

# 正弦稳态电路相量分析法 例题

例 3 已知  $u_s = 4\cos(100t - 45^\circ)\text{V}$ ,  $i_s = 2.236\sqrt{2}\cos(100t + 153.43^\circ)\text{A}$ ,  $C = 0.01\text{F}$ ,  
 $L_1 = L_2 = 0.01\text{H}$ ,  $R_1 = R_2 = 1\Omega$ , 求电流  $i_2(t)$ 。

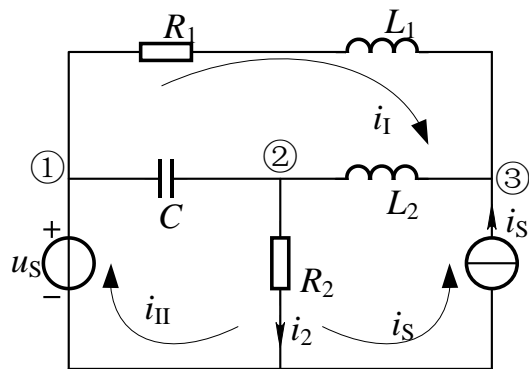
解：回路电流法

$$\dot{U}_s = 2\sqrt{2}\angle 45^\circ\text{V} = (2 - j2)\text{V}$$

$$\dot{I}_s = 2.236\angle 153.43^\circ\text{A} = (-2 + j)\text{A}$$

$$(R_1 + j\omega L_1 + j\omega L_2 + \frac{1}{j\omega C})\dot{I}_I - \frac{1}{j\omega C}\dot{I}_{II} + j\omega L_2\dot{I}_s = 0$$

$$-\frac{1}{j\omega C}\dot{I}_I + (R_2 + \frac{1}{j\omega C})\dot{I}_{II} + R_2\dot{I}_s = \dot{U}_s$$



$$\begin{cases} \dot{I}_I = -j\text{A} = 1\angle 90^\circ\text{A} \\ \dot{I}_{II} = 3\text{A} \end{cases}$$

$$\Rightarrow \dot{I}_2 = \dot{I}_{II} + \dot{I}_s = \sqrt{2}\angle 45^\circ\text{A}$$

$$i_2(t) = 2\cos(100t + 45^\circ)\text{A}$$

# 正弦稳态电路相量分析法

例 3 已知  $u_s = 4\cos(100t - 45^\circ)\text{V}$ ,  $i_s = 2.236\sqrt{2}\cos(100t + 153.43^\circ)\text{A}$ ,  $C = 0.01\text{F}$ ,  
 $L_1 = L_2 = 0.01\text{H}$ ,  $R_1 = R_2 = 1\Omega$ , 求电流  $i_2(t)$ 。

## 节点电压法

$$\dot{U}_{n1} = \dot{U}_s$$

$$-j\omega C \dot{U}_{n1} + (j\omega C + \frac{1}{R_2} + \frac{1}{j\omega L_2}) \dot{U}_{n2} - \frac{1}{j\omega L_2} \dot{U}_{n3} = 0$$

$$-\frac{1}{R_1 + j\omega L_1} \dot{U}_{n1} - \frac{1}{j\omega L_2} \dot{U}_{n2} + (\frac{1}{R_1 + j\omega L_1} + \frac{1}{j\omega L_2}) \dot{U}_{n3} = \dot{I}_s$$

$$\begin{cases} \dot{U}_{n2} = \sqrt{2} \angle 45^\circ \text{V} \\ \dot{U}_{n3} = \sqrt{2} \angle -45^\circ \text{V} \end{cases} \Rightarrow \dot{I}_2 = \dot{U}_{n2} / R_2 = \sqrt{2} \angle 45^\circ \text{A}$$

$$i_2(t) = 2\cos(100t + 45^\circ)\text{A}$$

