Lecture 23

1. A Capacitor of Capacitance 100μF is connected across an AC voltage source 100sin(100πt) V. Determine

i) Capacitive Reactance

ii) Impedance

iii) Instantaneous expression for the current

Also, draw the phasor diagram.

SOLUTION:

Given, V(t) = 100sin(100πt) V

Hence, $\omega = 100\pi$ rad/s

i) Capacitive Reactance, $X_C = \frac{1}{\omega C} = 31.83\Omega$

ii) Impedance, $Z = -jX_C = -j31.83\Omega$

iii) Instantaneous current, $i(t) = V_m \omega C \sin(\omega t + 90°)$ A

$= 3.14\sin(\omega t + 90°)$ A

Phasor Diagram:

$\bar{V} = \frac{100}{\sqrt{2}} \angle 0°$ V

$\bar{I} = \frac{3.14}{\sqrt{2}} \angle 90°$ A