

一、选择题

1. C
2. D
3. D
4. C
5. C
6. C
7. B
8. C
9. A
10. A

二. 填空

1. 容性

2. $5\angle 60^\circ$

3. $3+j2$

4. 500 200

5. 10

6. $L \frac{di}{dt}$

7. 70

8. $\frac{1}{100} - \frac{1}{100}$

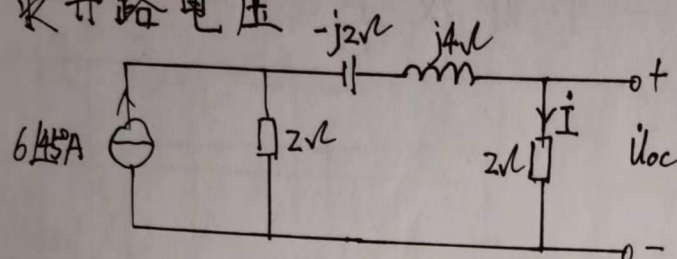
9. 75 5

10. 相电压 线电压

三. 计算题 (每题 12 分)

(1)

求开路电压



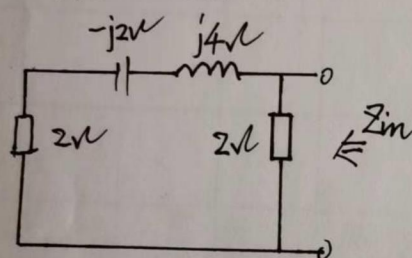
$$U_{oc} = 2i = 5.36 \angle 18.4^\circ \text{ V}$$

$$i_o = \frac{2}{2+2+j2} \times 6 \angle 45^\circ$$

$$= 2.5456 + j0.8485 \text{ A}$$

$$= 2.68 \angle 18.4^\circ \text{ A}$$

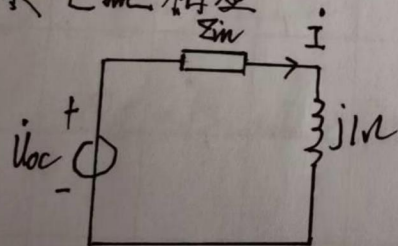
求输入阻抗



$$Z_{in} = 2 \parallel (2+j2)$$

$$= \frac{2 \times (2+j2)}{2+2+j2} = 1.2 + j0.4 \Omega$$

求电流相量



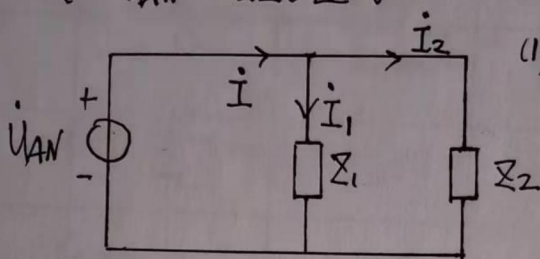
$$i = \frac{U_{oc}}{Z_{in} + j1} = \frac{5.36 \angle 18.4^\circ}{1.2 + j1.4} = 2.49 - j1.49 \text{ A}$$

$$= 2.9 \angle -31.0^\circ \text{ A}$$

(2)

线电压为 380V, 相电压为 220V,

设 $\dot{U}_{AN} = 220 \angle 0^\circ \text{ V}$.



$$\begin{aligned} (1) \quad \dot{I}_1 &= \frac{\dot{U}_{AN}}{Z_1} = \frac{220 \angle 0^\circ}{40 - j30} = 4.4 \angle 36.9^\circ \text{ A} \\ \dot{I}_2 &= \frac{\dot{U}_{AN}}{Z_2} = \frac{220 \angle 0^\circ}{20 + j20} = 7.78 \angle -45^\circ \end{aligned}$$

$$\dot{I} = \dot{I}_1 + \dot{I}_2 = 9.46 \angle 17.6^\circ \text{ A}$$

$$|\dot{I}_1| = 4.4 \text{ A} \quad |\dot{I}_2| = 7.78 \text{ A} \quad |\dot{I}| = 9.46 \text{ A}$$

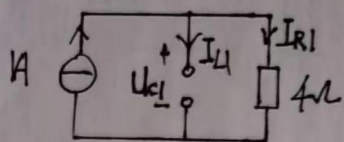
$$(2) \quad Z = \frac{Z_1 \cdot Z_2}{Z_1 + Z_2} = \frac{(40 - j30)(20 + j20)}{40 - j30 + 20 + j20} = 23.25 \angle 17.59^\circ \Omega$$

$$P_{\text{总}} = \sqrt{3} U_L I_L \cos \varphi = \sqrt{3} \times 380 \times 9.46 \times \cos 17.59^\circ = 5935 \text{ W}$$

$$Q_{\text{总}} = \sqrt{3} U_L I_L \sin \varphi = \sqrt{3} \times 380 \times 9.46 \times \sin 17.59^\circ = 1882 \text{ var}$$

(3)

4 解: (1) 当 $I_{S1} = 1A$ 时



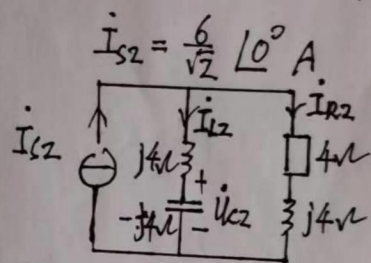
$$U_{C1} = 4V$$

$$I_{R1} = 1A$$

$$I_{L1} = 0A$$

$$U_{C1} = 4V$$

(2) 当 $i_{S2} = 6 \sin \omega t$ 时



$$\dot{I}_{S2} = \frac{6}{\sqrt{2}} \angle 0^\circ A$$

$$\dot{I}_{R2} = 0A \quad \dot{I}_{L2} = \dot{I}_{S2}$$

$$\dot{U}_{C2} = -j4 \times \dot{I}_{S2} = -j \frac{24}{\sqrt{2}} A = \frac{24}{\sqrt{2}} \angle -90^\circ V$$

$$u_{C2}(t) = 24 \sin(\omega t - 90^\circ) V$$

$$i_{L2}(t) = 6 \sin \omega t A$$

$$i_R(t) = I_{R1} + i_{R2}(t) = 1 (A)$$

$$i_L(t) = I_{L1} + i_{L2}(t) = 6 \sin \omega t (A)$$

$$u_C(t) = U_{C1} + u_{C2}(t) = 4 + 24 \sin(\omega t - 90^\circ) V$$

(4)

$$X_C = \frac{1}{\omega C} = \frac{1}{100 \times 0.4 \times 10^{-6}} = 25000 \Omega.$$

$$I_C = \frac{U_C}{X_C} = \frac{80}{25000} = 0.0032 A.$$

$$R = \frac{U}{I_C} = 3125 \Omega.$$

$$X_C = \omega L \Rightarrow L = \frac{X_C}{\omega} = 250 H$$

(5)

u) 由 KCL 对 结点 ①.

$$15 \angle 30^\circ = \dot{I}_1 + \dot{I}_2 \quad (1)$$

$$\dot{I}_1 = \frac{\dot{U}_{n1}}{j2} \quad (2)$$

$$\dot{I}_2 = \frac{\dot{U}_{n1} - \dot{U}_{n2}}{-j2} \quad (3)$$

$$\dot{U}_{n2} = 2\dot{I}_1 = \frac{2\dot{U}_{n1}}{j2} = -j\dot{U}_{n1} \quad (4)$$

节点电压方程为

$$\left\{ \begin{array}{l} \frac{\dot{U}_{n1}}{j2} + \frac{\dot{U}_{n1} - \dot{U}_{n2}}{-j2} = 15 \angle 30^\circ \\ \dot{U}_{n2} = -j\dot{U}_{n1} \end{array} \right. \Rightarrow \left\{ \begin{array}{l} \dot{U}_{n1} = 30 \angle 150^\circ \text{ V} \\ \dot{U}_{n2} = 30 \angle 60^\circ \text{ V} \end{array} \right.$$

$$(2) \quad \dot{I}_1 = \frac{\dot{U}_{n1}}{j2} = 15 \angle 60^\circ \text{ A}.$$

$$\dot{I}_2 = \frac{\dot{U}_{n1} - \dot{U}_{n2}}{-j2} = 21.2 \angle -75^\circ \text{ A}.$$

$$(3) \quad \dot{I}^* = 15 \angle 30^\circ \text{ A}$$

$$\overline{S_{\text{发}}} = \dot{U}_{n1} \cdot \dot{I}^* = 30 \angle 150^\circ \times 15 \angle 30^\circ = -450 \text{ VA}$$