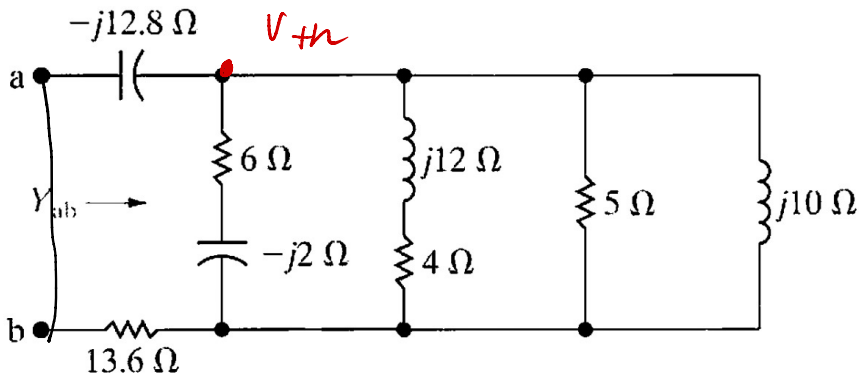




Figure P9.26



$$Y_p = \frac{1}{6 - j2} + \frac{1}{4 + j12} + \frac{1}{5} + \frac{1}{j10}$$

$$= 0.375 - j0.125 \text{ (S)}$$

$$Z_p = \frac{1}{Y_p} = 2.4 + j0.8 \text{ (}\Omega\text{)}$$

$$Z_{ab} = -j12.8 + 13.6 + 2.4 + j0.8$$

$$= 16 - j12 \text{ (}\Omega\text{)}$$

$$Y_{ab} = \frac{1}{Z_{ab}} = 0.04 + j0.03 \text{ (S)}$$

$$Z_C = \frac{1}{j\omega C} = \frac{1}{j4 \times 0.1} = -j2.5 (\Omega)$$

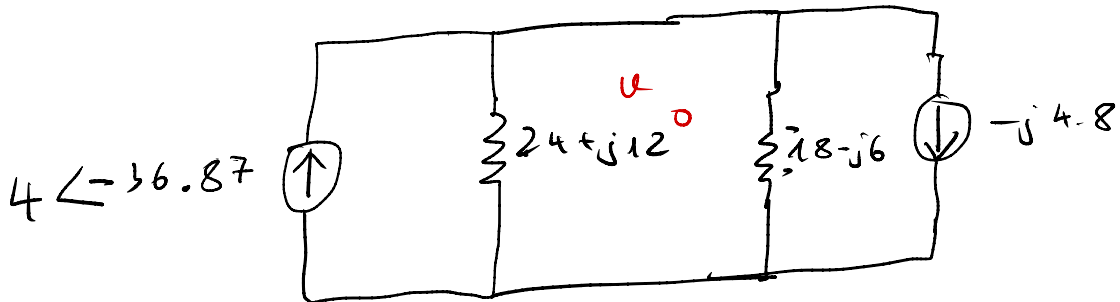
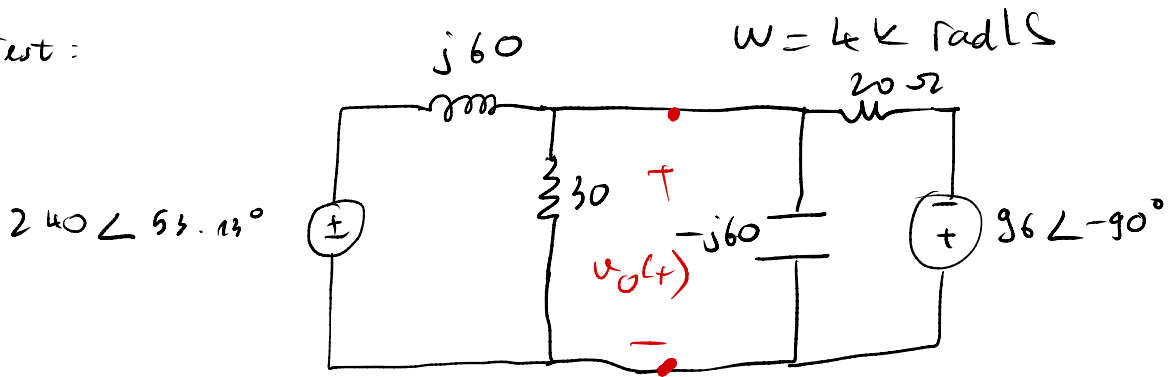
$$V = 10 \times \frac{-j2.5}{5 - j2.5} = 2 - j4 = 4.47 \angle -63.43^\circ$$

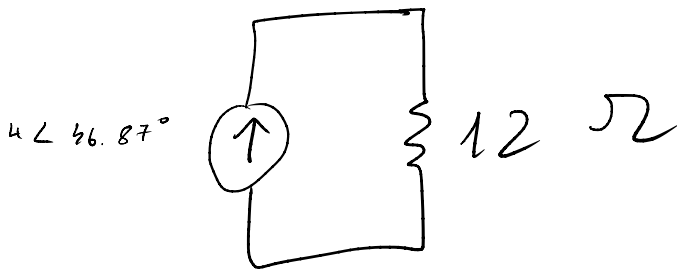
$$v(t) = 4.43 \cos(4t - 63.43^\circ)$$

$$i = \frac{10}{5 - j2.5} = 1.79 \angle 26.57^\circ$$

$$i(t) = 1.79 \cos(4t + 26.57^\circ)$$

Test:

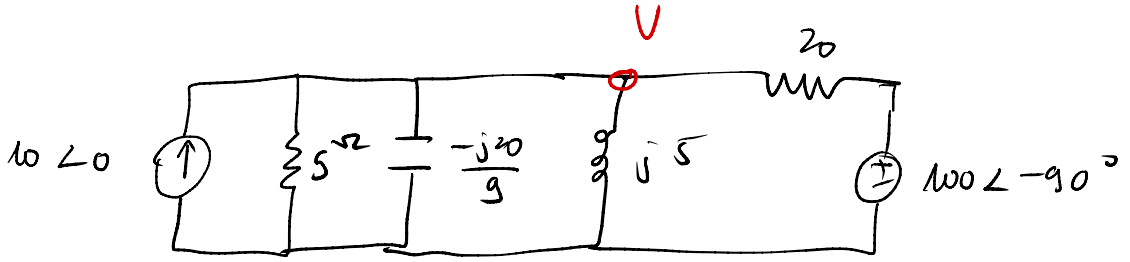




$$\begin{aligned}
 v_o &= 4 \angle 36.87^\circ + 12 \\
 &= 48 \angle 36.87^\circ
 \end{aligned}$$

$$\Rightarrow v_o(t) = 48 \cos(1000t + 36.87^\circ)$$

$$\omega = 50 \text{ k rad/s}$$



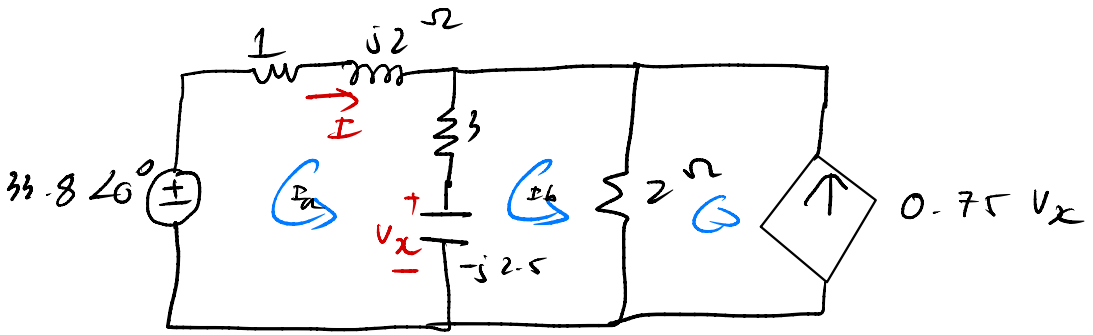
$$\frac{V - 100 \angle -90^\circ}{20} + \frac{V}{j5} + \frac{V}{-\frac{j20}{9}} + \frac{V}{5} = 10$$

$$\Leftrightarrow V \left( \frac{1}{20} + \frac{1}{j5} + \frac{j9}{20} + \frac{1}{5} \right) = 10 - j5$$

$$\Rightarrow V \left( \frac{1}{4} + \frac{j}{4} \right) = 10 - j5$$

$$\Rightarrow V = 10 - j30 = 31.62 \angle -71.57^\circ$$

$$v(t) = 31.62 \cos(50000t - 71.57^\circ)$$



$$V_x = -j2.5(I_a - I_b) = -0.75$$

$$\Rightarrow I_c = +j1.875(I_a - I_b)$$

loop 1:

$$34.8 = I_a(1 + j2) + (I_a - I_b)(3 - j5)$$

loop 2:

$$0 = (3 - j5)(I_b - I_a) + 2(I_b - I_c)$$

$$\Leftrightarrow 0 = (3 - j5)(I_b - I_a) + 2[I_b - j1.875(I_a - I_b)]$$

$$I_a = 29 + j2$$

$$v(t) = 60 \cos(100\pi t) \text{ (V)}$$

$$\omega = 2\pi f \rightarrow f = 50 \text{ Hz}$$

$$C = 1.8 \mu\text{F} \rightarrow Z_C = \frac{1}{100\pi \times 1.8 \times 10^{-6} j}$$

$$= -j 1768.39$$

$$i(t) = \frac{60 \angle 0}{200 + j50\pi - j1768.39}$$

$$= 0.037 \angle 82.92^\circ$$

$$Q_2: \frac{v}{4} + \frac{v - 40}{j4} = 0$$

$$\Leftrightarrow v \left( \frac{1}{4} + \frac{1}{j4} \right) = -j40$$

$$\Rightarrow v = 20\sqrt{2} \angle -45^\circ$$

$$b) z_{in} = z_{ab}$$

$$z_{ab} = (-j2) \parallel (4 + j4)$$

$$= 2.53 \angle -71.56^\circ$$