

Experiment 8:-

Impedance & Reactance

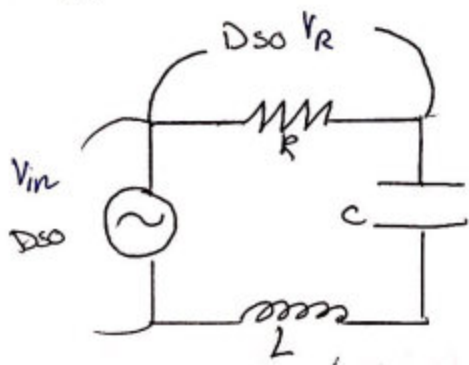
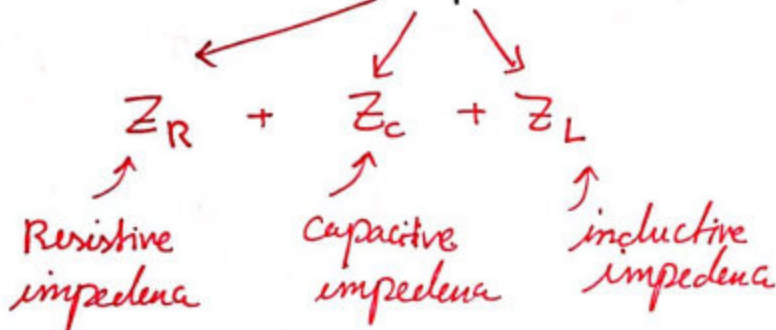
A measure of how much the element opposes current flow (it's a complex number)

We use the sine wave

In An RLC Circuit:- equation ①

$$I(t) = \frac{E(t)}{Z_{eq}} = I_0 \sin(\omega t - \phi)$$

An expression of the extent to which an electric component Release or stores energy (exists only in AC)

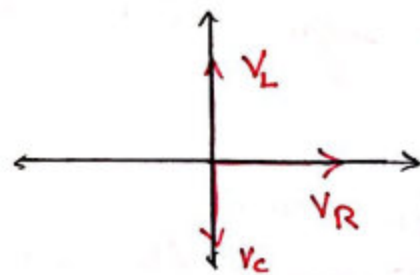


$$V_R = I_0 R \sin(\omega t - \phi)$$

V_R is 90° ahead to V_C .

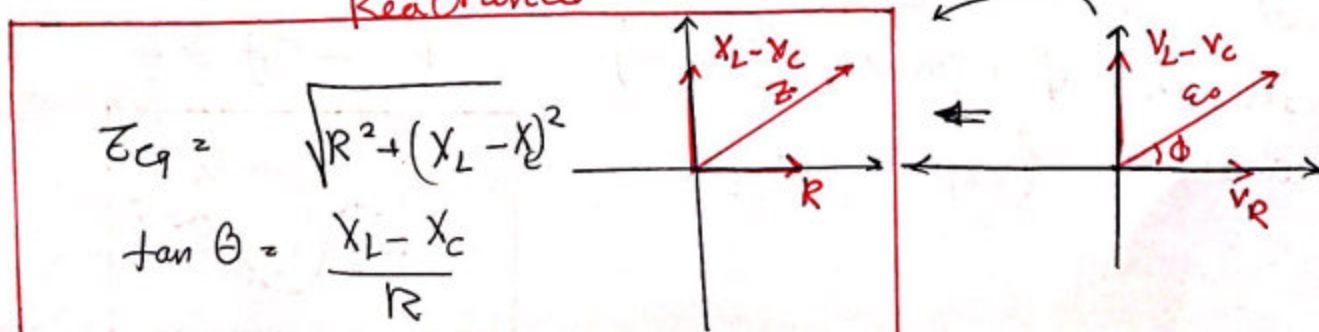
$$V_C = X_C I_0 \sin(\omega t - \phi - \frac{\pi}{2})$$

Capacitive Reactance = $\frac{1}{\omega C} \Omega$



$$V_L = X_L I_0 \sin(\omega t - \phi + \frac{\pi}{2})$$

inductive Reactance = $\omega L \Omega$



- Using equation 1 :-

$$I_0 = \frac{E_0}{\sqrt{R^2 + (X_L - X_C)^2}}$$

I_0 is Maximum when $X_L = X_C$

$$I_0 = \frac{E_0}{R}$$

$$\omega L = \frac{1}{\omega C}$$

$$\omega = \frac{1}{\sqrt{LC}}$$

$$f = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\omega\pi}$$

- What we use
 - a Capacitor
 - an inductor
 - a Resistance
 - signal Generator and DSO
- قم بوضع الآلة المحاسبية في القناة الأولى
- قم بوضع جهاز ال DSO مع R مع signal Generator
- قم بتغيير التردد في المدى (0.1 - 100) KHz
- قسط شاشة ال DSO في الحالة

Procedure

- Connect the circuit As shown
- Connect the DSO with R and signal Generator
- Change frequency in the Range (0.1 - 100) KHz and measure Δt

Calculate Φ (phase difference) :- $\Phi = 2\pi f \Delta t$

Calculate $f_{exp} = \frac{1}{2\pi\sqrt{LC}}$

