Khwaja Yunus Ali University

Lab Report -08

Name of the Department: Computer Science and Engineering

Course Code: CSE 0713-1104

Course Title: Electrical Circuit Lab

Experiment No.: 08

Name of the Experiment : Study of Resonance behavior of a series of RLC circuits with variable Capacitance.

Date of Experiment : 06-04-2025

Date of Submission : 13-04-2025

Instructor Signature & Date

Submitted by –	**Submitted to –**

Name: Md Sojib Ahmed
ID Number: 06224205101006
Batch No: 18th
Semester: 1st Year 2nd Semester
Khwaja Yunus Ali University

Name: Sakil Ahammed
Lecturer
Department of EEE
Khwaja Yunus Ali University

Name of the Experiment:

Measurement of Power and Power Factor using AC Circuit

Objectives:

- To measure power and power factor in a series RLC circuit using simulation.
- To understand the phase relationship between voltage and current.

Theory:

In AC circuits, power can be classified into three types:

- **Real Power (P):** The actual power consumed (in Watts).
- **Apparent Power (S):** The product of RMS voltage and current (in Volt-Amperes).
- **Power Factor (pf):** The ratio of real power to apparent power, given by:

$$\text{Power Factor } = \cos\theta = \frac{P}{S}$$

For sinusoidal signals:

$$V_{rms} = \frac{V_m}{\sqrt{2}}, I_{rms} = \frac{I_m}{\sqrt{2}}$$

Power factor indicates whether the circuit is resistive, inductive, or capacitive in nature.

Circuit Diagram:

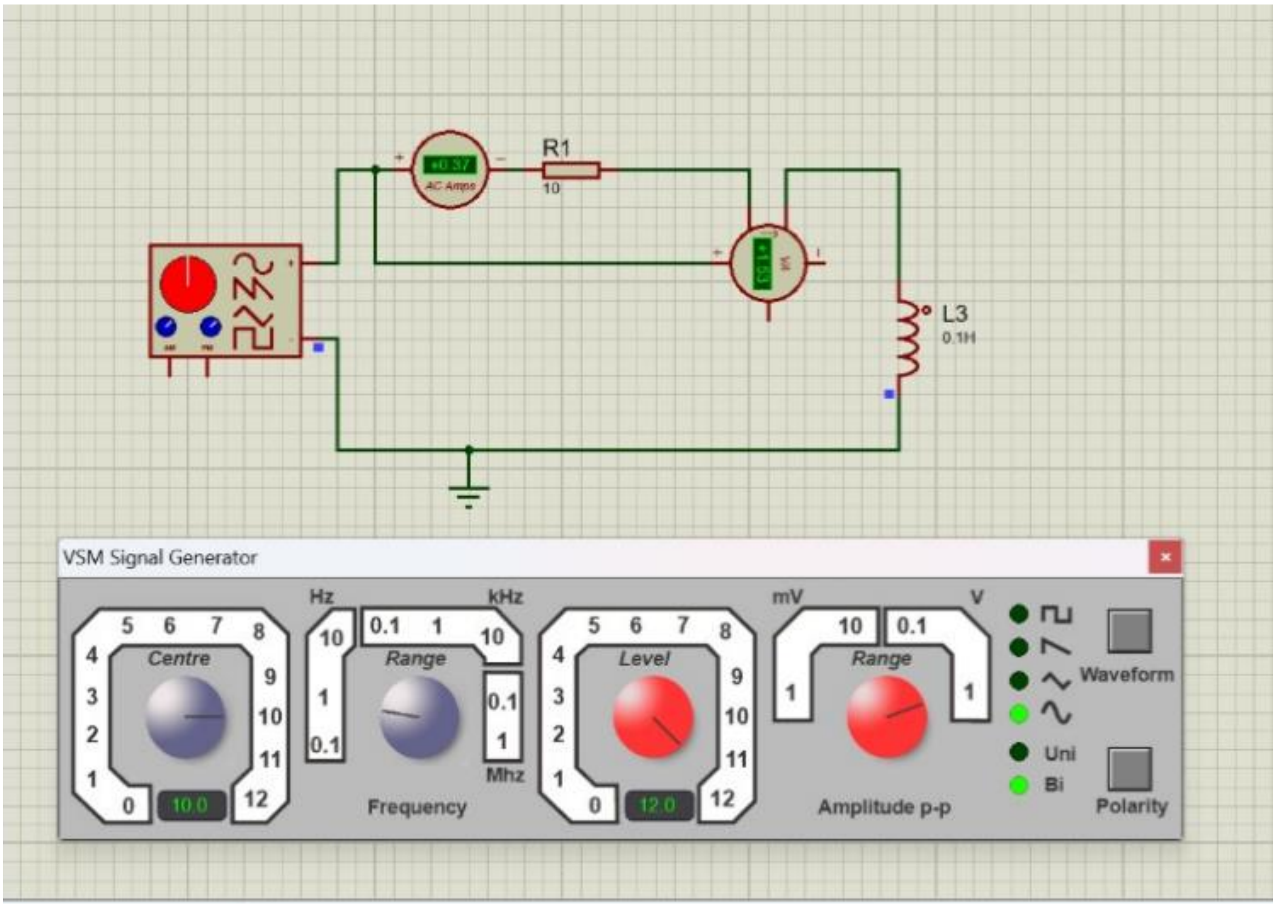

Fig. (1) AC Circuit for Power and Power Factor Measurement

Apparatus Used:

- AC Signal Generator
- Ammeter
- Voltmeter
- Resistor (R = 10Ω)
- Inductor (L = 0.1H)
- Proteus 8 Professional Software
- Connecting Wires

Working Procedure:

1. Opened Proteus 8 and constructed the circuit as shown.
2. Connected the ammeter in series and voltmeter in parallel with the load.

3. Used a VSM Signal Generator to supply AC voltage.
4. Measured the RMS current and peak voltage.
5. Calculated the real and apparent power.
6. Computed the power factor using the given formula.

Given Data:

- Peak Voltage, $V_m = 52 \text{ V}$
- Current, $I = 0.37 \text{ A}$
- Real Power, $P = 3.53 \text{ W}$

Calculation:

Apparent Power (S):

$$V_{rms} = \frac{V_m}{\sqrt{2}} = \frac{52}{1.414} = 36.77 \text{ V}$$
$$S = V_{rms} \times I = 36.77 \times 0.37 = 13.6\text{VA}$$

Power Factor (pf):

$$\cos\theta = \frac{P}{S} = \frac{3.53}{13.6} \approx 0.26$$

SL No.	Peak Voltage (V)	RMS Voltage (V)	Current (A)	Apparent Power (VA)	Real Power (W)	Power Factor
1	52	36.77	0.37	13.60	3.53	0.26
2	48	33.94	0.35	11.88	3.10	0.26
3	44	31.11	0.33	10.27	2.80	0.27
4	40	28.28	0.30	8.48	2.30	0.27

Result and Discussion:

- The apparent power was calculated to be **13.6 VA**, and the real power measured was **3.53 W**.
- This resulted in a **power factor of 0.26**, indicating a predominantly inductive circuit.
- The simulation verified the effect of phase difference between voltage and current on power factor.
- A low power factor suggests inefficiency due to reactive components.

Conclusion:

In this experiment, we successfully measured real and apparent power and determined the power factor of a series RLC circuit. The observed low power factor demonstrates the influence of inductive reactance, validating the concept of reactive power in AC circuits.