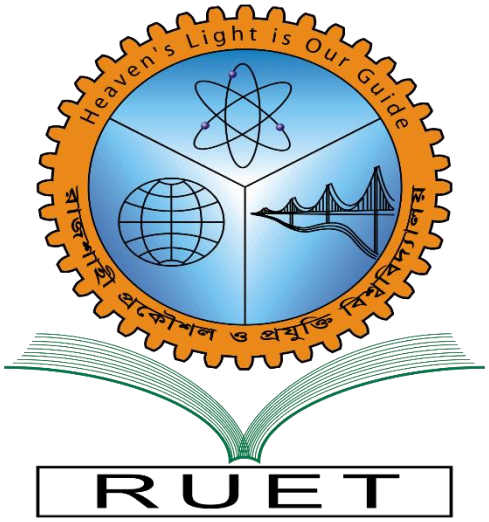

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