16、图 16.20 所示正弦稳态电路中，已知 $u_S(t)=2\cos(2t)$ V，求 $u(t)$?

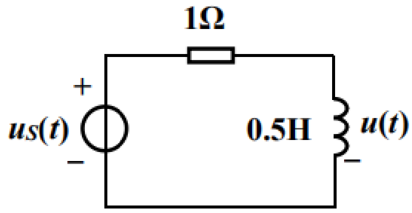
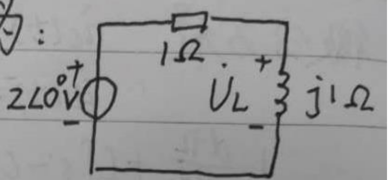


图 16.20

∵ ω = 2 rad/s，相量模型为：



则 $\dot U_L = \frac{j}{1+j} 2\angle 0°$

$= 1+j = \sqrt{2}\angle 45°$ (V)

∴ $u(t) = \sqrt{2}\cos(2t+45°)$ V

17、图 16.21 所示正弦稳态电路中，已知 $u_S(t) = 5\cos(t)$ V，求 $i_C(t)$。

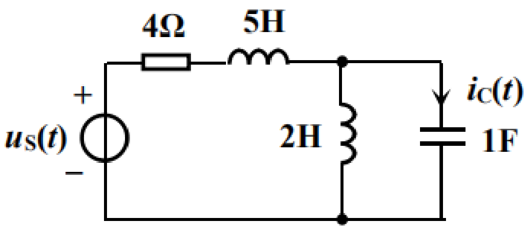
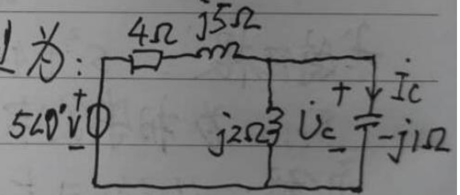


图 16.21

图16.21

∵ ω = 1 rad/s，相量模型为：



∴ $\dot U_C = \dfrac{\dfrac{-2j\cdot j}{2j-j}}{4+5j+\dfrac{-2j\cdot j}{2j-j}}$

$= \dfrac{-2j}{4+3j} = -0.24-0.32j$ (V)

∴ $\dot I_C = \dfrac{\dot U_C}{-j} = 0.32-0.24j \doteq 0.4\angle -36.9°$ (A)

∴ $i_C(t) = 0.4\cos(t-36.9°)$ (A)

19、图 16.23 所示正弦稳态电路中，已知 $i_S(t)=\cos(2t)$ A，$u_S(t)=2\cos(2t)$ V；求电流 $i(t)$。

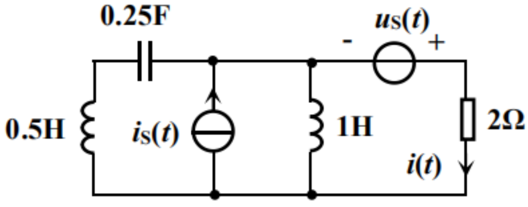
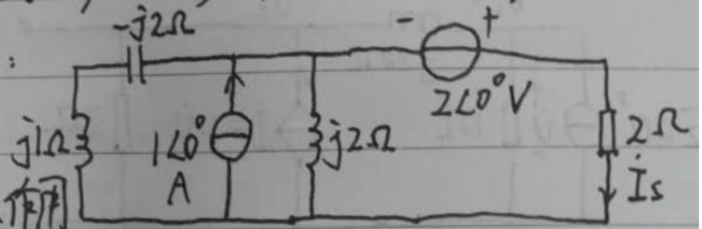


图 16.23

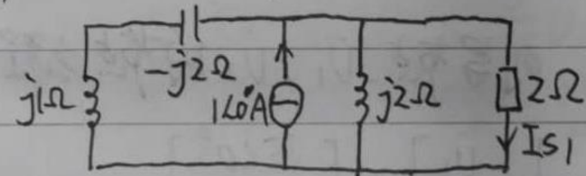
电路含有两个独立源，同频，且 $\omega = 2\,rad/s$

相量模型为：



叠加定理：

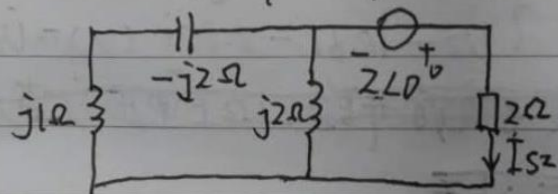
(1) 当电流源单独作用



$$\because \dot{U} = \frac{1\angle 0^\circ}{\frac{1}{j-2j} + \frac{1}{2j} + \frac{1}{2}} = 1 - j\ (V)$$

$$\therefore \dot{I}_{S1} = \frac{\dot{U}}{2} = \frac{1}{2} - \frac{1}{2}j\ (A)$$

(2) 当电压源单独作用时



$$\dot{I}_{S2} = \frac{2\angle 0^\circ}{\frac{-j\cdot 2j}{j} + 2} = \frac{1}{2} + \frac{1}{2}j\ (A)$$

(3) 共同作用时：$\dot{I}_S = \dot{I}_{S1} + \dot{I}_{S2} = 1A$

$i(t) = \cos(2t)$ A

26、图 16.30 所示正弦稳态电路，已知 $i_S(t)=\sqrt{2}\cos 10t$ A，求 ab 端口的戴维宁等效电路。

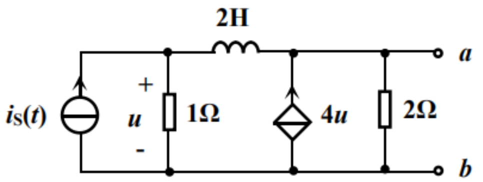
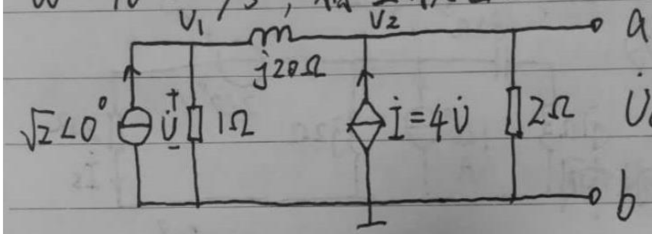


图 16.30

$w=10$ rad/s，相量模型为：



(1) 求 ab 端开路电压 $\dot{U}_0$，列写节点 $\dot{U}_1$，$\dot{U}_2$ 的节点方程

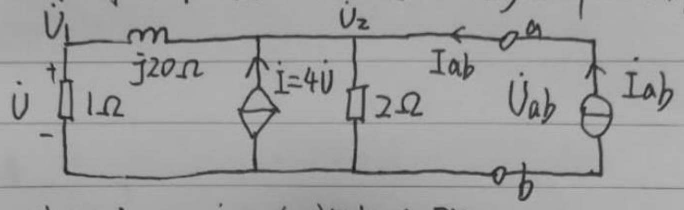
$$\begin{bmatrix} 1-j\frac{1}{20} & +j\frac{1}{20} \\ +j\frac{1}{20} & \frac{1}{2}-j\frac{1}{20} \end{bmatrix}\begin{bmatrix} \dot{U}_1 \\ \dot{U}_2 \end{bmatrix}=\begin{bmatrix} \sqrt{2}\angle 0^\circ \\ 4\dot{U}_1 \end{bmatrix}$$

$$\Downarrow$$

$$\begin{cases} \dot{U}_1=1.30-0.47j\ (V) \\ \dot{U}_2=10.61-2.80j\ (V)=\dot{U}_0 \end{cases}$$

$\dot{U}_0=10.98\angle -14.8^\circ$

(2) 求等效阻抗 Zab，令电流源开路，相量模型为：



列写 $\dot{U}_1$ 和 $\dot{U}_2$ 的节点方程

$$\begin{cases} (1-\frac{j}{20})\dot{U}_1+\frac{j}{20}\dot{U}_2=0 \\ \frac{j}{20}\dot{U}_1+(\frac{1}{2}-\frac{j}{20})\dot{U}_2=4\dot{U}_1+I_{ab} \end{cases}$$

$$\Longrightarrow Z_{ab}=\frac{\dot{U}_{ab}}{I_{ab}}=\frac{\dot{U}_2}{I_{ab}}\approx 1.86-j0.56\ (\Omega)$$

因此 ab 端的戴维宁等效电路为：