

Experiment 8:-

Impedance & Reactance

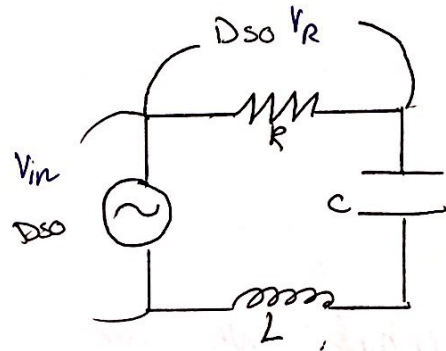
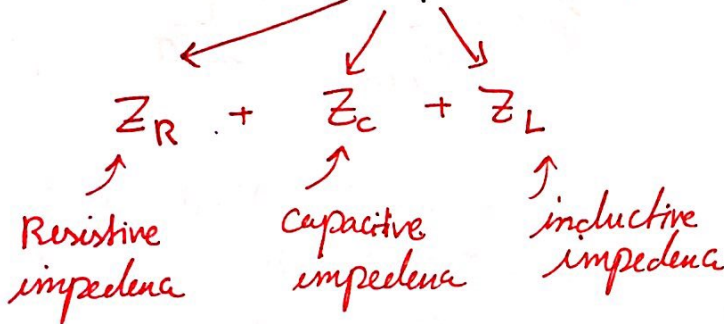
A measure of how much the element opposes current flow (it's a complex number)

We use the sine wave

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

In An RLC Circuit:- equation ①

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



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

$$V_R \text{ is } 90^\circ \text{ ahead of } V_C$$

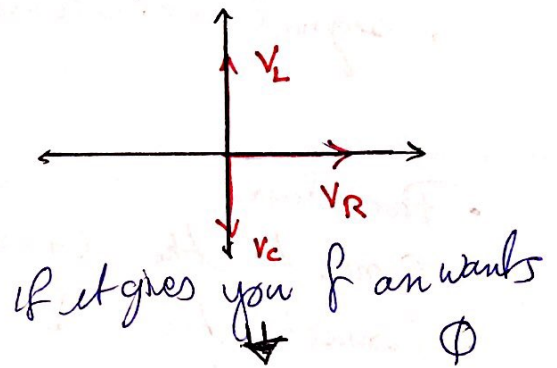
$$\phi = \omega \Delta t$$

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

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

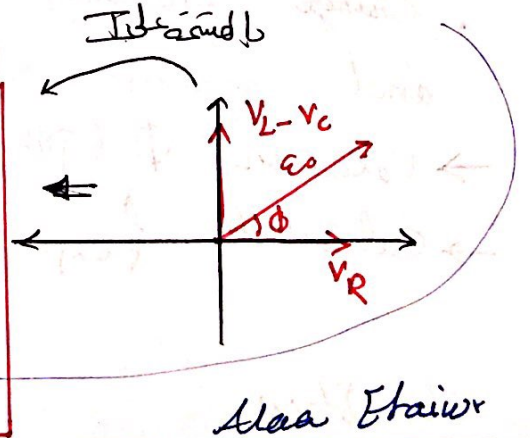
$$V_L = X_L I_0 \sin(\omega t - \phi + \frac{\pi}{2})$$

Inductive Reactance $= \omega L \Omega$



$$Z_{eq} = \sqrt{R^2 + (X_L - X_C)^2}$$

$$\tan \theta = \frac{X_L - X_C}{R}$$



- Using equation 1 :-

$$\rightarrow I_0 = \frac{\varepsilon_0}{\sqrt{R^2 + (X_L - X_C)^2}}$$

$\rightarrow I_0$ is Maximum when $X_L = X_C$

$$\hookrightarrow I_0 = \frac{\varepsilon_0}{R}$$

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

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

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

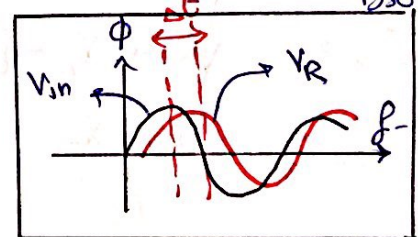
- What we use
 - a Capacitor
 - an inductor
 - a Resistance
 - signal Generator and DSO
- قم بوضع الدارة كما هو مبين في الصفحة الأولى
- قم بوضع جهاز ال DSO مع R مع signal Generator
- قم بتغيير التردد في المدى (0.1 - 100) KHz
- قس Δt من شاشة ال DSO لفصل طارة

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



Alaa Etaiwi