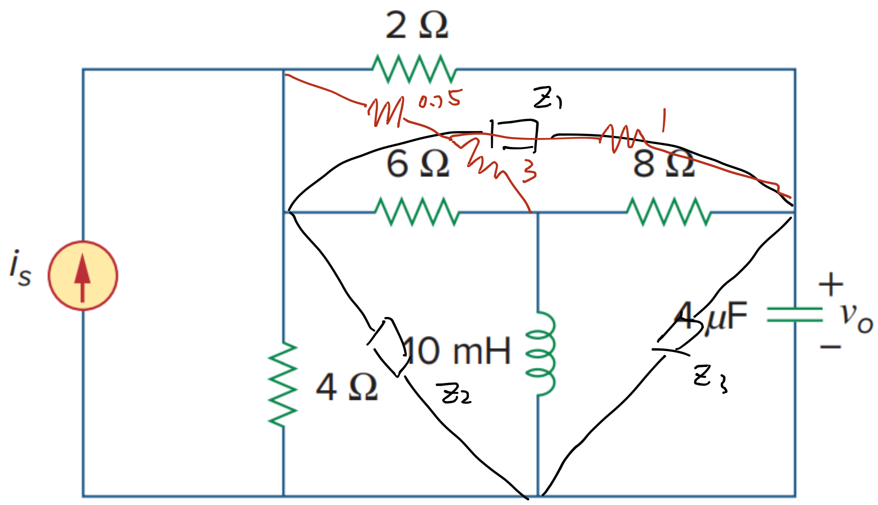


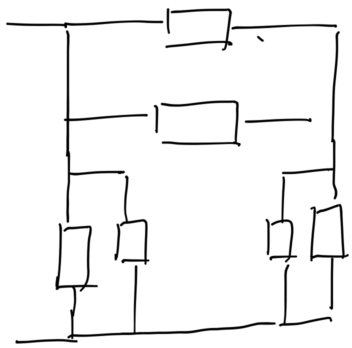
$i_s = 2\cos(1000t)$

$\omega = 1000\ rad \cdot s^{-1}$

$10mH: Z = j\omega L = j10\ \Omega$

$4uF: Z = \frac{1}{j\omega C} = -j250\ \Omega$

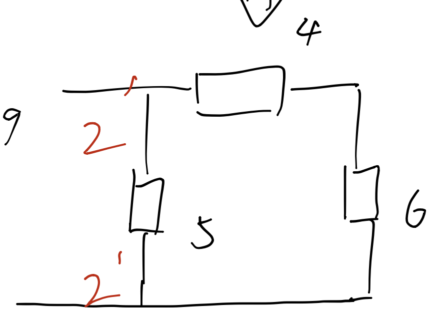
analysis 3'



$$(1)\ Z_1 = \frac{6\times j10 + 8\times j10 + 6\times 8}{j10} = 14 - j\frac{24}{5}\ \Omega$$ 3'

$$Z_2 = \frac{6\times j10 + 8\times j10 + 6\times 8}{8} = 6 + j\frac{35}{2}\ \Omega$$ 3'

$$Z_3 = \frac{6\times j10 + 8\times j10 + 6\times 8}{6} = 8 + j\frac{70}{3}\ \Omega$$ 3'



$$Z_4 = 2\Omega \parallel Z_1 = \frac{2Z_1}{2+Z_1} = 1.771 - j0.069$$ 2'

$$Z_5 = 4\Omega \parallel Z_2 = \frac{4Z_2}{4+Z_2} = 3.606 + j0.690$$ 2'

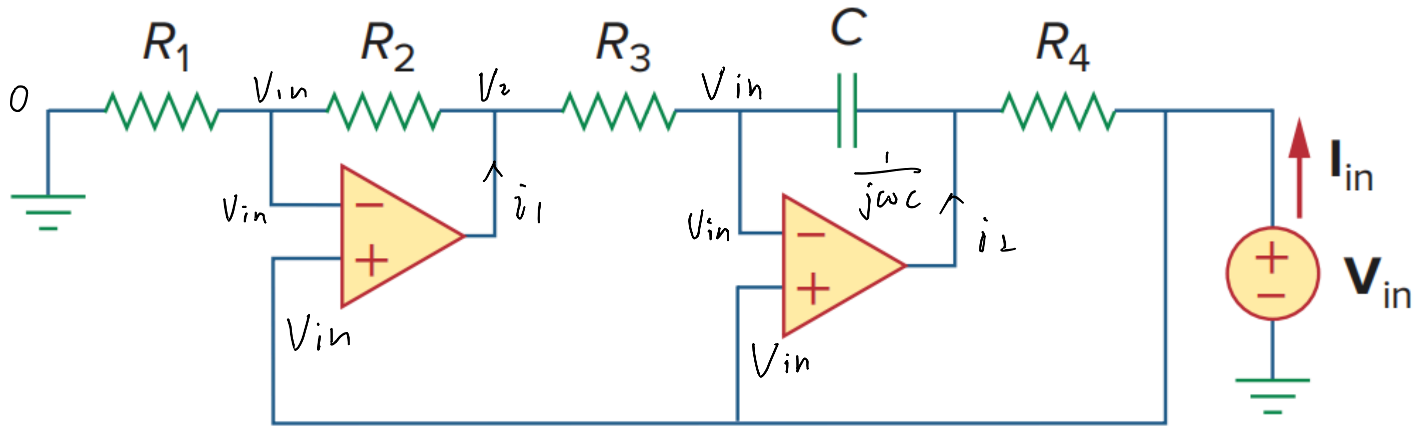
$$Z_6 = -j250\Omega \parallel Z_3 = \frac{-j250\times Z_3}{-j250+Z_3} = 9.720 + j25.392\ \Omega$$ 2'

$$Z = Z_5 \parallel (Z_4+Z_6) = \frac{Z_5(Z_4+Z_6)}{Z_5+Z_4+Z_6} = 3.254 + j0.967\ \Omega$$ 2'

$$= 3.395\angle 16.55\ \Omega$$

$$(2)\ i_2 = i_s\frac{Y_2}{Y_1+Y_2} = i_s\frac{\frac{1}{Z_4+Z_6}}{\frac{1}{Z_5}+\frac{1}{Z_4+Z_6}} = 0.160 - j0.184\ A$$ 2'

$$v_o = Z_6 i_2 = 6.638\angle 20.015\ V$$ 3'



$V_{in} = V\cos\omega t$

$I_{in} + i_2 = \dfrac{(V_{in} - I_{in}R_4) - V_{in}}{\frac{1}{j\omega C} = Z} \Rightarrow (I_{in} + i_2)Z = -I_{in}R_4$ 4'

$i_1 + \dfrac{V_{in} - \cancel{V_2}}{R_3} = \dfrac{V_2 - V_{in}}{R_2} \Leftarrow$ no necessary 4'

$\dfrac{V_2 - V_{in}}{R_2} = \dfrac{V_{in}}{R_1} \Rightarrow V_2 = \left(1 + \dfrac{R_2}{R_1}\right)V_{in}$

$\dfrac{V_{in} - V_2}{R_3} = I_{in} + i_2 \Rightarrow V_{in} - V_2 = (I_{in} + i_2)R_3 \Rightarrow V_2 = V_{in} - (I_{in} + i_2)R_3$ 4'

process 10'

So $\left(1 + \dfrac{R_2}{R_1}\right)V_{in} = V_{in} - (I_{in} + i_2)R_3$

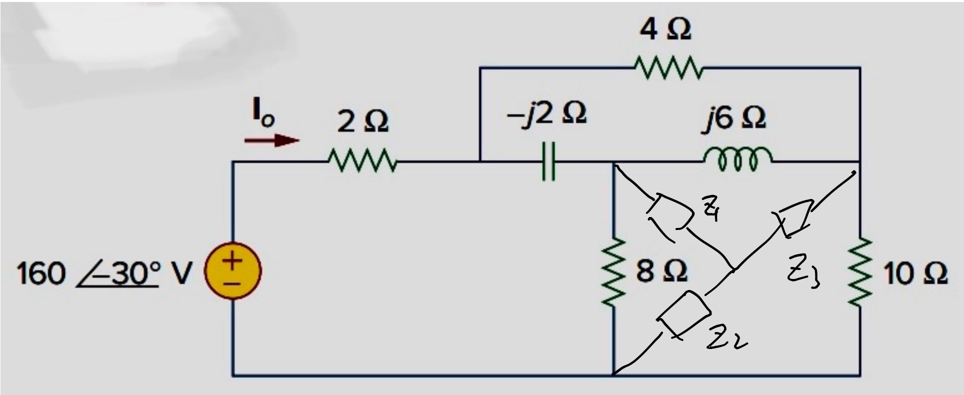
$\dfrac{R_2}{R_1R_3}V_{in} = -I_{in} - i_2 \Rightarrow i_2 = -I_{in} - \dfrac{R_2}{R_1R_3}V_{in}$

So $-\dfrac{R_2Z}{R_1R_3}V_{in} = -I_{in}R_4$

$Z_{in} = \dfrac{V_{in}}{I_{in}} = \dfrac{R_1R_3R_4}{R_2Z} = \dfrac{R_1R_3R_4}{R_2\frac{1}{j\omega C}} = j\omega\dfrac{R_1R_3R_4C}{R_2}$

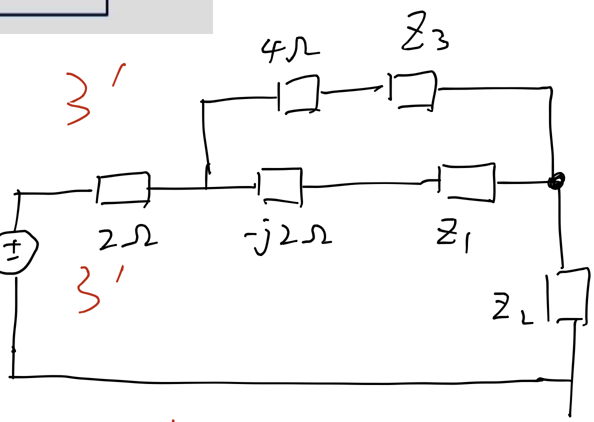
3'

9.53



analysis 7'

$$Z_1 = \frac{8 \times j6}{8 + j6 + 10} = 2.530 \angle 71.565^\circ \quad 3'$$



$$Z_2 = \frac{10 \times 8}{8 + j6 + 10} = 4.216 \angle -18.435^\circ \quad 3'$$

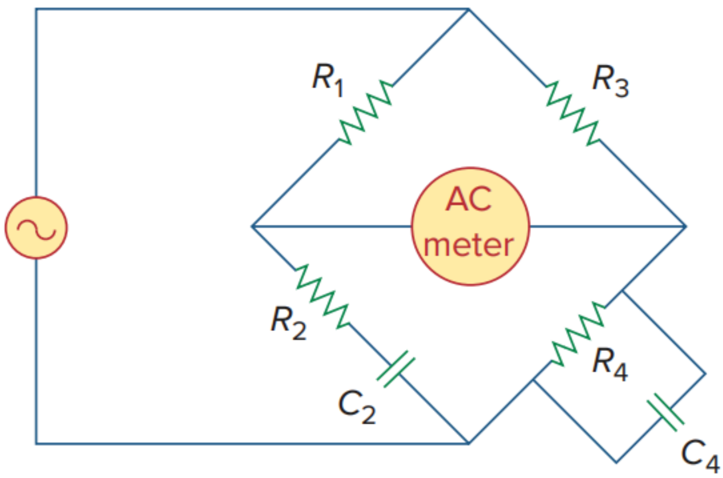
$$Z_3 = \frac{j6 \times 10}{8 + j6 + 10} = 3.162 \angle 71.565^\circ \quad 3'$$

$$Z_4 = 4 + Z_3 \,||\, -j2 + Z_1 = \frac{(4 + Z_3) \times (-j2 + Z_1)}{4 + Z_3 + (-j2 + Z_1)} = 0.776 \angle 27.156^\circ \quad 3'$$

$$Z = 2 + Z_4 + Z_2 = 6.761 \angle -8.326^\circ \quad 3'$$

$$I_0 = \frac{V}{Z} = 23.664 \angle -21.674^\circ \text{A} \quad 3'$$

$$21.99 - j8.74$$



Assume $V = V_0 \cos\omega t$.

balance $\Rightarrow$ $$\frac{R_2 + C_2}{R_4 \parallel C_4} = K$$ 5'

$$R_2 + C_2 = R_2 + \frac{1}{j\omega C_2}$$ 3'

$$R_4 \parallel C_4 = \frac{R_4 \times \frac{1}{j\omega C_4}}{R_4 + \frac{1}{j\omega C_4}} = \frac{R_4}{j\omega R_4 C_4 + 1}$$ 3'

$$\frac{R_2 + \frac{1}{j\omega C_2}}{\frac{R_4}{j\omega R_4 C_4 + 1}} = \frac{\left(R_2 + \frac{1}{j\omega C_2}\right)\left(j\omega R_4 C_4 + 1\right)}{R_4}$$

j part : $$j\omega R_2 R_4 C_4 + \frac{1}{j\omega C_2} = 0$$ 5'

$$\omega^2 R_2 R_4 C_2 C_4 = 1$$ 3'

$$\omega = \frac{1}{\sqrt{R_2 R_4 C_2 C_4}}$$ 3' $$f = \frac{\omega}{2\pi} = \frac{1}{2\pi\sqrt{R_2 R_4 C_2 C_4}}$$ 3'