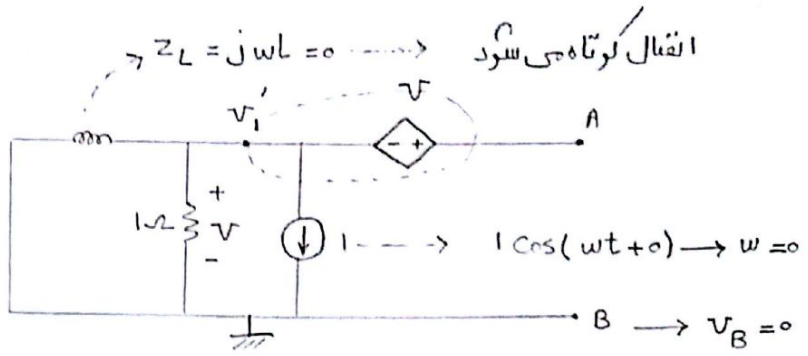
س ۱ →

روش جمع آثار →

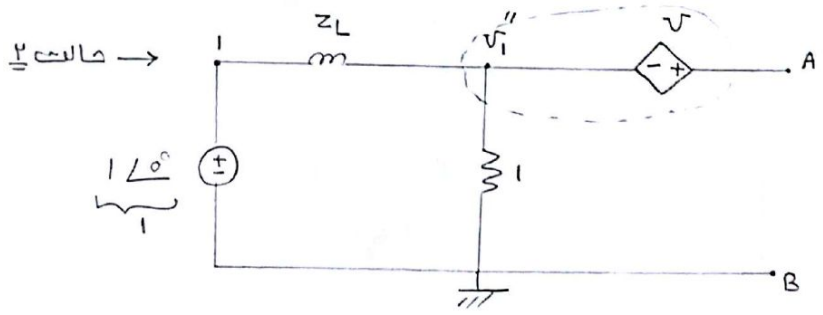
حالت فازور →



$Z_L = 0 \longrightarrow v_1' = 0 \longrightarrow v_1'(t) = 0v \xrightarrow{*} v_A' = 0$

$v_1'(t) = v(t)$, $v(t) = v_A - v(t) \longrightarrow 2v(t) = v_A$ *

حالت ۲ →



گره //

$Z_L = jwL = j$

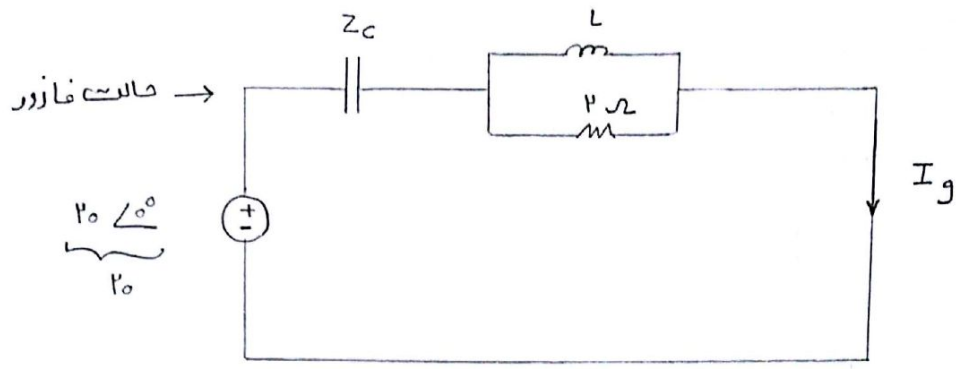
$KCL \longrightarrow \frac{v_1''}{1} + \frac{v_1'' - 1}{j} = 0 \longrightarrow v_1'' j + v_1'' = 1 \longrightarrow v_1'' = \frac{1}{1+j} \xrightarrow{\times(1-j)}$

$v_1'' = \frac{1-j}{2} = 0.5 - 0.5j \xrightarrow{*} v_1'' = 0.71 \angle -45^\circ \longrightarrow v_1''(t) = 0.71\cos(t-45)$

$\xrightarrow{*} v_A'' = 2 \times 0.71\cos(t-45) = 1.42\cos(t-45)$

$v_{AB} = \underbrace{v_A'}_{0} + v_A'' - \underbrace{v_B'}_{0} = 1.42\cos(t-45)$

س ۲ →



حق فرض ← $I_g = \underbrace{V_g}_{۲۰} \longrightarrow |I_g| = ۲۰$

$$Z_C = \frac{۱}{j\omega C} = \frac{۱}{۰/۲۵ \times ۴j} = -j \quad , \quad Z_L = j\omega L = ۴Lj$$

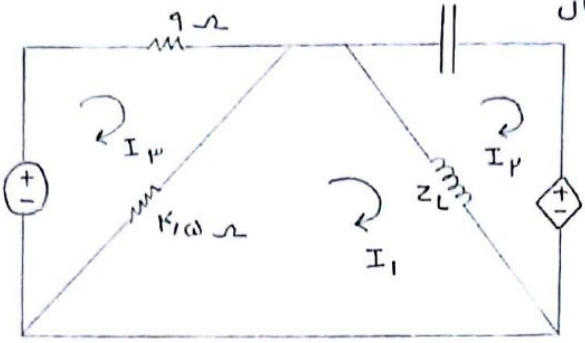
$$Z_{eq} = \frac{V_g}{I_g} = ۱ \longrightarrow ۱ = -j + \frac{۴Lj \times ۲}{۴Lj + ۲} \longrightarrow ۱ = \frac{۸Lj - ۲j + ۴L}{۴Lj + ۲} \longrightarrow$$

$$۴Lj + ۲ = ۸Lj + ۴L - ۲j \longrightarrow L = \frac{۲ + ۲j}{۴ + ۴j} \xrightarrow{\times(۴ - ۴j)} L = \frac{۱۶ - ۸j + ۸j}{۳۲} = ۰/۵\,H$$

س ۳ →

$$Z_C = \frac{1}{j\omega C} = \frac{-10^{6}j}{500 \times 1000} = -2j$$

حالت فازور →



$$Z_L = j\omega L = 4 \times 10^{-3} \times 10^{3} j = 4j$$

س ۳ ○

$$KVL\ I_2 \rightarrow 2I_1 + 4j(I_2 - I_1) - 2jI_2 = 0 \rightarrow 2jI_2 + (2 - 4j)I_1 = 0$$

$$KVL\ I_1 \rightarrow 4j(I_1 - I_2) + 4.5(I_1 - I_3) = 0 \rightarrow (4j + 4.5)I_1 - 4jI_2 - 4.5I_3 = 0$$

$$KVL\ I_3 \rightarrow 9I_3 + 4.5(I_3 - I_1) = 300 \rightarrow 13.5I_3 - 4.5I_1 = 300$$

$$I_2 = 15.385 + 23.077j \quad , \quad I_3 = 25.812 + 21.538j$$

$$I_1 = 10.769 + 9.154j \rightarrow I_1 = 12.40 \angle 29.74^\circ \rightarrow$$

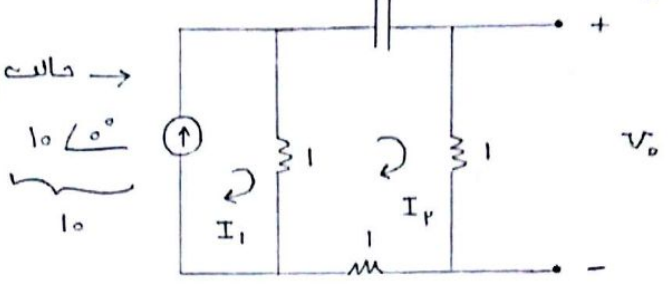
$$I_1(t) = 12.40 \cos(1000t + 29.74)$$

۴ س →

روش جمع آثار →

$$z_C = \frac{1}{j\omega C} = \frac{1}{j \times 1 \times 1} = -j$$

حالت ۱ ← حالت خاموش



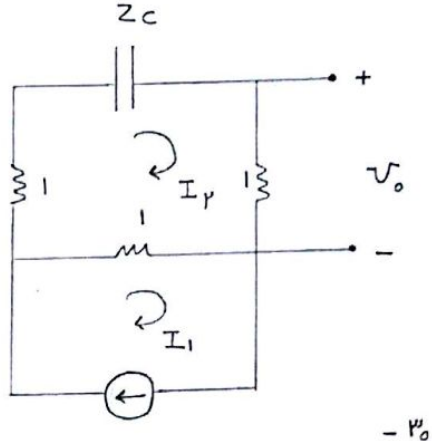
مش → $I_1 = 10$

KVL I_2 → $I_2 + I_2 - jI_2 + I_2 - 10 = 0 \longrightarrow (3-j)I_2 = 10 \rightarrow I_2 = \frac{10}{3-j}$

$$\rightarrow I_2 = \frac{30+10j}{10} = 3+j \longrightarrow I_2 = 3{,}16 \angle 18{,}43^\circ = 3{,}16\, e^{18{,}43j}$$

$$V_0' = I_2 \times 1 = 3{,}16\, e^{18{,}43j} \longrightarrow v_0'(t) = 3{,}16 \cos(+18{,}43)$$

حالت ۲ ←



$$z_C = \frac{1}{j\omega C} = \frac{1}{2j} = -0{,}5j$$

$$2 \angle -30^\circ = 2\, e^{-30j} = 2\left[\cos(-30) + j\sin(-30)\right] = 1{,}73 - j$$

مش → $I_1 = 1{,}73 - j$

KVL I_2 → $-0{,}5jI_2 + 2I_2 + 1(I_2 - 1{,}73 + j) = 0 \longrightarrow (3 - 0{,}5j)I_2 + j = 1{,}73$

$$\rightarrow I_2 = \frac{1173 - j}{3 - 0.5j} \longrightarrow I_2 = \frac{-2.135j + 0.49}{9.25} = 0.491 - 0.231j \rightarrow$$

$$I_2 = 0.494 \angle -20.58 = 0.494 e^{-20.58j}$$

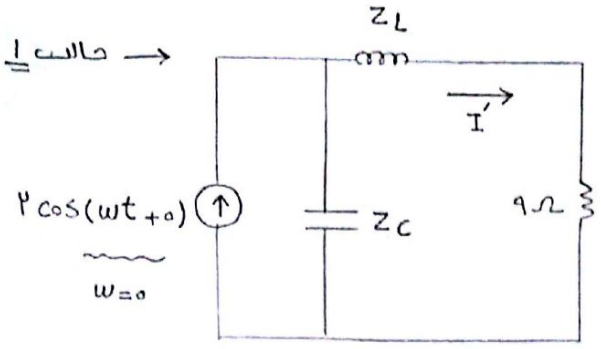
$$V_o'' = I_2 \times 1 = 0.494 e^{-20.58j} \longrightarrow V_o''(t) = 0.494 \cos(2t - 20.58)$$

$$V_o(t) = V_o'(t) + V_o''(t) = 3.14 \cos(t + 18.43) + 0.494 \cos(2t - 20.58)$$

س ۵ ←

روش جمع آثار ←

حالت ۱ ←



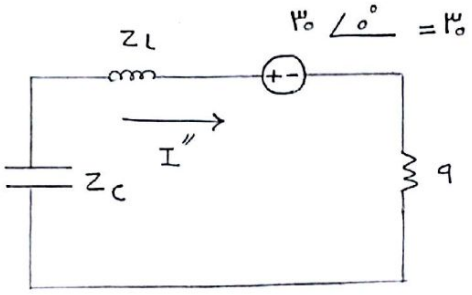
حالت ماندگار ←

$\omega=0$ ⌐ $\rightarrow Z_L = j\omega L = 0$ ← سلف اتصال کوتاه می شود

$\Longrightarrow I' = 2 \rightarrow i'(t) = 2$

⌙ $\rightarrow Z_C = \frac{1}{j\omega C} = \frac{1}{0} = \infty$ ← تعریف نشده ← خازن اتصال باز می شود

حالت ۲ ←



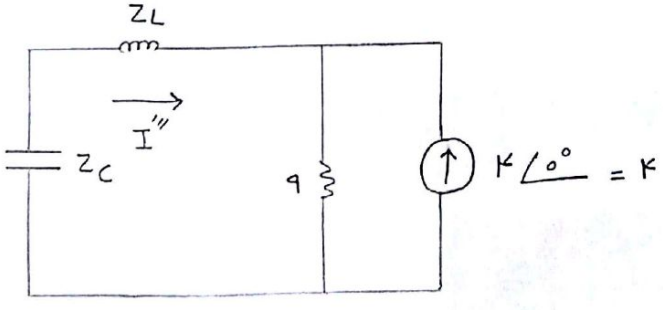
$Z_L = j\omega L = 4j$

$Z_C = \frac{1}{j\omega C} = \frac{1}{\frac{1}{32} \times 2j} = -16j$

$KVL \rightarrow 4j\,I'' + 30 + 9\,I'' - 16j\,I'' = 0 \rightarrow I'' = \frac{-30}{9-12j} \rightarrow I'' = \frac{-270-360j}{225}$

$\rightarrow I'' = -1.2 - 1.6j \rightarrow I'' = 2\angle -53.13^\circ \rightarrow i''(t) = 2\cos(2t - 53.13)$

حالت ۳ ←



$Z_L = j\omega L = 8j$

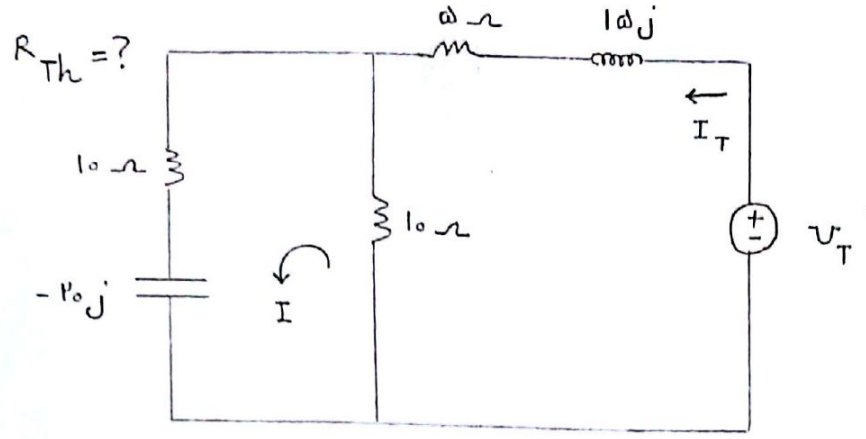
$Z_C = \frac{1}{j\omega C} = \frac{1}{\frac{1}{32} \times 4j} = -8j$

$$KVL \rightarrow \quad \wedge j I''' - \wedge j I'' + 9(I''' + 4) = 0 \longrightarrow I''' = \frac{-36}{9} = -4 \rightarrow I''' = +4 \angle 0^\circ$$

$$\rightarrow i'''(t) = +4 \cos(4t)$$

$$i(t) = i'(t) + i''(t) + i'''(t) = 2 + 2\cos(2t + 53.13^\circ) + 4\cos(4t)$$

س ۴ →



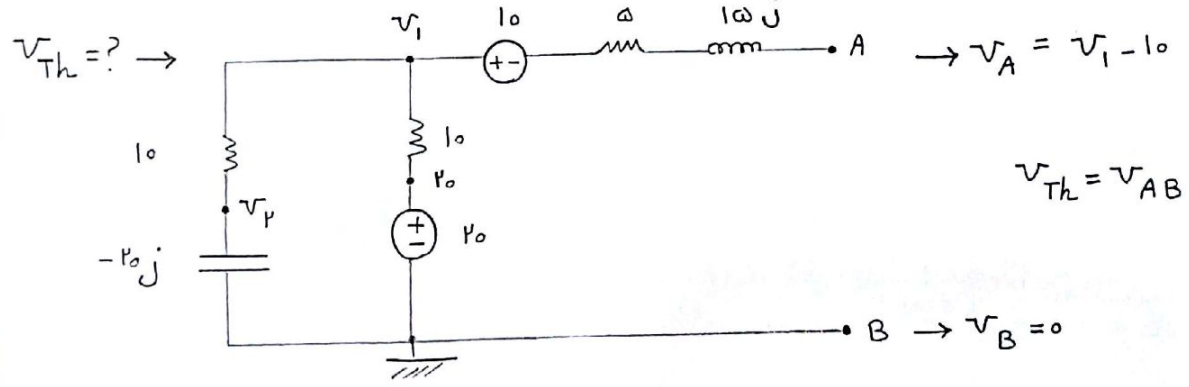
KVL I_T → $15j\, I_T + 5 I_T + 10 I_T - 10 I = V_T$ → $15j\, I_T + 15 I_T - 10I = V_T$ ☆

KVL I → $10 I - 20j\, I + 10 I - 10 I_T = 0$ → $20 I - 10 I_T - 20j\, I = 0$ →

$$I = \frac{10 I_T}{20 - 20j} \longrightarrow I = \frac{200 I_T + 200j\, I_T}{800} = 0.25 I_T + 0.25j\, I_T$$

☆ → $15j\, I_T + 15 I_T - 10 (0.25 I_T + 0.25j\, I_T) = V_T$ →

$(12.5j + 12.5) I_T = V_T$ → $R_{Th} = 12.5 + 12.5j$



KCL V_1 → $\frac{V_1 - 20}{10} + \frac{V_1 - V_2}{10} = 0$ → $\frac{2 V_1}{10} - \frac{V_2}{10} = 2$

~~KCL V~~

$$KCL\ V_2 \longrightarrow \frac{V_2 - V_1}{10} + \frac{V_2}{-20j} = 0 \longrightarrow \frac{-V_1}{10} + \frac{(2+j)V_2}{20} = 0$$

$$\frac{20jV_2}{80}$$

$$V_1 = 10\omega - 5j \qquad V_2 = 10 - 10j$$

$$V_{AB} = V_A - V_B = V_1 - 10 = 10\omega - 10 - 5j = 5 - 5j = V_{Th}$$

(0)