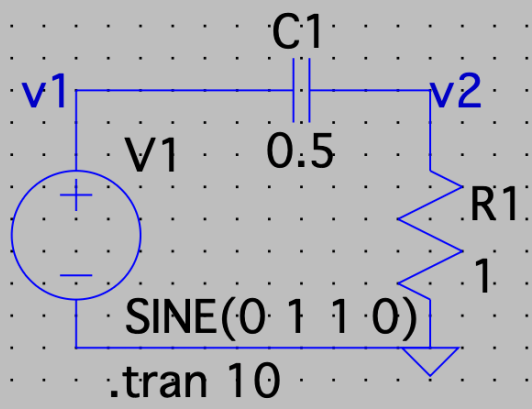
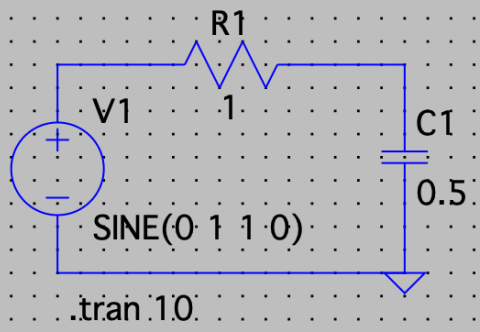
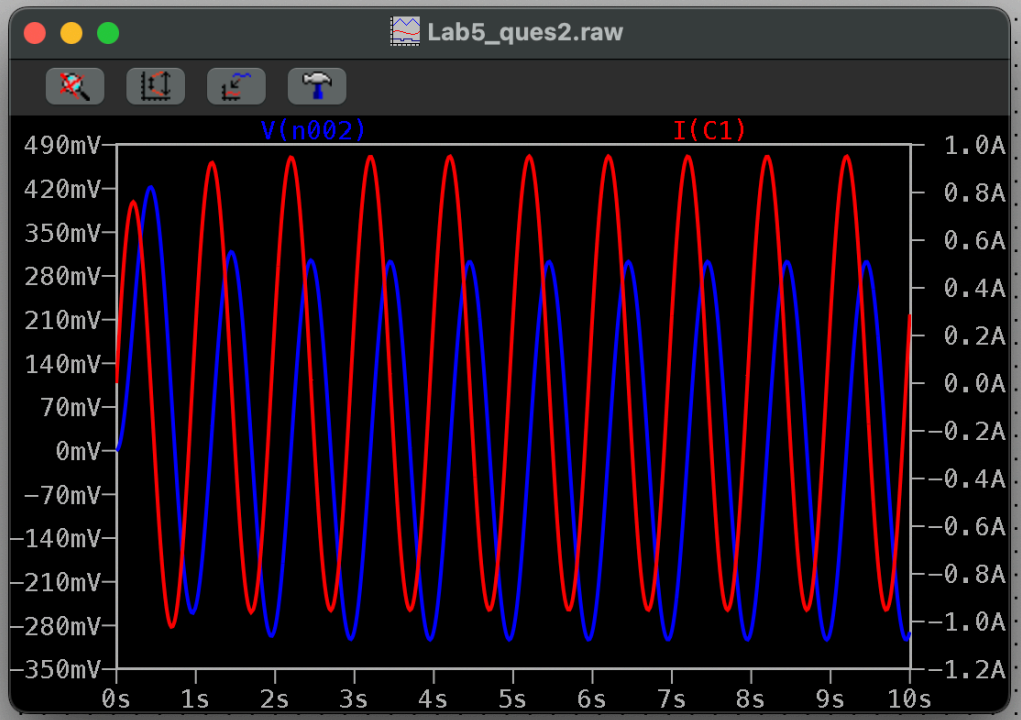
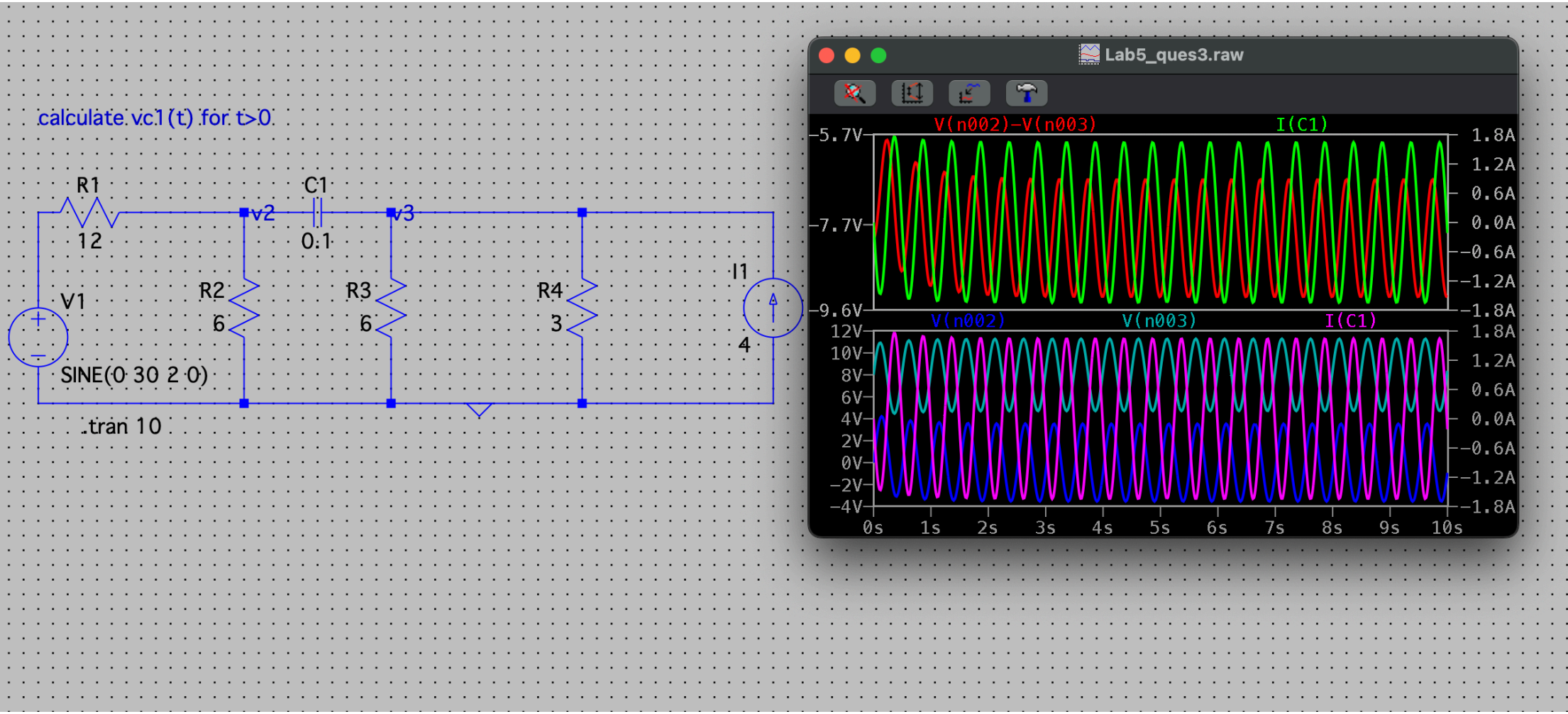
Transient Analysis of AC Circuits First order
(order is number of elements that are enenry absorber)



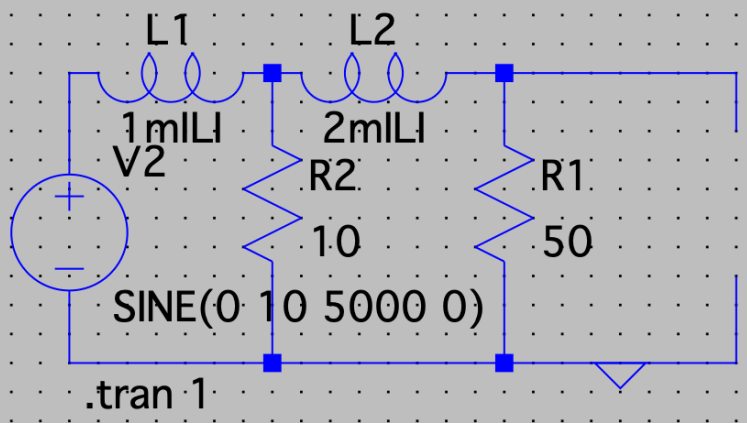
calculate V0(t) for t > 0

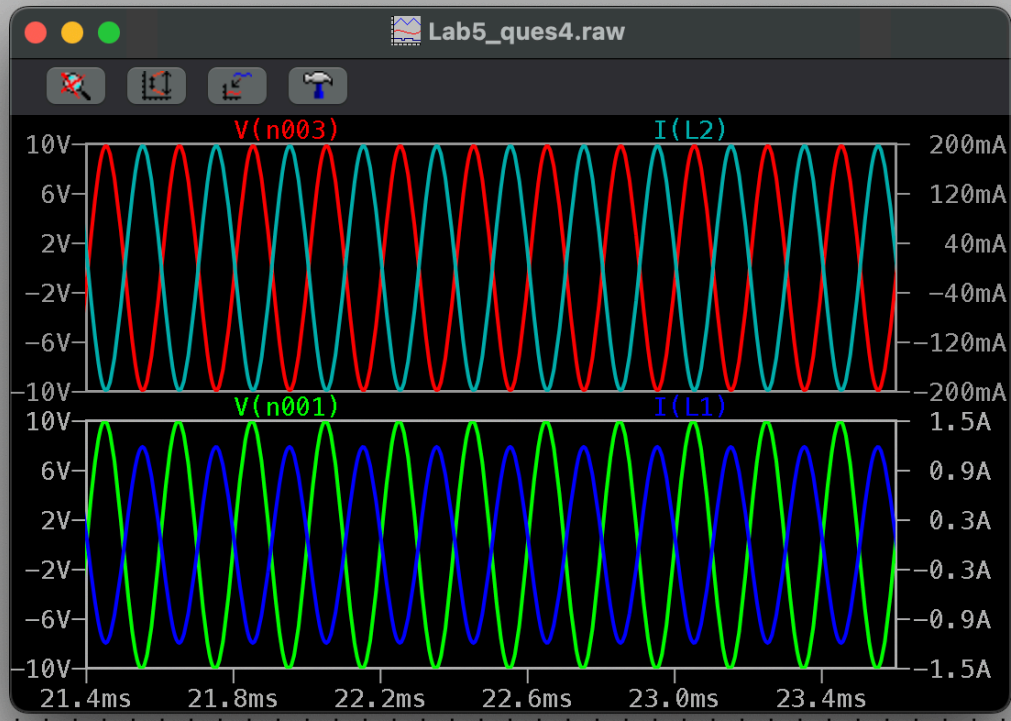




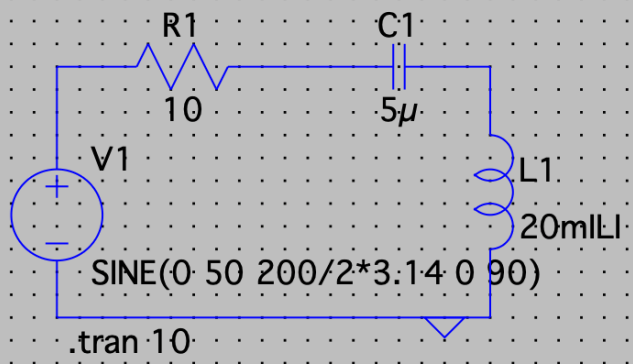

calculate vc1(t) for t>0
R1
12
C1
0.1
v2
v3
V1
SINE(0 30 2 0)
R2
6
R3
6
R4
3
I1
4
.tran 10
Lab5_ques3.raw
V(n002)-V(n003)
I(C1)
-5.7V
-7.7V
-9.6V
1.8A
1.2A
0.6A
0.0A
-0.6A
-1.2A
-1.8A
V(n002)
V(n003)
I(C1)
12V
10V
8V
6V
4V
2V
0V
-2V
-4V
0s
1s
2s
3s
4s
5s
6s
7s
8s
9s
10s

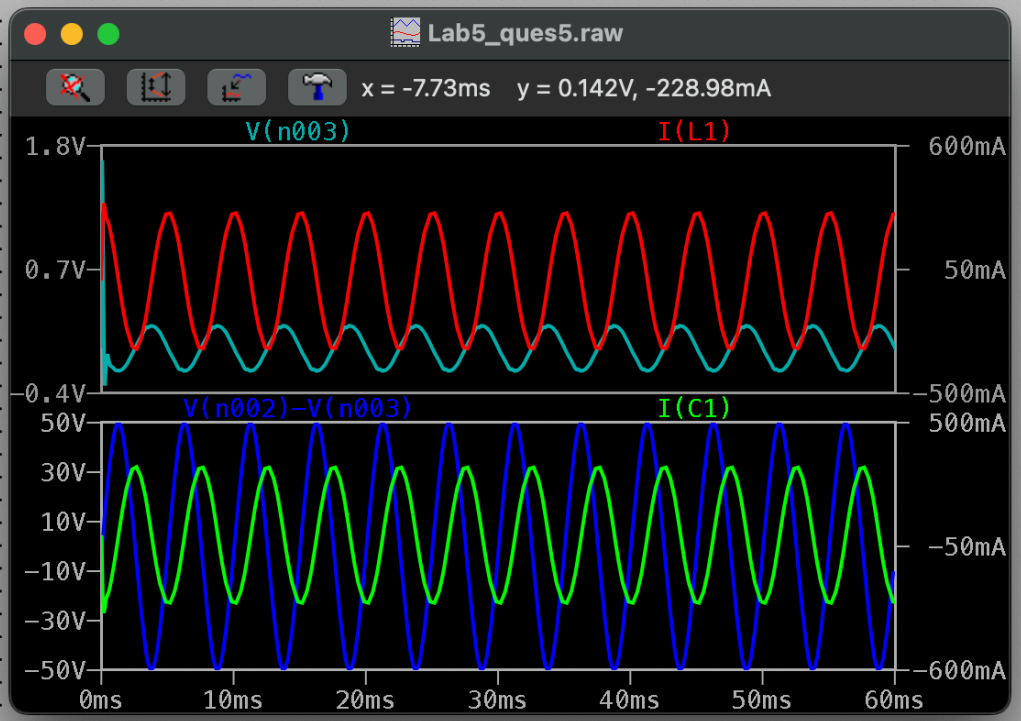
Refer to the RL circuit in fig. If 10 V is applied to the input, Find the magnitude and the phase shift produced at 5 khz. Specify wheather the phase shift is leading or lagging.



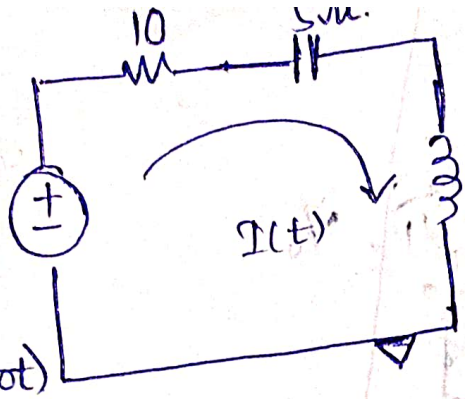


Find current i in the circuit of Fig. when vs(t) = 50 cos 200t V.





(5)



V(t) ⇒ 50 sin (90 + 200t)

$\frac{1}{j\omega C}$

$V(t) \Rightarrow 10I(t) + 5\mu \cdot I(t) + j\omega L$

$V(t) \Rightarrow 10I(t)\left[10 + \frac{1}{j\omega C} + j\omega L\right]$

$Z \Rightarrow R + \frac{1}{j\omega C} + j\omega L$

$\therefore |Z| \Rightarrow \sqrt{R^2 + \left[\frac{1}{\omega^2 C^2} + \omega^2 L^2\right]}$

$\therefore I(t) = \frac{V(t)}{10 + \frac{1}{j\omega C} + j\omega L}$

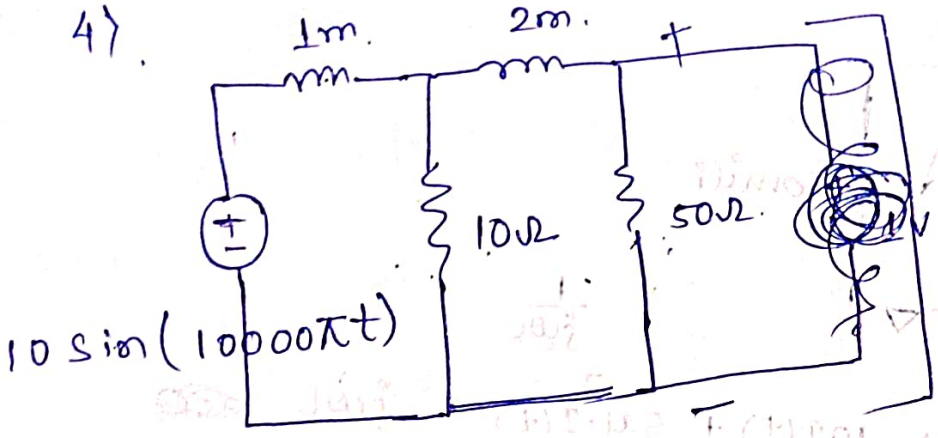
$\tan^{-1}\left[\frac{X}{R}\right]$

$-89°$

$= \frac{50 \sin (90 + 200t) \angle 0°}{\sqrt{10^2 + \left[\frac{1}{\omega^2 C^2} + \omega^2 L^2\right]}\, \angle \tan^{-1}\left[\frac{100}{10}\right]}$

$\Rightarrow$ 0.0667 ∠ 89

4)



$\omega t = \quad f = \quad 2\pi f$

$2\pi f = \omega$

$\omega = 10000\pi$

$\Rightarrow$ $(((j \cdot 2\times10^{-3} \cdot \omega) + 50) \,//\, 10)$ series $(1\times10^{-3} \cdot \omega \cdot j)$

$\Rightarrow$ $(20j + 50) \,//\, 10$ series $(10j)$.

$$\frac{200j+500}{20j+60} + 10j$$

$$\Rightarrow \frac{200j+500+200j^2+600j}{20j+60}$$

$$\Rightarrow \frac{800j+300}{20j+60} \times \frac{20j+60}{20j+60}$$

$$\Rightarrow \frac{5\pi(8j+3)}{4j+3} \Rightarrow$$

$$\frac{V}{Z} = I$$

$$\Rightarrow \frac{10\angle 0^\circ}{5\pi(13.51\angle 51.01)}$$

(I)

$5\pi\sqrt{74} = \frac{80j+36}{2j+60}$

$= \frac{40j+15\angle 69.44}{j+3\angle 19.43}$

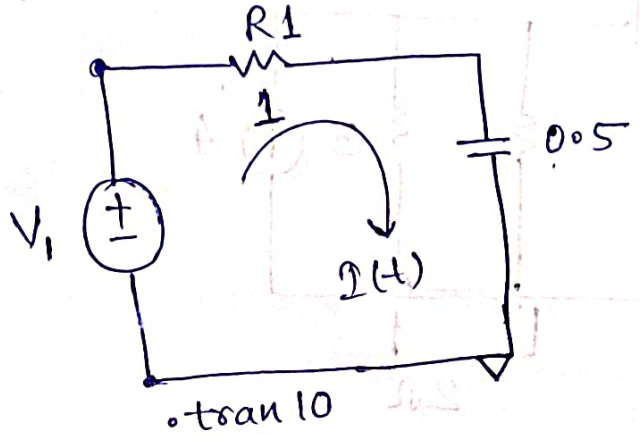
$= \sqrt{(40)^2+(15)^2} = \sqrt{1600+225}$

$= \sqrt{1825} = 42.72$

$= \sqrt{10} \angle \frac{42.72}{3.16} = 13.51$

$Z = 13.51\angle 51.01$

2). Calc $V_o(t)$ for $t>0$.



$$V(t) = 1\sin(\omega t) \Rightarrow I(t)\cdot R + I(t)\cdot \frac{1}{j\omega \cdot 1/2}$$

$$V(t) \Rightarrow I(t)\left[1 + \frac{2}{j\omega 1}\right] \quad \text{or} \quad \left[1 - 2j\right]$$

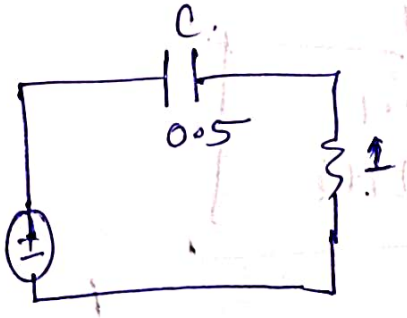
$$V(t) \Rightarrow I(t)\left[1 + \frac{2}{j}\right]$$

$$I(t) \Rightarrow \frac{V(t)}{Z_{in}} \Rightarrow \frac{\frac{1}{\sin(t)}\angle 0^\circ}{\sqrt{1^2 + \left(\frac{2}{j}\right)^2}} \Rightarrow \frac{\frac{1}{\sin(t)}\cdot \angle 0^\circ}{\sqrt{5}\cdot \angle -63.43}$$

$$\Rightarrow 0.4472 \angle 63.43$$

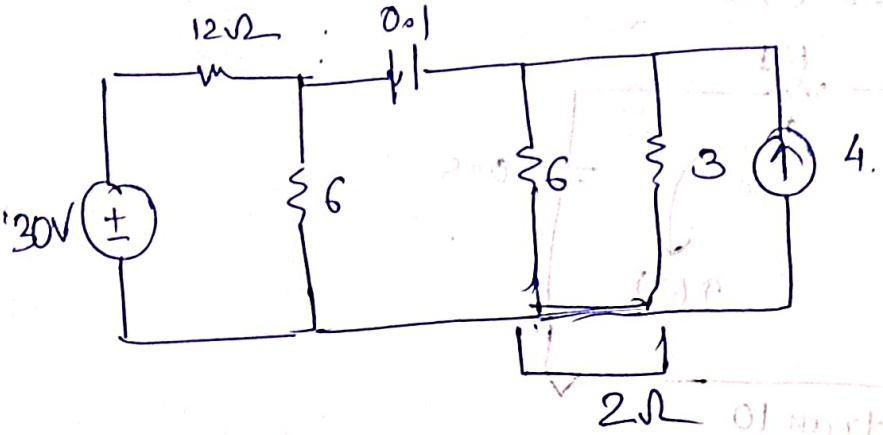
$$\Rightarrow \frac{\sin(t)\angle 0^\circ}{\sqrt{1^2 + 4^2}}$$

1)

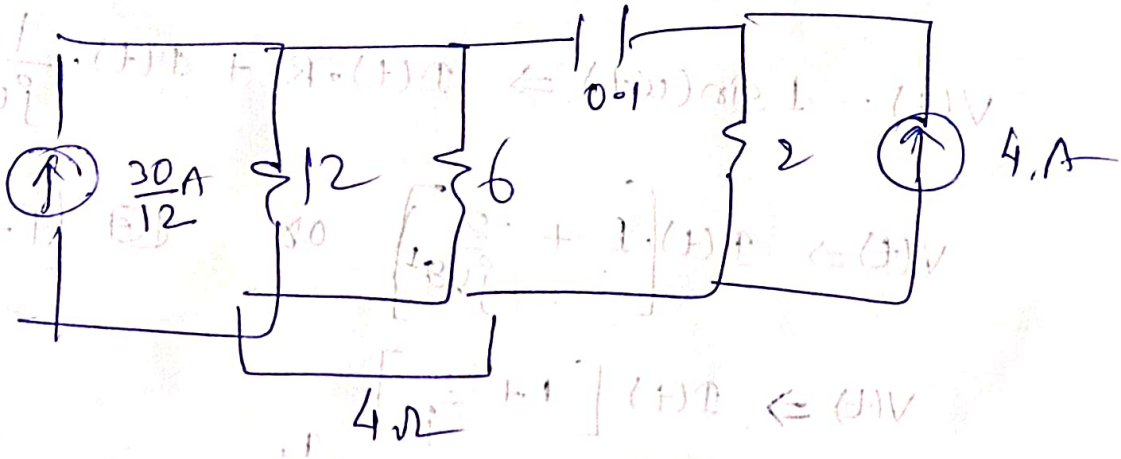


$\Rightarrow$ Same ans as (2).

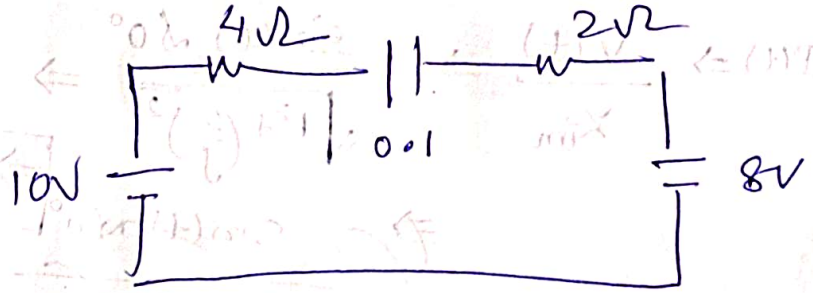
3)



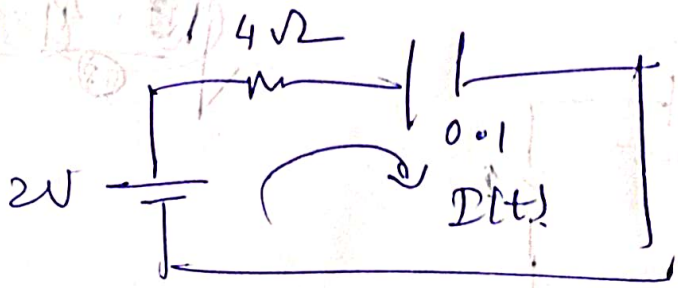
⇒



⇒



⇒



⇒

$$2 \Rightarrow I(t) \cdot 4 + \frac{1}{0.1\omega j} \cdot I(t)$$

$$2 = I(t)\left[4 + \frac{10}{j\omega}\right] 4\Omega$$

⇒

$$2 = I(t)\left[4 - 2.5\pi j\right]$$

$$\theta = \tan^{-1}\left[\frac{b}{a}\right]$$

$$\theta \Rightarrow \tan^{-1}\left[\frac{2.5}{4.}\right]$$

$$\Rightarrow \quad I(t) \Rightarrow \frac{2 \angle 0.}{\sqrt{4^2+(2.5)^2} \angle -32.005 \text{ degree}.}$$

$$\Rightarrow \frac{2 \quad \angle 0^\circ}{4.71 \angle -32.005}$$

$$\Rightarrow \boxed{0.42 \angle 32.005}$$