EXPERIMENT NO. 7

Objective: To find the power factor and circuit constant in R-L-C series circuit.

Apparatus Required:

Sr. No.	Apparatus	Quantity	Range/ Remark
1	Single phase AC supply	1	(……..) V
2	Variac (i/p-230V,o/p-0-270V,15A)	1	
3	AC Voltmeter	4	(……)V, (…..) V, (……)V , (…...)V
4	AC Ammeter	1	(……….)A
5	wattmeter	1	(……….)W, …..V, …..A
6	Rheostat	1	……..Ω
7	capacitor	1	--
8	inductor	1	--
9	Connecting wires	--	--

Circuit Diagram:
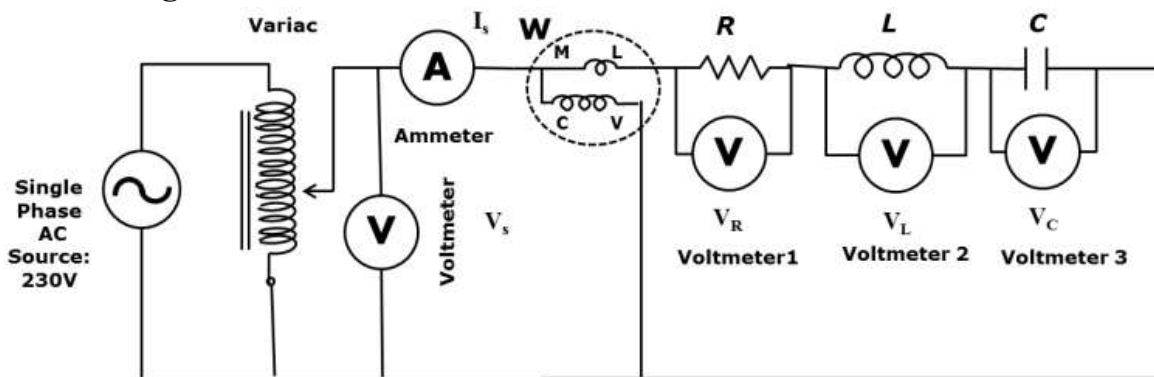
Fig 1 – R-L-C Series Circuit

Observation Table:

S. N.	Observed value						Calculated value					Θ	L	C
	V (v)	I (A)	V_R (v)	V_L (v)	V_C (v)	P (Watt)	R (V_R/I)	X_L V_L/I	X_c V_C/I	Cosθ = P/VI	Z= $\frac{V}{I}$			

Theory:

A series R-L-C circuit is shown in Fig.1 from KVL

$$V = V_R + V_L + V_C$$

$$V = IR + I(jwL) + I\left(\frac{1}{jwc}\right)$$

$$V = I[R + j(wL - \frac{1}{wc})]$$

$$V = IZ, \text{ where } Z = \text{impedance}$$

$$Z = [R + j(wL - \frac{1}{wc})]$$

$$\Theta = \tan^{-1}[(wL - \frac{1}{wC})/R]$$

Power factor $\cos(\Theta) = \frac{P}{VI}$, $R = \frac{VR}{I}$, $X_L = \frac{VL}{I}$, $X_C = \frac{VC}{I}$, $L = X_L/w$, $C = 1/wX_C$

Procedure:

1. Connect the circuit as shown in the circuit diagram.
2. Switch On the AC supply
3. Set the variac to zero value
4. Vary the variac to a suitable value and note down the reading of V, V_R, V_L, V_C, I and W.
5. Repeat step 4 and take more reading.

Result:

Value of power factor and circuit constant (R,L,C) have been obtained successfully.

Precaution:

1. Make the connections properly.
2. Note the readings of voltmeters and ammeters properly avoid parallax
3. Avoid loose connections and don't touch wire with wet hand.
4. Before connecting all instruments check their zero reading.