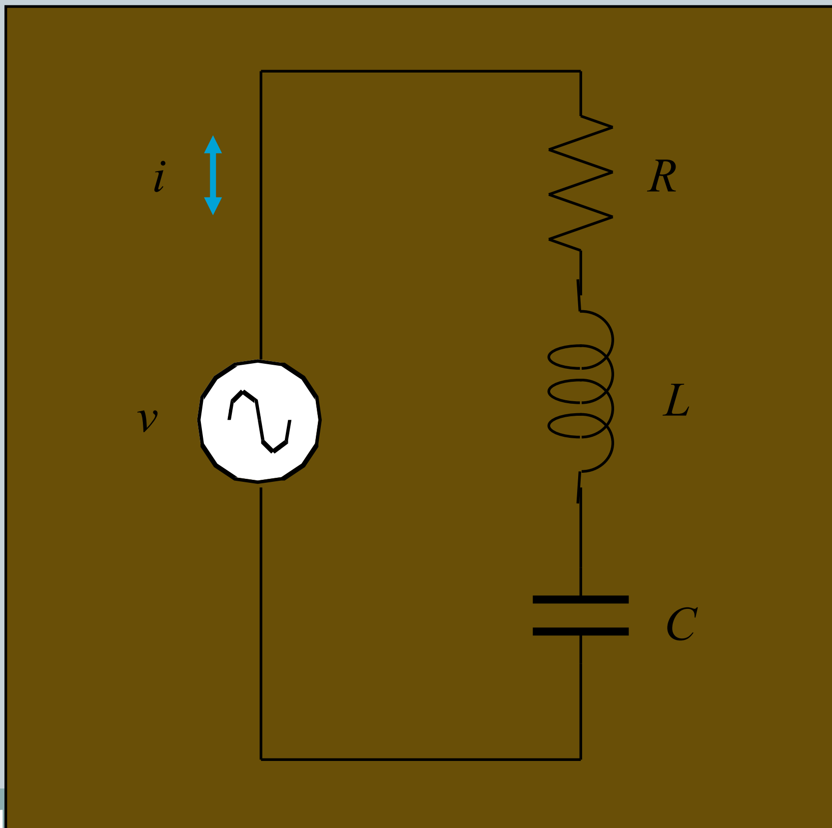
UNIT-2

Steady-State Analysis of Single Phase AC Circuits:

- AC Fundamentals: Sinusoidal, square and triangular waveforms-average and effective values,
- form and peak factors, concept of phasors, phasor representation of sinusoidally varying
- voltage and current, concept of impedance, analysis of series, parallel and series-parallel RLC
- Circuits: apparent, active & reactive powers, power factor, resonance in series and parallel
- circuits, bandwidth and quality factor

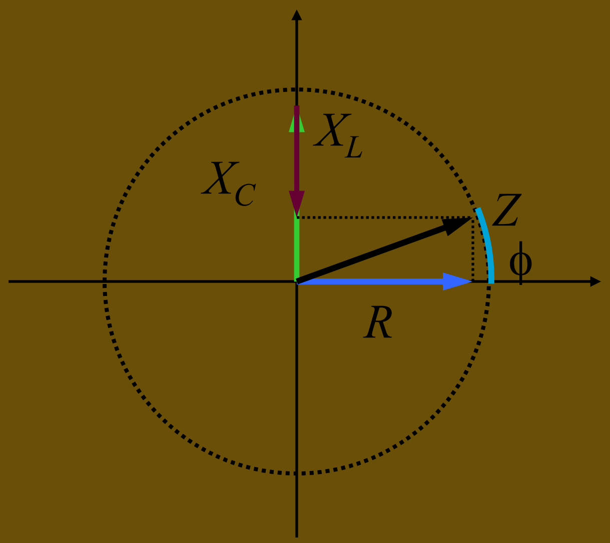
Resonant Circuit :

- The behavior of the series RLC circuit is governed by the impedance.
  - Magnitude and phase



$$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

$$\phi = \arctan\left(\frac{\omega L - \frac{1}{\omega C}}{R}\right)$$



$$Z = \sqrt{R^2 + \left(X_L - X_C\right)^2}$$

$$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

The total impedance is the magnitude of *Z*.

The phase between the current and voltage is the angle ϕ between *Z* and the x-axis.

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

$$\phi = \arctan\left(\frac{\omega L - \frac{1}{\omega C}}{R}\right)$$

At resonance the current is at maximum for the voltage.

$$X_C = X_L$$

$$\frac{1}{\omega_0 C} = \omega_0 L$$

$$\omega_0^2 = \frac{1}{LC}$$

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

$$f_0 = \frac{\omega_0}{2\pi} = \frac{1}{2\pi\sqrt{LC}}$$