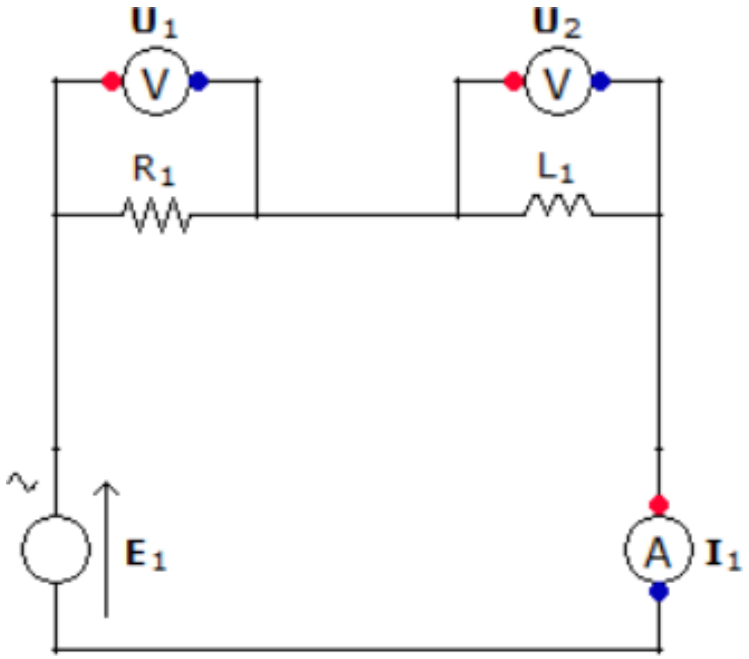
EXPERIMENT TITLE:1.3

Student Name: **UID:**
Branch: **Section/Group:**
Semester: **Date of Performance:**
Subject Name: BEEE **Subject Code: 21ELH-101**

Aim: To study voltage-current relationship in an R-L series circuit and todetermine the power factor of the circuit.

Apparatus: Voltage Source, Resistor, Inductor, Ammeter, Voltmeter, ConnectingWires.

Circuit Diagram:



Steps for experiment:

1. Take a Resistor of 45 ohm and Inductor of 1 Henry.
2. Connect the resistor and inductor in series using connecting wires as shownin figure.
3. Connect a voltmeter in parallel to resistor and inductor using connectingwires as shown in figure.
4. Connect an ammeter to the circuit using connecting wires as shown in figure.
5. Connect the voltage source to the circuit as shown in the figure.

Calculations/Theorems /Formulas used

$Z = (R^2 + X^2)^{(1/2)}$

$X_L = 2\pi fL$

$X_L = 2 \times 3.14 \times 50 \times 1$

$X_L = 314$ ohm

$Z = (45^2 + 314^2)^{(1/2)}$

$Z = 317.2$ ohm

Power Factor = $\cos\alpha = R/Z$

$= 45/317.2$

$= 0.141$

$$\mathbf{I}_1 = \frac{\mathbf{E}_1}{R_1 + j\,w\,L_1}$$

$$I_1\text{rms} = \frac{E_1\text{rms}}{\sqrt{R_1{}^2 + (w\,L_1)^2}}$$

$$I_1\text{rms} = 94.5\ \text{mA}$$

$$\text{Phi}I_1 = -81.8\ °$$

$$\mathbf{U}_1 = \frac{\mathbf{E}_1}{1 + j\frac{w\,L_1}{R_1}}$$

$$U_1\text{rms} = \frac{E_1\text{rms}}{\sqrt{1 + \left(\frac{w\,L_1}{R_1}\right)^2}}$$

$$U_1\text{rms} = 4.25\ \text{V}$$

$$\text{Phi}U_1 = -81.8\ °$$

$$\mathbf{U}_2 = \frac{\mathbf{E}_1}{1 - j\frac{R_1}{w\,L_1}}$$

$$U_2\text{rms} = \frac{E_1\text{rms}}{\sqrt{1 + \left(\frac{R_1}{w\,L_1}\right)^2}}$$

$$U_2\text{rms} = 29.7\ \text{V}$$

Observations/Discussions:

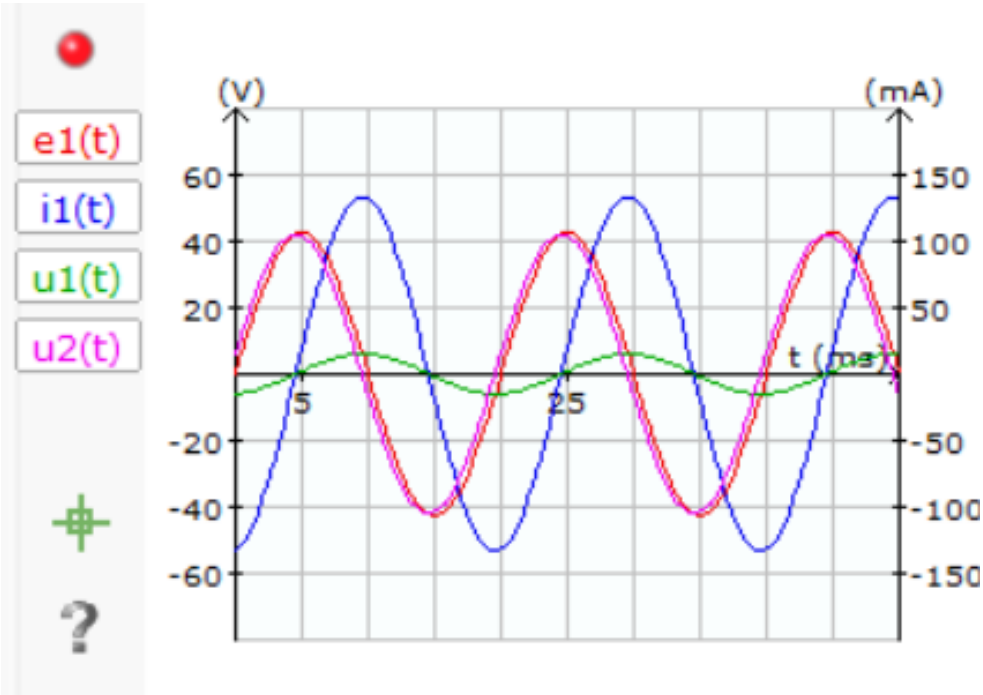
S.NO	V	I	Power Factor
1	30V	94.5 mA	0.141

Percentage error (if any or applicable):
NIL

Result/Output/Writing Summary:

We have observed the values of current and voltage and verified the relationshipin which voltage is leading and current is lagging. We have also calculated the valueof power factor.

Graphs (If any): Image /Soft copy of graph paper to be attached here



Learning outcomes (What I have learnt):

1. Learned how to connect resistor and inductor in series.
2. Learned how to connect voltmeter and ammeter.
3. Learned how to measure voltage and current.
4. Learned how to calculate impedance Z.
5. Learned how to calculate power factor.

Evaluation Grid:

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.	Worksheet completion including writing learning objectives/Outcomes. (To be Submitted at the end of the day).		10
2.	Post Lab Quiz Result.		5
3.	Student Engagement in Simulation/Demonstration/Performance and Controls/Pre-Lab Questions.		5
	Signature of Faculty (with Date):	Total Marks Obtained:	