P9.31

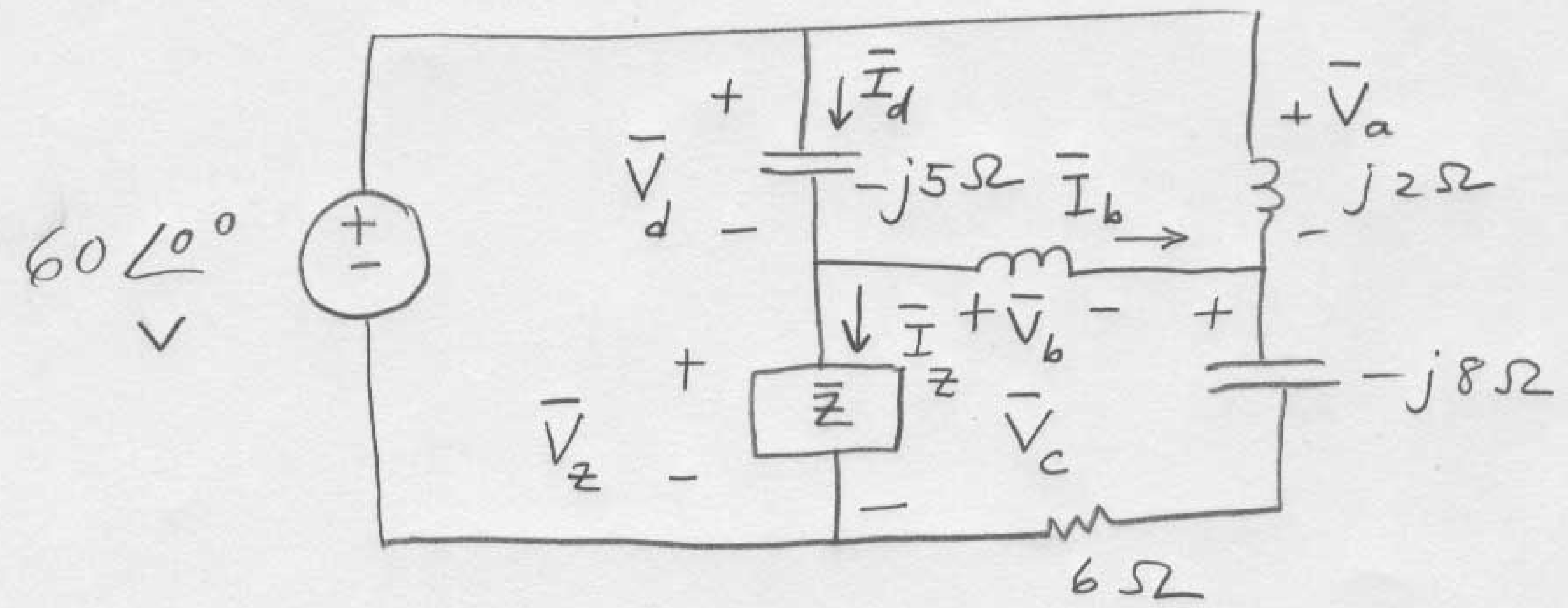
$$\bar{Z}_0 = 600 - j\frac{10^6}{5000(0.25)} = 600 - j800\ \Omega$$

$$\bar{Z}_T = 300 + j2000 + 600 - j800 = 900 + j1200\ \Omega = 1500\angle 53.13^\circ\ \Omega$$

$$\bar{V}_0 = \frac{\bar{Z}_0}{\bar{Z}_T}\bar{V}_g = \frac{1000\angle -53.13^\circ}{1500\angle 53.13^\circ}(75\angle 0^\circ) = 50\angle -106.26^\circ\ \text{V}$$

$$v_0(t) = 50\cos(5000t - 106.26^\circ)\ \text{V}.$$

P9.35



$$\bar{V}_a = j2\bar{I}_a = j2(-j5) = 10\angle 0^\circ\ \text{V}$$

$$\bar{V}_c = 60\angle 0^\circ - \bar{V}_a = 5\angle 0^\circ\ \text{V}$$

$$\bar{I}_c = \frac{\bar{V}_c}{6 - j8} = \frac{50\angle 0^\circ}{10\angle -53.13^\circ} = 5\angle 53.13^\circ = 3 + j4\ \text{A}$$

$$\bar{I}_b = \bar{I}_c - \bar{I}_a = 3 + j4 - (-j5) = 3 + j9 = 9.49\angle 71.57^\circ\ \text{A}.$$

$$\bar{V}_b = j5\bar{I}_b = j5(3 + j9) = -45 + j15\ \text{V}$$

$$\bar{V}_z = \bar{V}_b + \bar{V}_c = -45 + j15 + 50 + j0 = 5 + j15\ \text{V}$$

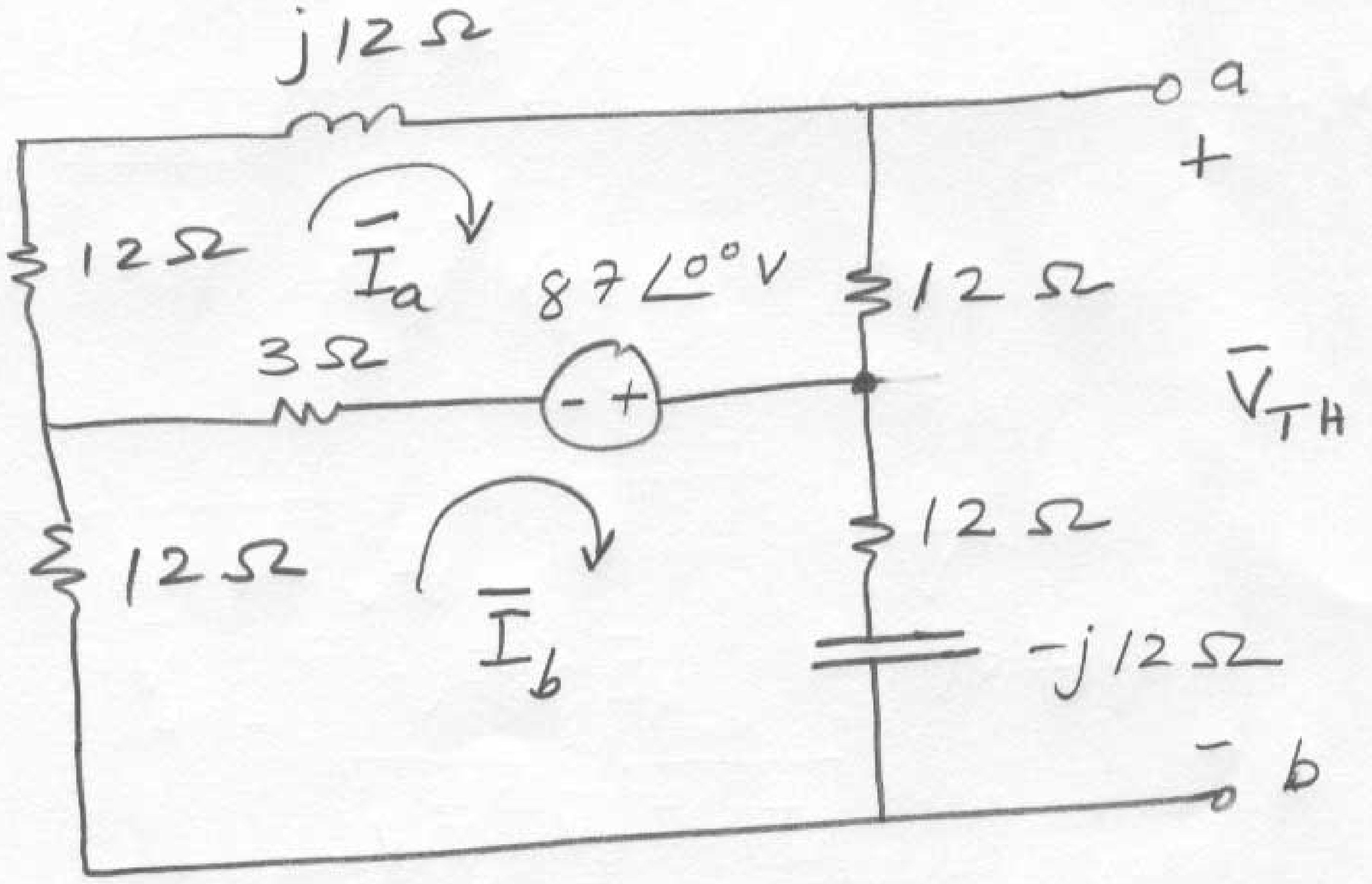
$$\bar{V}_d + \bar{V}_z = 60\angle 0^\circ \quad \therefore\ \bar{V}_d = 60 - 5 - j15 = 55 - j15\ \text{V}$$

$$\bar{I}_d = \frac{V_d}{-j5} = 3 + j11 \quad A$$

$$\bar{I}_z = \bar{I}_d - \bar{I}_b = 3 + j11 - 3 - j9 = j2 \ A$$

$$\bar{Z} = \frac{\bar{V}_z}{\bar{I}_z} = \frac{5 + j15}{j2} = 7.5 - j2.5 \ \Omega$$

P 9.42



$$(27 + j12)\bar{I}_a - 3\bar{I}_b = -87\angle 0^\circ \quad (1)$$

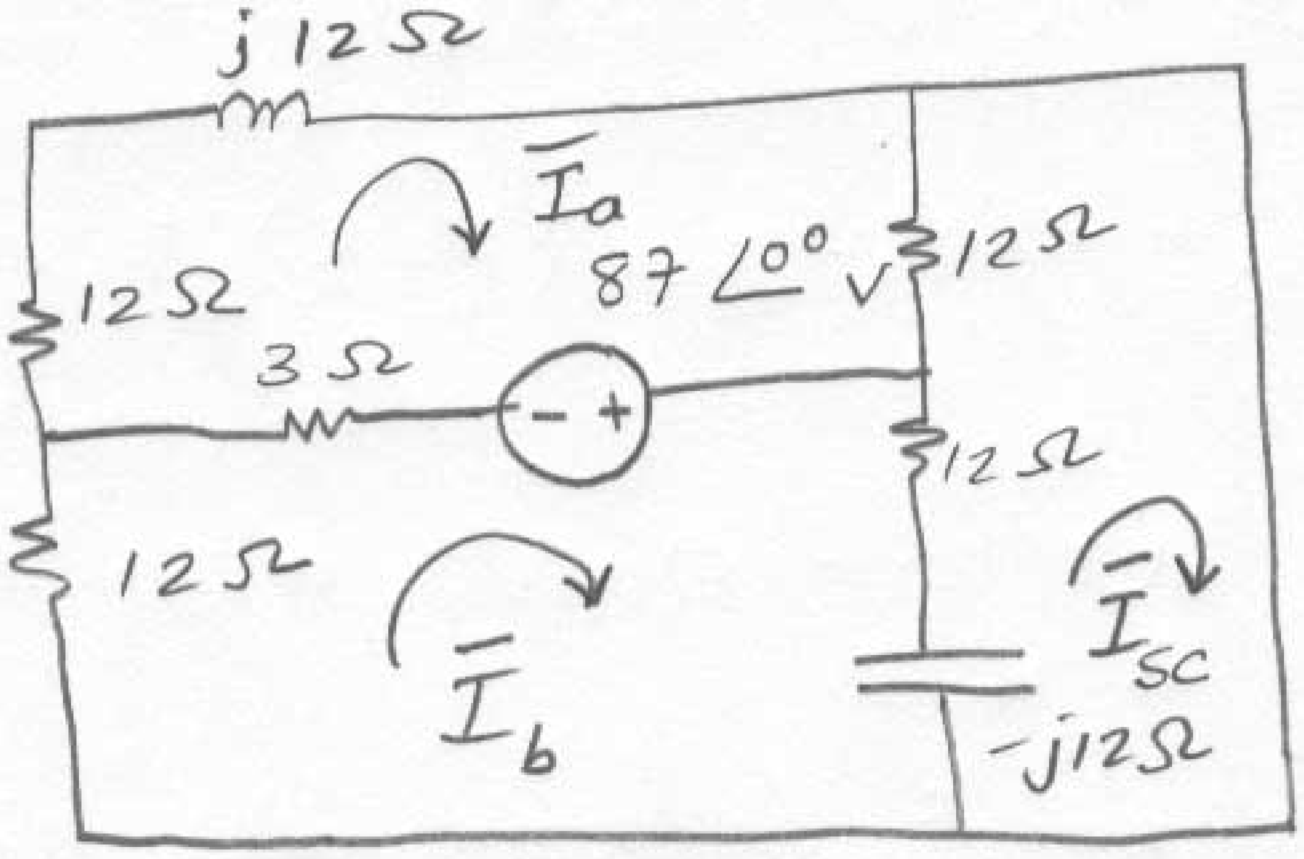
$$-3\bar{I}_a + (27 - j12)\bar{I}_b = 87\angle 0^\circ \quad (2)$$

solving (1) & (2) $\Rightarrow$

$$\bar{I}_a = -2.4167 + j1.21, \quad \bar{I}_b = 2.4167 + j1.21$$

$$\bar{V}_{TH} = 12\bar{I}_a + (12 - j12)\bar{I}_b = 14.5\angle 0^\circ \ V$$

Short circuit test:



$(27+j12)\bar{I}_a - 3\bar{I}_b - 12\bar{I}_{sc} = -87$ ①

$-3\bar{I}_a + (27-j12)\bar{I}_b - (12-j12)\bar{I}_{sc} = 87$ ②

$-12\bar{I}_a - (12-j12)\bar{I}_b + (24-j12)\bar{I}_{sc} = 0$ ③

solving ① , ② , ③ $\Rightarrow$

$\bar{I}_{sc} = 1\angle 0^\circ$

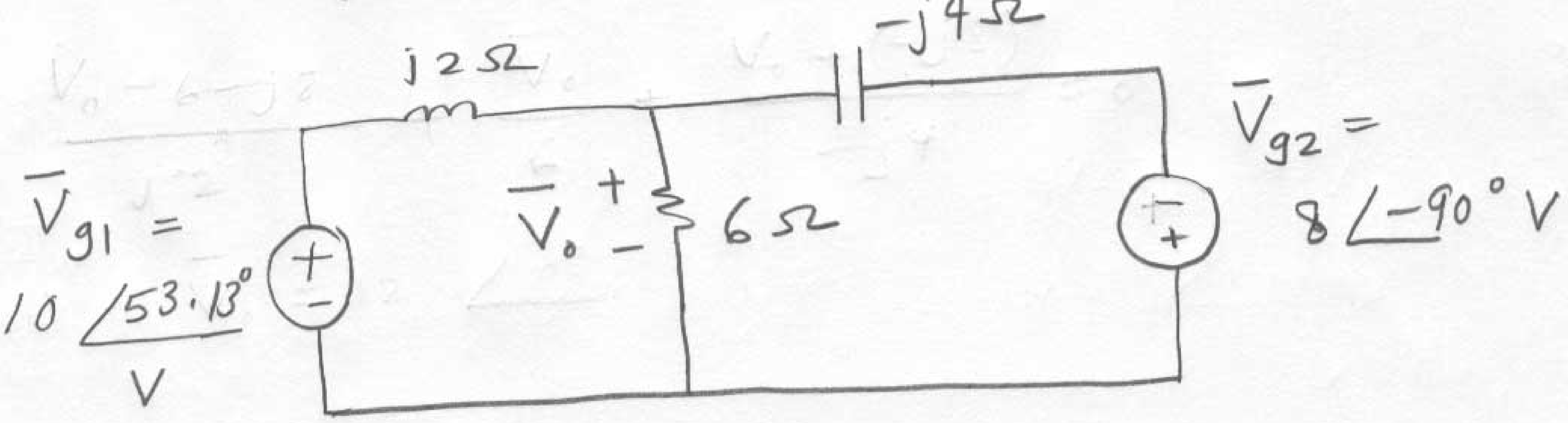
$\therefore \quad \bar{Z}_{TH} = \dfrac{\bar{V}_{TH}}{\bar{I}_{sc}} = \dfrac{14.5\angle 0^\circ}{1\angle 0^\circ} = 14.5\,\Omega.$

P 9.50 $\quad j\omega L = j\,5000(0.4\times10^{-3}) = j2\,\Omega$

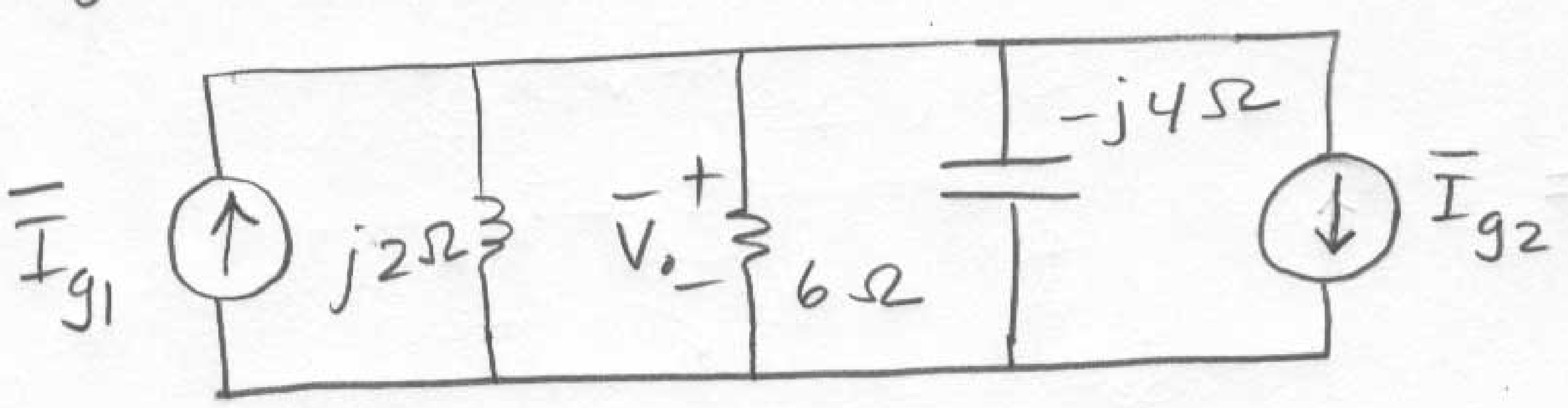
$\dfrac{1}{j\omega C} = -j\,\dfrac{10^6}{5000(50)} = -j4\,\Omega$

$\bar{V}_{g1} = 10\angle 53.13^\circ = 6+j8\,\Omega$

$\bar{V}_{g2} = 8\angle -90^\circ = -j8\,\Omega$



Making two source transformations $\Rightarrow$

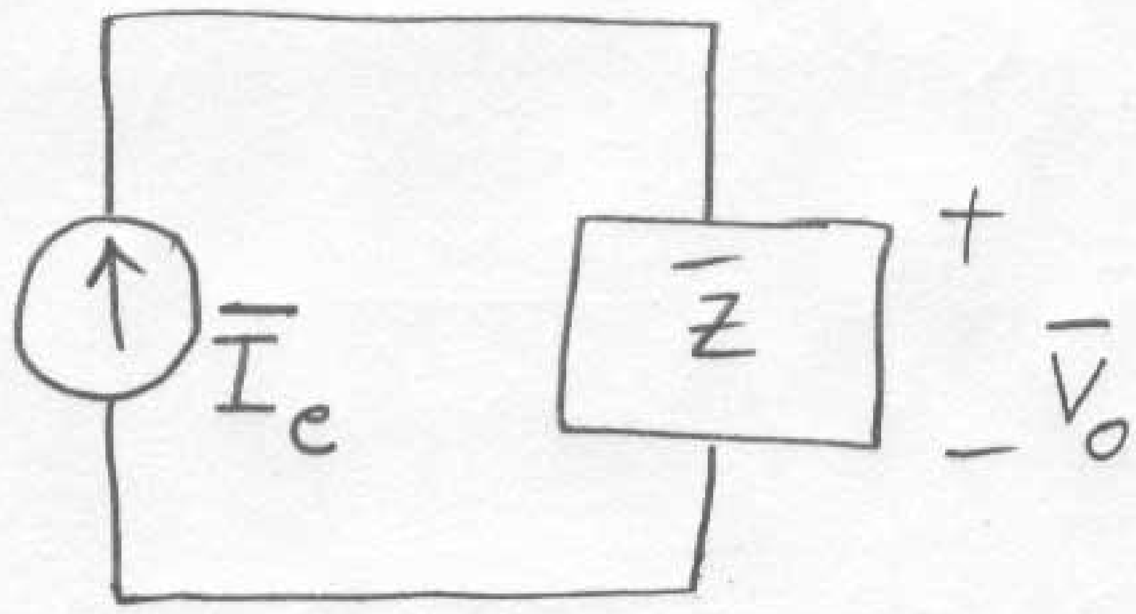


$$\bar{I}_{g1} = \frac{10\angle 53.13^\circ}{j2} = 5\angle -36.87^\circ = 4 - j3 \text{ A}$$

$$\bar{I}_{g2} = \frac{8\angle -90^\circ}{-j4} = 2\angle 0^\circ = 2 \text{ A}$$

$$\bar{Y} = \frac{1}{j2} + \frac{1}{6} + \frac{1}{-j4} \ (S) = \frac{1}{6} - j\frac{1}{4} \quad (S)$$

$$\bar{Z} = \frac{1}{\bar{Y}} = \frac{1}{\frac{1}{6} - j\frac{1}{4}} = 1.85 + j2.77 \ \Omega$$



$$\bar{I}_e = \bar{I}_{g1} - \bar{I}_{g2} = 4 - j3 - 2 = 2 - j3 \quad \text{A}$$

$$\therefore \ \bar{V}_o = \bar{Z}\bar{I}_e = (1.85 + j2.77)(2 - j3) = 12\angle 0^\circ$$

$$v_o(t) = 12\cos 5000t \quad \text{V}$$