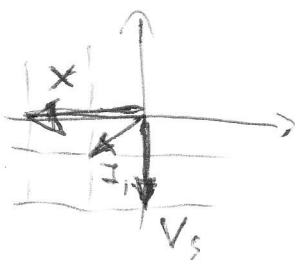




① $12\sqrt{2} \text{ V}$

②

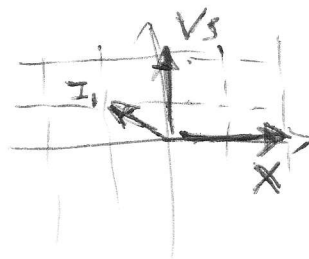


③ $\frac{2\sqrt{2}}{5} \text{ H}$



① $8\sqrt{2} \text{ V}$

②

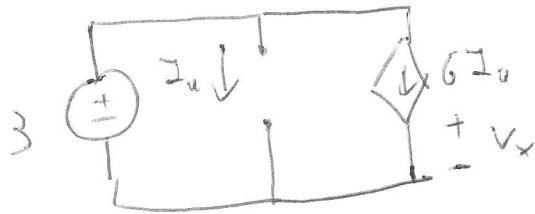


③ $\frac{\sqrt{2}}{5} \text{ H}$

1

SUPERPOSITION

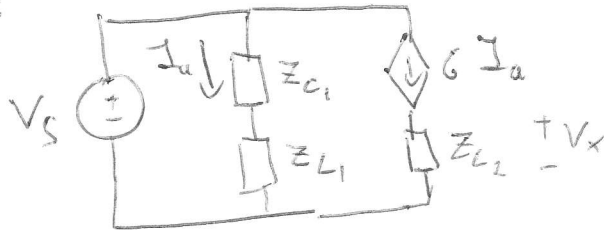
$\omega = 0$:



$$I_a = 0$$

$$V_x = 0 \Rightarrow V_x = 0$$

$\omega = 2$:



$$Z_{C1} = \frac{1}{j \cdot 2 \cdot 1} = -\frac{j}{2}$$

$$Z_{L1} = j \cdot 2 \cdot 1 = 2j$$

$$Z_{L2} = j \cdot 2 \cdot 3 = 6j$$

$$I_a = \frac{V_s}{Z_{C1} + Z_{L1}} = \frac{1}{-j/2 + 2j} = \frac{1}{3/2j} \Rightarrow$$

$$V_x = (6I_a) \cdot Z_{L2} = 6 \cdot \frac{1}{3/2j} \cdot 6j = 24$$

$$V_x(t) = 24 \cos(2t)$$

$$V_x\left(\frac{\pi}{8}\right) = 24 \cos\left(\frac{\pi}{4}\right) = 24 \cdot \frac{\sqrt{2}}{2} = 12\sqrt{2}$$

$$V_x\left(\frac{\pi}{8}\right) = 12\sqrt{2} \text{ V}$$

(2) (a) PHASORS: V_s & I_1 \rightarrow only draw these
 IMPEDANCES: Z_1 \rightarrow do NOT draw this (it is NOT a phasor)

(b) $V_s = -2j = 2 e^{-j\frac{\pi}{2}}$

$$V_s(t) = 2 \cos\left(2t - \frac{\pi}{2}\right)$$

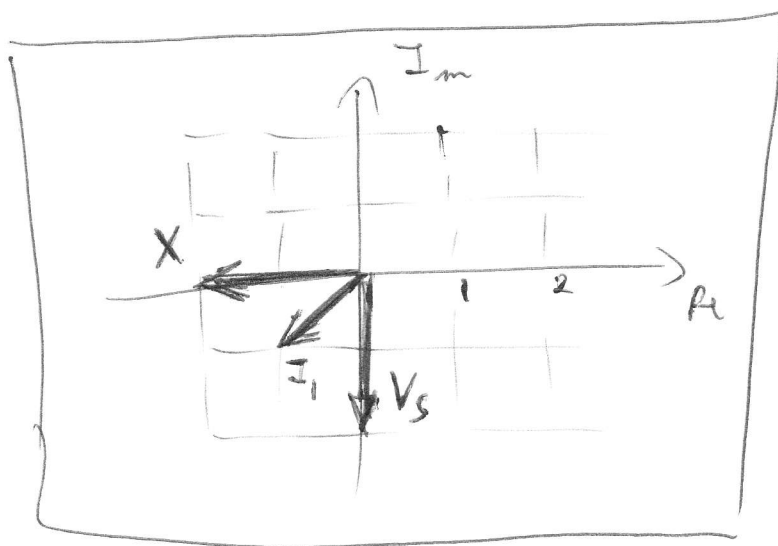
$$V_s(t - t_0) = 2 \cos\left(2(t - t_0) - \frac{\pi}{2}\right) = 2 \cos\left(2t - 2t_0 - \frac{\pi}{2}\right)$$

$$= 2 \cos\left(2t - 2 \cdot \frac{\pi}{4} - \frac{\pi}{2}\right)$$

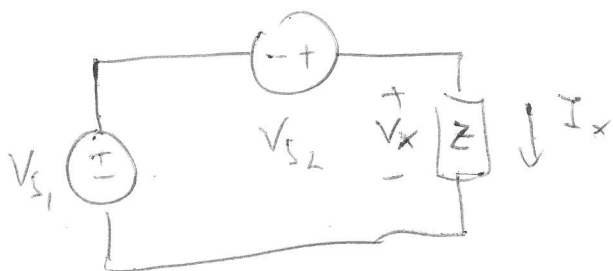
$$= 2 \cos(2t - \pi)$$

$$= x(t)$$

$$X = 2 e^{-j\pi}$$



3



$$V_x = V_{s1} + V_{s2} = 20\sqrt{2} e^{j\frac{3\pi}{4}}$$

FOR ANY OF THE POSSIBLE ELEMENTS:

I_x either is in phase with V_x (same sign)
or leads or lags V_x by $\frac{\pi}{2}$

\Rightarrow only option is I_A

$$I_A = |I_A| e^{j\frac{\pi}{4}}$$

$$Z = \frac{V_x}{I_A} = \frac{20\sqrt{2} e^{j\frac{3\pi}{4}}}{5 e^{j\frac{\pi}{4}}} = 4\sqrt{2} e^{j\frac{\pi}{2}} = \underline{4\sqrt{2}j}, \text{ inductor}$$

$$Z_L = j\omega L = 4\sqrt{2}j \Rightarrow \omega L = 4\sqrt{2}$$

$$L = \frac{4\sqrt{2}}{\omega} = \frac{4\sqrt{2}}{10}$$

$$L = \frac{2\sqrt{2}}{5} \text{ H}$$