NATIONAL UNIVERSITY OF SCIENES & TECHNOLOGY

Electric Network Analysis (EE-211)

Assignment # 1

Submitted to: Ahsan Azhar

Submitted by: Muhammad Umer

Class: BEE-12C

Semester: 2nd

Dated: 19/03/2021

CMS ID: 345834

Assignment 1

9.2 $i_s = 15\cos(25\pi t + 25°)\,A$

a) What is the amplitude of the current?

Since, $i(t) = i_m \cos(\omega t + \phi)\,A$

Amplitude $i_m = 15A$

b) What is the angular frequency?

$\omega = 25\pi = 78.53\ rad/s$

c) Find the frequency of the current?

As $\omega = 2\pi f$

$$f = \frac{\omega}{2\pi} = \frac{25\pi}{2\pi} = 12.5\ Hz$$

d) Calculate i_s at $t = 2ms$.

$i_s = 15\cos(25\pi(2\times10^{-3}) + 25°)$

$i_s = 15\cos\left(\pi/20 + 25° \times \frac{\pi}{180°}\right)$

$i_s = 15\cos(0.59341)$

$i_s = 12.435\ A$

9.5 $v_1 = 45\sin(\omega t + 30°)V$

$v_2 = 50\cos(\omega t - 30°)V$

$v_1 = 45\sin(\omega t + 30°) = 45\cos(\omega t + 30 - 90)$

$v_1 = 45\cos(\omega t - 60°)\ V$

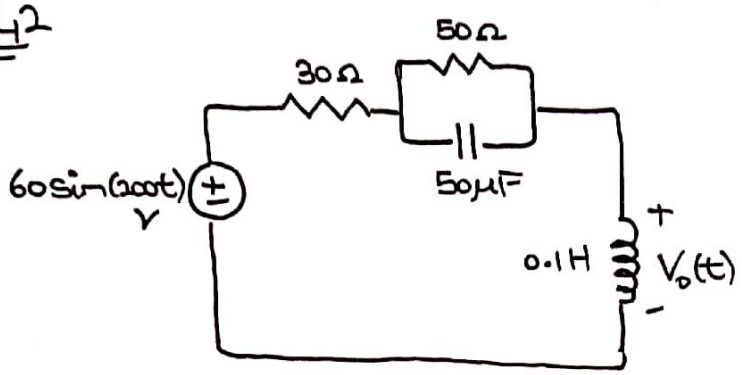
$\phi_{v_1} - \phi_{v_2} = -60° - (-30°) = -30°$

The phase difference is of $\boxed{-30°}$

The phase angle is $\boxed{30^\circ}$.

V_1 Lags V_2.

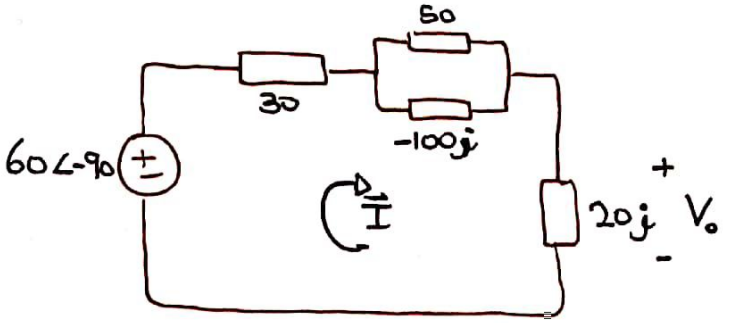
9.42



Source in terms of cosine,

$V_s = 60\sin(200t) = 60\cos(200t - 90^\circ)$

In Phasor, $V_s = 60\angle -90\ V$

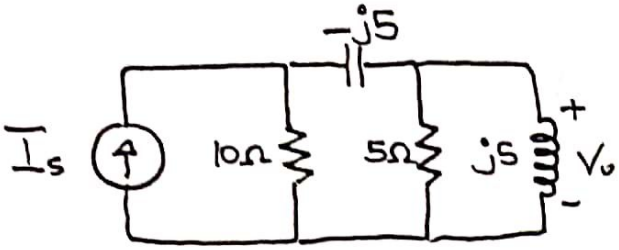


$$\vec{I} = \frac{\vec{V}}{Z} = \frac{60\angle -90}{\left(30 + \left(\frac{1}{50} + \frac{1}{-100j}\right)^{-1} + 20j\right)} = -\frac{6}{7}j$$

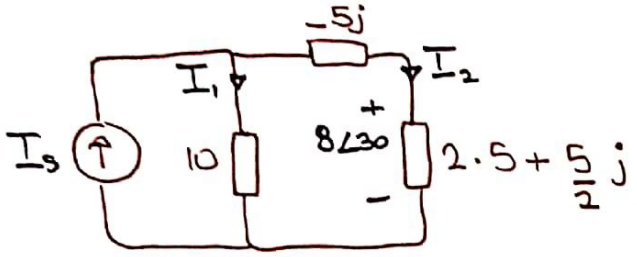
$$V_o = \vec{I}(20j) = 17.14\angle 0$$

$$\boxed{V_o(t) = 17.14\cos(200t)\ V}$$

9.52 $V_o = 8\angle 30^\circ V$



Combining parallel elements



$$I_2 = \frac{V_o}{Z} = \frac{8\angle 30^\circ}{2.5+2.5j} = 2.26\angle -15$$

By CDR,

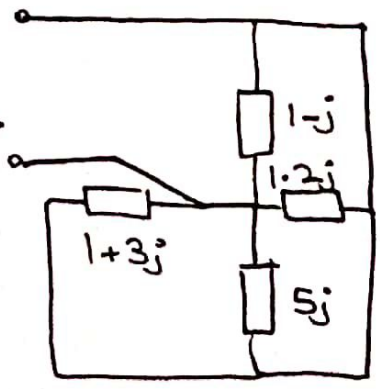
$$I_2 = I_s\left(\frac{10}{12.5-2.5j}\right)$$

$$2.26\angle -15 = I_s\left(\frac{10}{12.5-2.5j}\right)$$

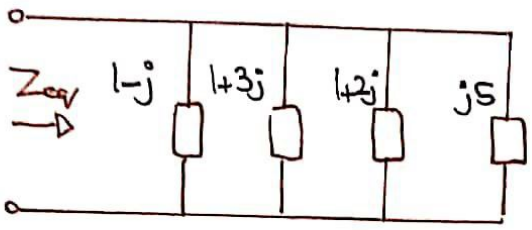
$$I_s = 2.26\angle -15 \cdot \left(\frac{12.5-2.5j}{10}\right)$$

$$\boxed{I_s = 2.88\angle -26.31^\circ}$$

9.61 Z_{eq} →



This can be redrawn as



Hence, all are in parallel.

$$Z_{eq} = \left(\frac{1}{1-j} + \frac{1}{1+j3} + \frac{1}{1+j2} + \frac{1}{j5} \right)^{-1}$$

$$= \left(\frac{4}{5} - \frac{2}{5}j \right)^{-1}$$

$$= 1 + j\frac{1}{2}$$

$$\boxed{Z_{eq} = 1 + j0.5}$$