Series R L C Circuit

Exp. No: **Date:**

Aim: To study the behaviour of series R-L-C circuit.

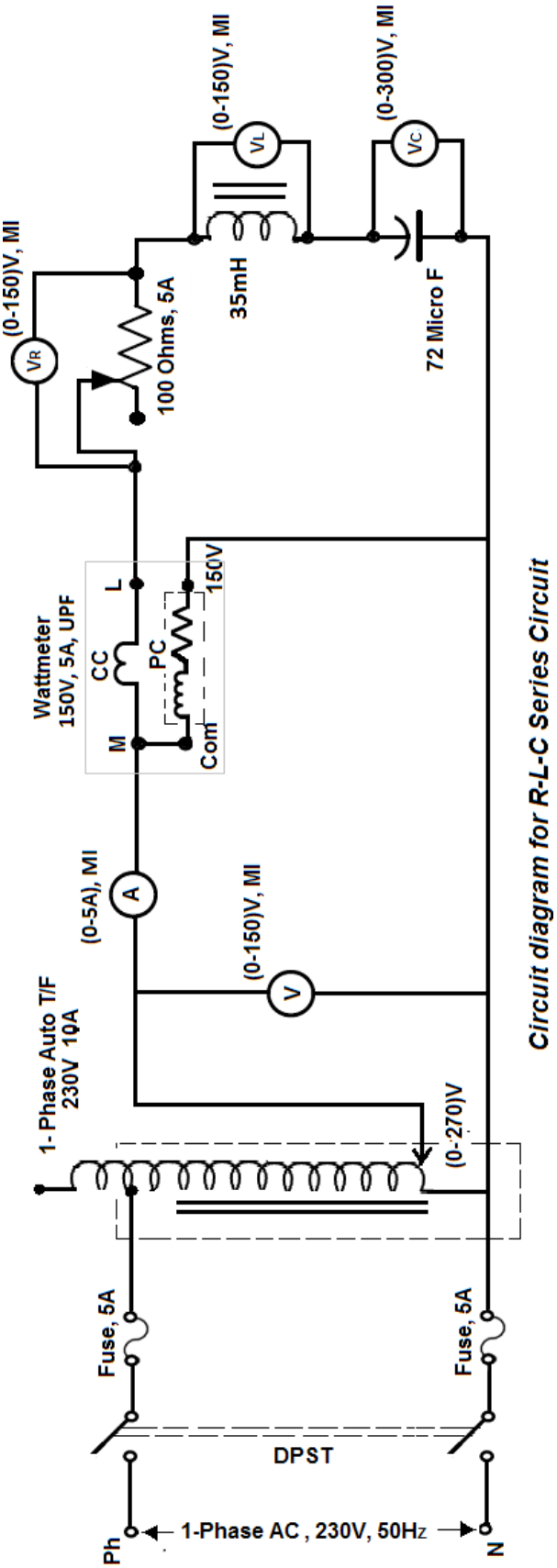
Apparatus required:

S.No	Name of the equipment	Range/ Specification	Type	Quantity
1	Voltmeter	(0-150) V	MI	3
2	Voltmeter	(0-300) V	MI	1
3	Ammeter	(0-5) A	MI	1
4	Wattmeter	150V, 5A,UPF	EDW	1
5	Rheostat	100Ω, 5A	Wire wound	1
6	Inductor	35mH	Core type	1
7	Capacitor	72µF, 440V	Electrolytic	1
8	1- Phase Auto Transformer	I/P:1-ϕ, 230V O/P: (0-270)V,10A	Core type	1
9	Connecting wires	1.5sq.mm	copper	Required

Procedure:

1. Connect the circuit as shown in the circuit diagram.
2. Adjust the rheostat for maximum resistance position and the auto transformer to the position of zero-output voltage and switch on the supply.
3. Adjust the voltage across the circuit to about 120 V by varying 1-ϕ auto transformer and note down the corresponding meter values i.e: V_s, I_L, W, V_R, V_L, V_C.

4. Adjust the rheostat for several resistance value settings and note down the corresponding meter values.
5. Draw Phasor diagrams showing V_R, V_L, V_C, V_S, and Ø for different sets of readings.
6. Compare the values of phase angle as obtained from the meter readings with the values obtained from the phasor diagrams.



Circuit diagram for R-L-C Series Circuit

Observation table:

S.No	**V_S** Volts	**I_L** Amps	**W** (Watt)	**V_R** **(V)**	**V_L** **(V)**	**V_C** **(V)**	**V_S.I** **(**VA**)**	**Cos ϕ =W/ (V_S.I)**	**Phase angle Ø**	**Ø From Phasor diagram**

Theoretical calculations:

Inductive Reactance, $X_L = 2\,\pi f L$

Capacitive Reactance, $X_C = \frac{1}{2\,\pi\,f\,C}$

Circuit Impedance, $Z = \sqrt{[\,R^2 + (X_L - X_C)\,]^2}$

Circuits Current, $I = \frac{VS}{Z}$

Voltages across the Series RLC Circuit, V_R, V_L, V_C.

$V_R = IR$

$V_L = I\,X_L$

$V_C = IX_C$

Circuits Power factor and Phase Angle, θ.

$$\text{Cos } \theta = \frac{R}{Z}$$

Apparent Power in VA $S = V_S I$

Active Power in Watts $P = V_S I \cos \theta$

Resonant Frequency of the circuit, $f_0 = \frac{1}{2\pi\sqrt{LC}}$

Q- Factor, $Q_0 = \frac{1}{R}\sqrt{\frac{L}{C}}$

Precautions:

1. All the connections should be tight.
2. Use proper ranges of the meters.
3. Take the readings without parallax error

Result: