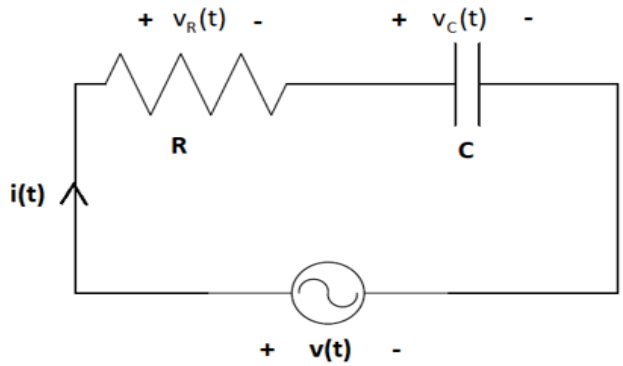
NOTES-26

Analysis of Series RC Circuit:



By KVL, $v(t) = v_R(t) + v_C(t)$

In Phasor form, $\bar{V} = \bar{V_R} + \bar{V_C}$

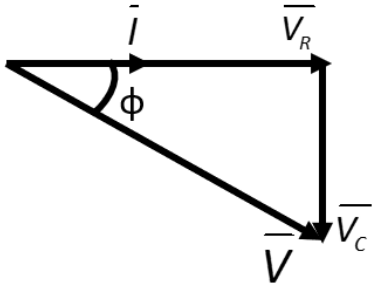
$$\bar{V_R} = \bar{I} * R$$

$$\bar{V_C} = \bar{I} * (-jX_C)$$

$$\bar{V} = \bar{I} * (R - jX_C)$$

$$Z_T = \frac{\bar{V}}{\bar{I}} = (R - jX_C) = \sqrt{R^2 + X_C^2} \angle -\text{Tan}^{-1}\left(\frac{X_C}{R}\right)$$

Phasor Diagram:



Phase angle of a network is found as

$$\phi = \angle\bar{V} - \angle\bar{I}$$

$$\phi = -\text{Tan}^{-1}\left(\frac{|\bar{V_C}|}{|\bar{V_R}|}\right) = -\text{Tan}^{-1}\left(\frac{V_C}{V_R}\right) = -\text{Tan}^{-1}\left(\frac{X_C}{R}\right)$$

Negative phase angle means voltage lags current.

In series AC networks, phase angle = Impedance angle