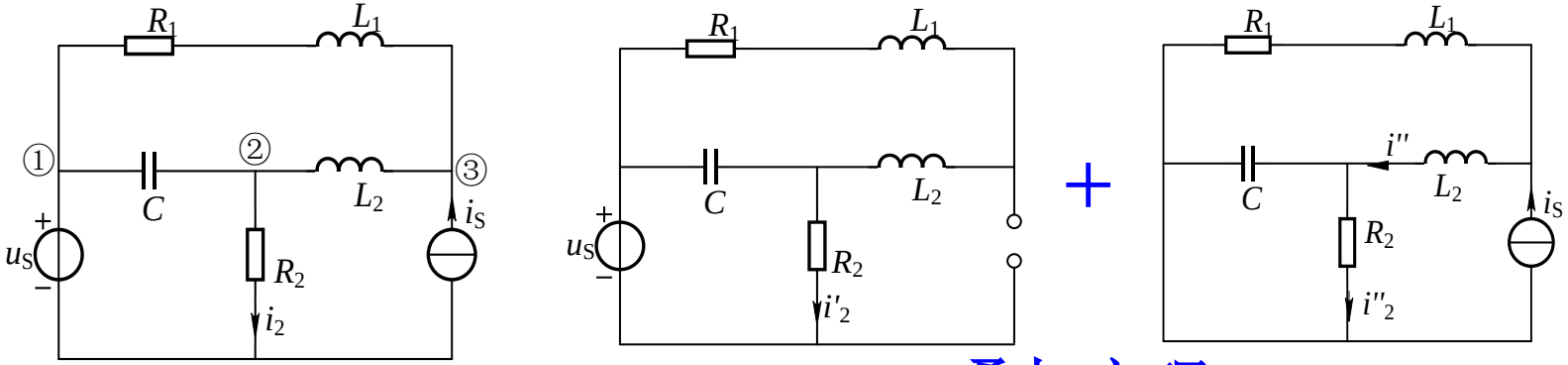
正弦稳态电路相量分析法



叠加定理

$$\dot{I}_2' = \frac{\dot{U}_S}{(R_1 + j\omega L_1 + j\omega L_2)\cdot\dfrac{1}{j\omega C}} = \frac{(2-j2)\text{V}}{\dfrac{3}{1+j}\Omega} = \frac{4}{3}\text{A}$$

$$R_2 + \frac{1}{R_1 + j\omega L_1 + j\omega L_2 + \dfrac{1}{j\omega C}}$$

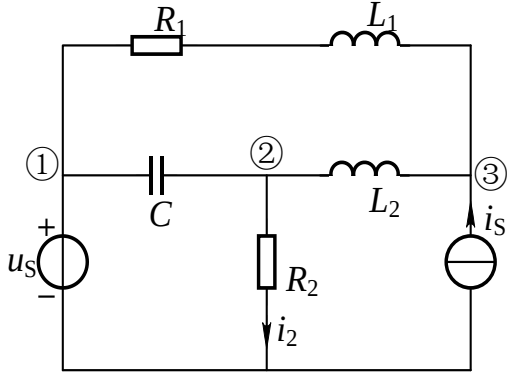
$$Z = j\omega L_2 + \frac{R_2 \cdot \dfrac{1}{j\omega C}}{R_2 + \dfrac{1}{j\omega C}} = \frac{1}{1-j}\Omega$$

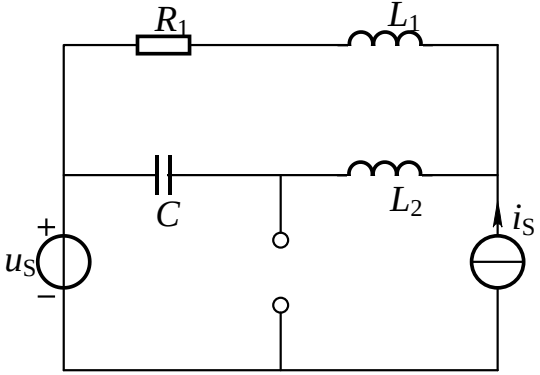
$$\dot{I}'' = \frac{R_1 + j\omega L_1}{Z + R_1 + j\omega L_1}\dot{I}_S = \frac{2}{3}(-2+j)\text{A}$$

$$\dot{I}_2'' = \frac{\dfrac{1}{j\omega C}}{R_2 + \dfrac{1}{j\omega C}}\dot{I}'' = (-\frac{1}{3}+j)\text{A}$$

$$\dot{I}_2 = \dot{I}_2' + \dot{I}_2'' = (1+j)\text{A} = \sqrt{2}\angle 45°\text{A}$$

例 3 已知 $u_S = 4\cos(100t - 45°)\text{V}$, $i_S = 2.236\sqrt{2}\cos(100t + 153.43°)\text{A}$, $C = 0.01\text{F}$,





$L_1 = L_2 = 0.01\text{H}, R_1 = R_2 = 1\Omega$,

求电流$i_2(t)$。

等效电源定理

$$\dot{U}_{OC} = \frac{1}{j\omega C}\dot{I}_C + \dot{U}_S = \frac{1}{j\omega C}\cdot\frac{R_1 + j\omega L_1}{R_1 + j\omega L_1 + j\omega L_2 + \dfrac{1}{j\omega C}}\dot{I}_S + \dot{U}_S = 3\text{V}$$

$$Z_i = \frac{(R_1 + j\omega L_1 + j\omega L_2)\cdot\dfrac{1}{j\omega C}}{R_1 + j\omega L_1 + j\omega L_2 + \dfrac{1}{j\omega C}} = (0.5 - j1.5)\Omega$$

$$\dot{I}_2 = \frac{\dot{U}_{OC}}{R_2 + Z_i} = \sqrt{2}\angle 45°\text{A}$$

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