

EXPERIMENT NO-9

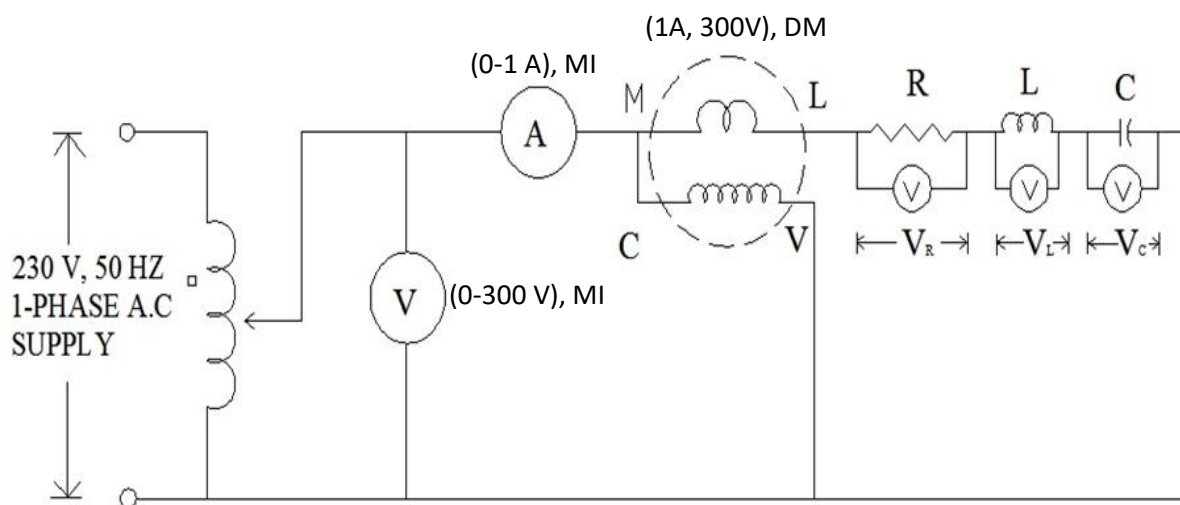
01. AIM OF THE EXPERIMENT: -

Measurement of current voltage power factor in series R-L-C circuit excited by a single phase AC supply.

02. APPARATUS REQUIRED: -

Sl No.	Components	Rating	Type	Quantity
1	Voltmeter	0-300 V	MI	1
2	Ammeter	0-1 A	MI	1
3	Wattmeter	1 A, 300 V	DM	1
4	Bulb	230 V, 40 W	Resistive	1
5	Choke	230 V, 40 W	Inductive	1
6	Capacitor	230 V, 0.25 μ f	Electrolytic	1
7	Variac	0-230-270 V, 8A	WW	1
8	Connecting Wires	230 V, 5A, 1/18 SWG	PVC coated	As per required

CIRCUIT DIAGRAM:



03. THEORY: -

Power in an electrical circuit can be measured using a wattmeter. A wattmeter consists of two coils, namely current coil and pressure coil or potential coil. The current coil is marked as ML and pressure coil is marked as a CV. The current coil measures the quantity that is proportional to the current in the circuit. The pressure coil measures quantity that is proportional to the voltage in the circuit. The given wattmeter is loaded by direct loading. The ammeter is connected in series to the wattmeter. Since the same current flows in both the coils, the current and voltage across the circuit are constant. The power consumed by the load is measured using the wattmeter and calculated using the relation given below.

A series RLC circuit with Kirchhoff's voltage law given:

$$V = V_R + V_L + V_C = I(R + j\omega L + 1/j\omega C) = IZ$$

In the above circuit, one can say whether current leads or lags the voltage. It depends upon relative value of terms ωL & $1/\omega C$.

There can be three possibilities

If $W_L > 1/W_c$ the current leads the voltage and circuit behaves as induced circuit.

If $W_L < 1/W_c$ the current leads the voltage and circuit behaves as capacitive circuit.

Special Case: At resonance the current through the circuit becomes in phase with supply voltage.

04. POCEEDURE: -

- Connect the circuit as shown in the circuit diagram.
- Initially no load is applied.
- Auto transformer is set to minimum voltage position before switching on the power supply.
- Set the rated voltage by using the auto transformer. Measure and record the values of voltmeter, ammeter and wattmeter on no load condition. Also carefully note the multiplication factor of the wattmeter that is mentioned in the wattmeter itself.
- Apply the load by adjusting RLC load.
- Measure and record the values of voltmeter, ammeter and wattmeter.
- Repeat the steps 5 and 6 until the ammeter reading reaches 10A.
- After taking all the readings, reduce the load slowly to the minimum and bring the voltage to minimum in the auto transformer. Switch off the power supply.
- Calculate the indicated power by the given formula.
- Calculate the power factor by the given formula.

05. FORMULA: -

Actual power= $W \times \text{multiplication factor}$.

Where, W = Observed wattmeter reading

Apparent power= VI

Where, V = Voltmeter reading

I = Ammeter reading

Power factor, $\cos\Phi = \text{Actual power}/\text{Apparent Power}$

06. OBSERVATION: -

Sl No	Voltage V (Volt)	Current I (Amp)	Wattmeter Reading (Watt)		Measured power (VA)	Power factor ($\cos\Phi$)
			Observed	Actual		
1						
2						
3						
4						
5						
6						

07. CONCLUSION: -