Attribution Nidhal Abdulaziz

Lecture 12 additional solutions

Example 17.12

Slide 22

EXAMPLE 17.12 Determine the voltage across the inductor for the network in Fig. 17.22.

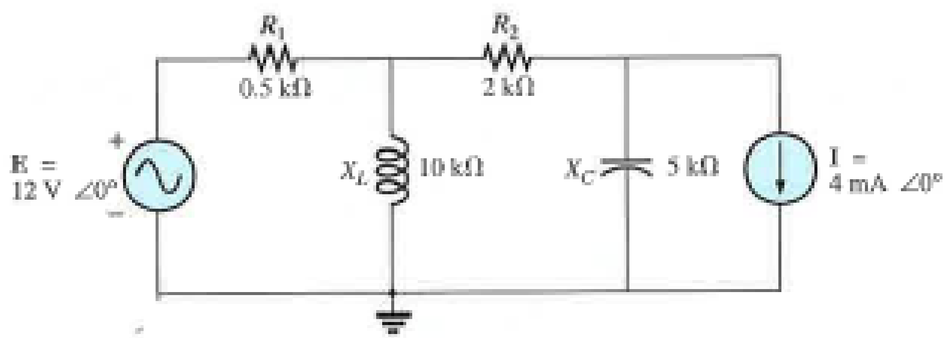
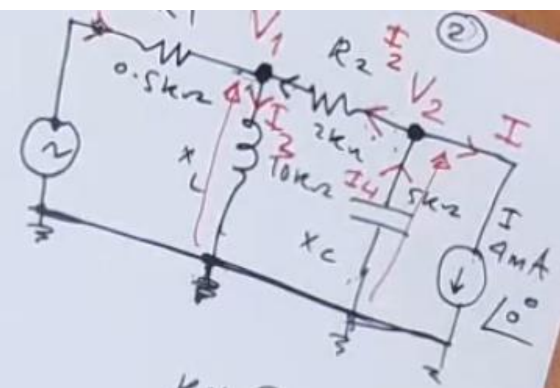


FIG. 17.22
Example 17.12.

E

$12V\angle 0^\circ$



$V_L = ?$ $\quad V_L = V_1$

KCL ①

$I_1 + I_2 = I_3$ —— ①

KCL ②

$I_4 = I + I_2$ —— ②

$$I_1 = \frac{E - V_1}{R_1} = \frac{12V\angle 0^\circ - V_1}{0.5k\Omega\angle 0^\circ} \quad \text{—— ③}$$

$$I_2 = \frac{V_2 - V_1}{R_2} = \frac{V_2 - V_1}{2k\Omega\angle 0^\circ} \quad \text{—— ④}$$

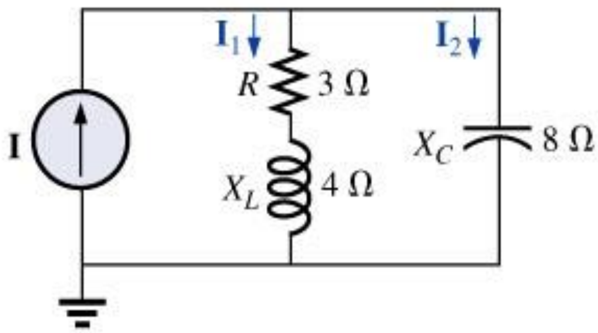
$$I_3 = \frac{V_1 - 0}{jX_L} = \frac{V_1}{j10k} = -j\,0.1\,V_1 \times 10^{-3} \quad \text{—— ⑤}$$
$$= -j\,0.1\,V_1$$

$$I_4 = \frac{0 - V_2}{-j5k} = V_2$$
$$= -j\,0.2\times 10^{-3}\,V_2 \quad \text{—— ⑥}$$

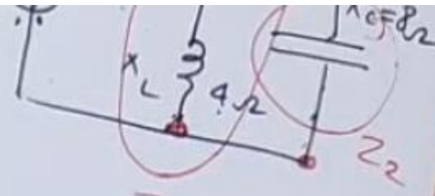
$$I = 4\times 10^{-3}\angle 0^\circ \quad \text{—— ⑦}$$

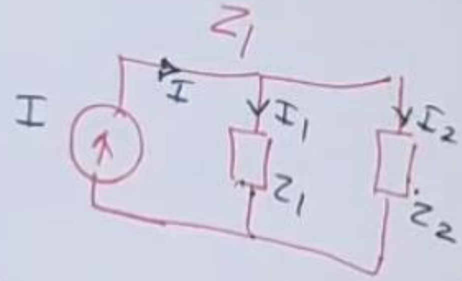
Example 16.2

Slide 10



$$I_1 = \frac{I \times Z_2}{Z_1 + Z_2}$$





$$Z_1 = R + jX_L$$

$$Z_1 = 3 + j4 = 5\Omega\angle 53^\circ$$

$$Z_2 = -j8\Omega = 8\Omega\angle -90^\circ$$

$$I_1 = \frac{50A\angle 30^\circ \times 8\angle -90^\circ}{3+j4-j8} = \frac{400\angle -60^\circ}{3-j4}$$

$$I_1 = \frac{400\angle -60^\circ}{5\angle -53^\circ} = 80A\angle -7^\circ$$

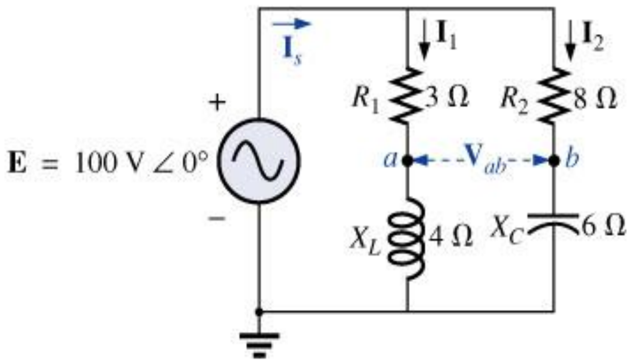
$$I_2 = \frac{I \times Z_1}{Z_1 + Z_2} = \frac{50A\angle +30^\circ \times 5\Omega\angle +53^\circ}{3+j4-j8}$$

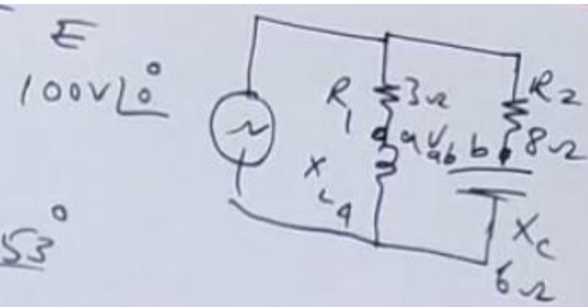
$$I_2 = \frac{250\angle +83}{5\angle -53^\circ} = 49A\angle 136^\circ$$

$$49A\angle 136^\circ$$

Example 16.4

Slide 12



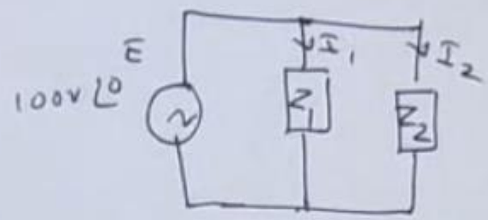


$Z_1 = R + jX_L$

$Z_1 = 3 + j4 = 5\Omega\angle 53^\circ$

$Z_2 = 8\Omega - j6$

$Z_2 = 10\Omega\angle -37^\circ$



$I_1 = \frac{E}{Z_1}$; $I_2 = \frac{E}{Z_2}$

$I_1 = \frac{100V\angle 0^\circ}{5\Omega\angle 53^\circ} = 20A\angle -53^\circ$

$$I_2 = \frac{100V \angle 0^\circ}{10\Omega \angle -37^\circ} = 10A \angle +37^\circ$$

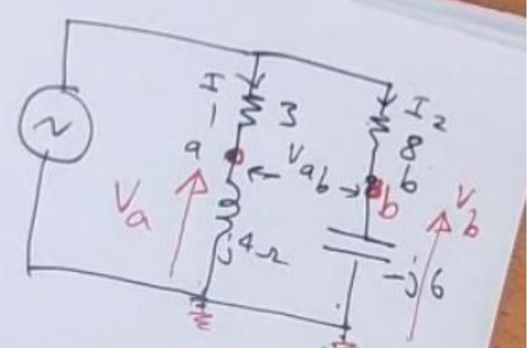
$$I_s = I_1 + I_2 = 20A \angle -53^\circ + 10A \angle +37^\circ$$

$$= 20[\cos(-53^\circ) + j\sin(-53^\circ)] + 10[\cos(37^\circ) + j\sin(37^\circ)]$$

$$i_s = 22.36A \angle -26.56^\circ$$

$$I_1 = 20A \angle -53^\circ$$

$$I_2 = 10A \angle +37^\circ$$



$$V_{ab} = V_a - V_b$$

$$V_a = I_1 \times X_L$$

$$V_a = 20A \angle -53^\circ \times 4\Omega \angle +90^\circ = 80V \angle 37^\circ$$

$$V_b = I_2 \times X_C = 10A \angle 37^\circ \times 6 \angle -90^\circ = 60V \angle -53^\circ$$

$$V_{ab} = 80V \angle 37^\circ - 60V \angle -53^\circ$$

$$V_{ab} = 80\left[\cos 36.87^\circ + j\sin 36.87^\circ\right]$$

$$- 60V\left[\cos(-53.4^\circ) + j\sin(-53.4^\circ)\right]$$

$$V_{ab} = 28 + j96 = 100V \angle 73.74^\circ$$