

Determination of a capacitance of a condenser by vectors method

Aim:

Determination of a capacitance of a condenser by vectors method

Apparatus:

1. Low voltage, A.C. source.
2. Voltammeter.
3. Capacitor.
4. resistance.
5. White board

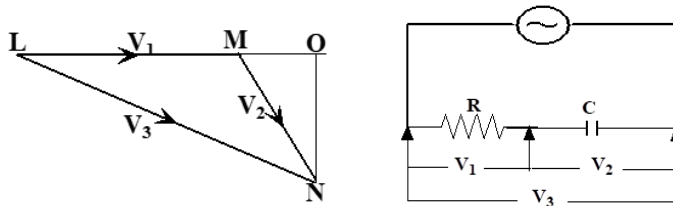
Theory:

In the circuit shown in Fig. the voltage V_1 across R_1 is given by:

$$V_1 = R_1 I$$

and is represented by LM in Fig.

$$V_1 = R_1 I = LM \quad (5)$$



V_2 is represented by MN

V_2 is the vector sum of the voltage due to the leakage resistance r and the voltage due to the capacitive reactance X_c

$$V_1 = I r = MO \quad (6)$$

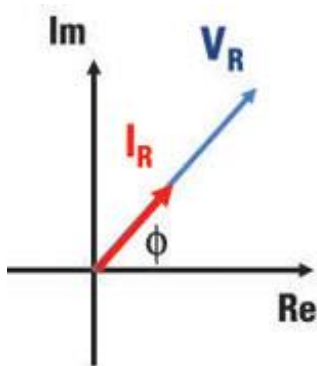
$$V_c = I X_c = ON \quad (7)$$

$$r = \frac{MO}{LM} R_1 \quad (8)$$

$$X_c = (ON/LM) R_1$$

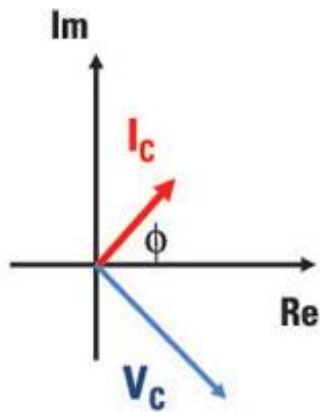
$$(1/2 \pi FC) = (ON/LM) R_1$$

$$C = \frac{LM}{NO} \times \frac{1}{2\pi f R_1} \quad (9)$$



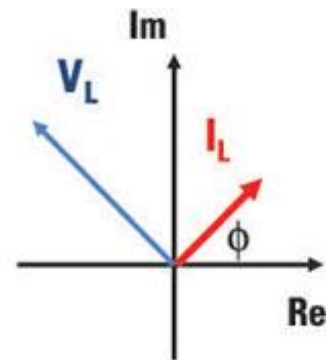
Resistor

Voltage in phase
with current



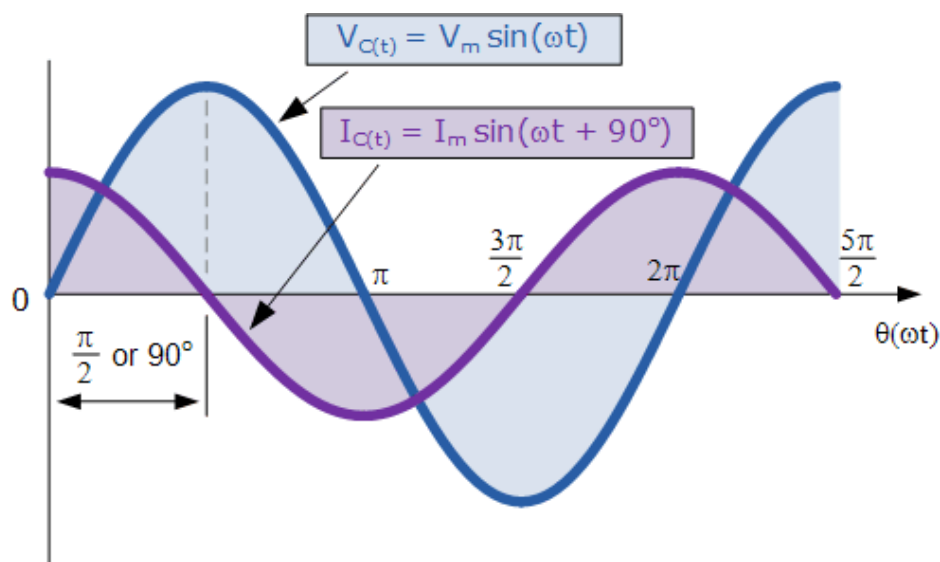
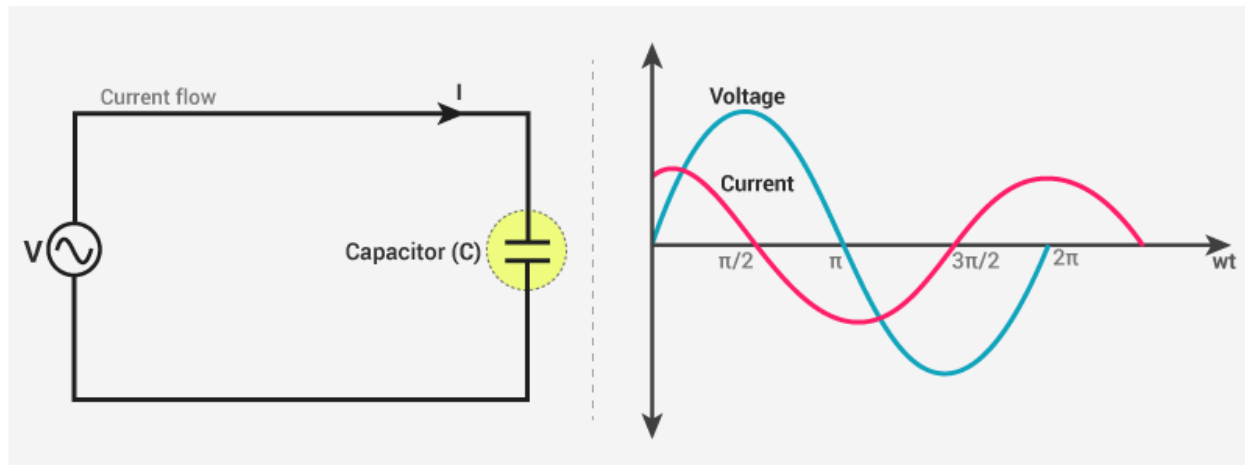
Capacitor

Voltage lags
current by 90°



Inductor

Voltage leads
current by 90°

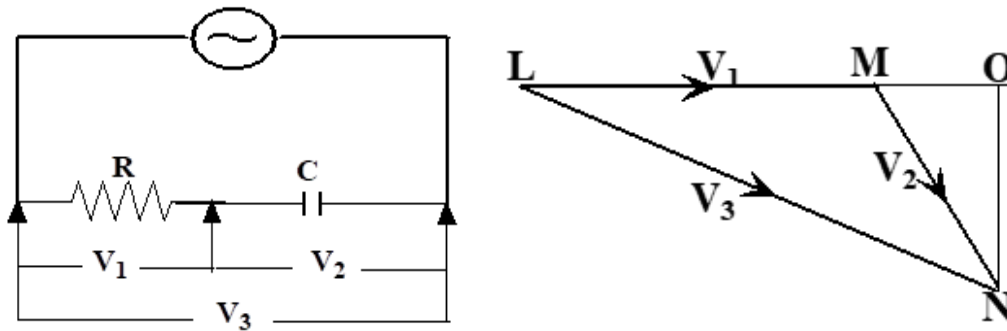


Method:

Connect the circuit as shown in Fig.

2. Measure the voltage across the resistor, coil and across the circuit.
3. Replace the coil by the capacitor as shown in Fig.
4. Measure the voltage across the resistor R_1 and the capacitor C and across the circuit.
5. Draw the vector triangle in case of the coil and the capacitor.
6. Calculate each of the following:

Ohmic resistance of the coil R , inductance of the coil L , leakage resistance (r), the capacitance of the capacitor (C).



Results:

For Condenser

Leakage resistance (r)=

The capacitance of the capacitor (C) =