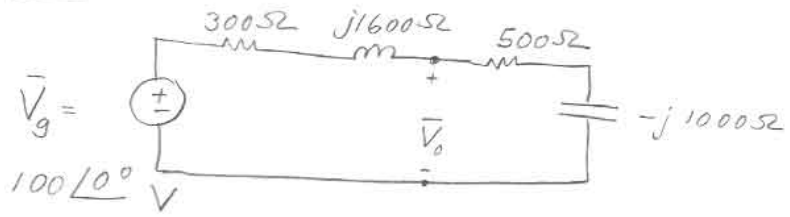
EE201 HW #12

9.36



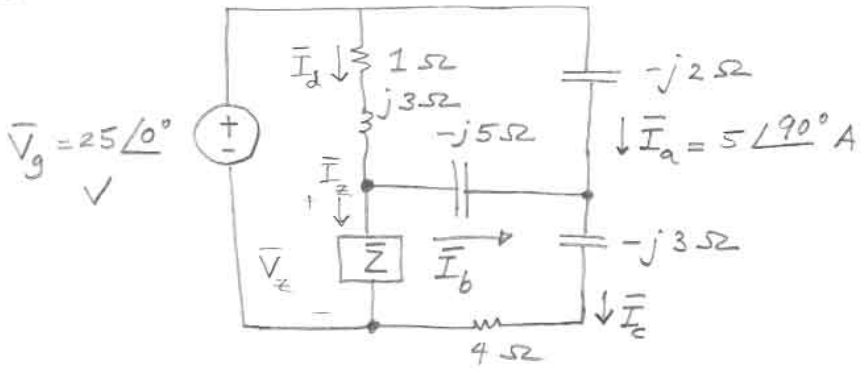
$$\bar{V}_o = \frac{(500 - j1000)}{(500 - j1000) + (300 + j1600)} \times 100\angle 0^\circ$$

$$= \frac{(1118.0\angle -63.435^\circ)(100\angle 0^\circ)}{800 + j600}$$

$$= \frac{1.118 \times 10^5 \angle -63.435^\circ}{10^3 \angle 36.87^\circ} = 111.8\angle -100.31^\circ$$

$$\therefore v_o(t) = 111.8\cos(8000t - 100.31^\circ) \text{ V}$$

9.38



KVL $\Rightarrow$ $-V_g + (-j2)\bar{I}_a + (-j3+4)\bar{I}_c = 0$

$-25 + (-j2)(j5) + (4-j3)\bar{I}_c = 0$

$$\bar{I}_c = \frac{15}{4-j3} = \frac{15}{5\angle -36.87°} = 3\angle 36.87° \text{ A}$$

$= (2.4 + j1.8)$ A

$\therefore \bar{I}_b = \bar{I}_c - \bar{I}_a = (2.4 + j1.8) - j5 = 2.4 - j3.2$ A

$\bar{V}_z = (-j5)\bar{I}_b + (4-j3)\bar{I}_c$

$= (-j5)(2.4 - j3.2) + (4-j3)(2.4 + j1.8)$

$= -1 - j12$ V

$-25 + (1+j3)\bar{I}_d + \bar{V}_z = 0 \Rightarrow$

$-25 + (1+j3)\bar{I}_d + (-1-j12) = 0$

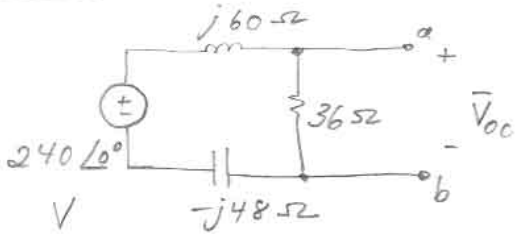
$$\therefore \quad \bar{I}_d = \frac{26 + j12}{1 + j3} = 6.2 - j6.6 \quad A$$

$$\bar{I}_z = \bar{I}_d - \bar{I}_b = (6.2 - j6.6) - (2.4 - j3.2)$$

$$= 3.8 - j3.4 \quad A$$

$$\therefore \quad \bar{Z} = \frac{\bar{V}_z}{\bar{I}_z} = \frac{-1 - j12}{3.8 - j3.4} = 1.42 - j1.88 \quad \Omega$$

9.42



$$\bar{V}_{oc} = \frac{36}{j60 + 36 - j48} \times 240\angle 0^\circ$$

$$= \frac{36(240\angle 0^\circ)}{36 + j12} = \frac{8640\angle 0^\circ}{37.947\angle 18.435^\circ}$$

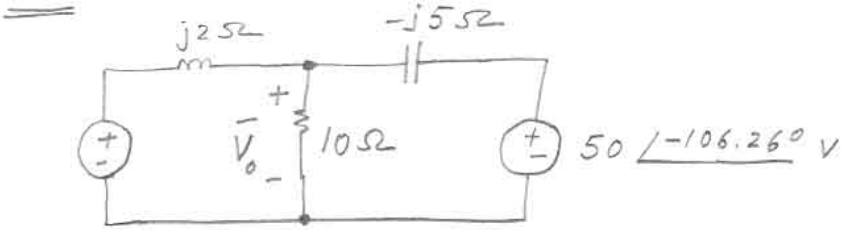
$$= 227.69\angle -18.435^\circ = \bar{V}_{th}$$

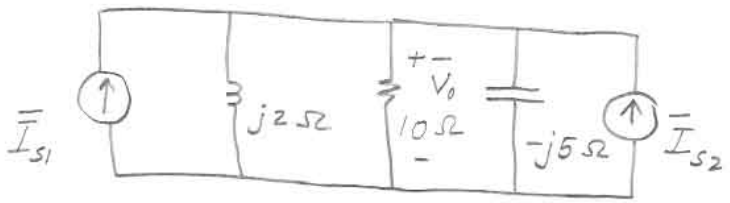
$$\bar{Z}_{th} = 36 \,//\, (j12) = \frac{36(12\angle 90^\circ)}{36 + j12}$$

$$= \frac{432\angle 90^\circ}{37.947\angle 18.435^\circ}$$

$$= 11.38\angle 71.565^\circ = 3.599 + j10.796 \ \Omega$$

9.53





$$\bar{I}_{s1} = \frac{20 \angle -36.87^\circ}{j2} = 10 \angle -126.87^\circ$$

$$\bar{I}_{s2} = \frac{50 \angle -106.26^\circ}{-j5} = 10 \angle -16.26^\circ$$

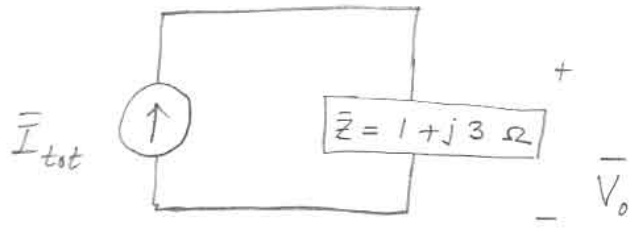
$$\bar{Y} = \bar{Y}_1 + \bar{Y}_2 + \bar{Y}_3 = \frac{1}{j2} + \frac{1}{10} + \frac{1}{-j5}$$

$$= -j0.5 + 0.1 + j0.2 = 0.1 - j0.3$$

$$\therefore \bar{Z} = \frac{1}{0.1 - j0.3} = 1 + j3 \ \Omega$$

$$\bar{I}_{tot} = \bar{I}_{s1} + \bar{I}_{s2} = 10 \angle -126.87^\circ + 10 \angle -16.26^\circ$$

$$= (-6 - j8) + (9.6 - j2.8) = 3.6 - j10.8 \ A$$



$= 3.6 - j10.8$ A

$$\bar{V}_o = \bar{I}_{tot}\,\bar{Z} = (3.6 - j10.8)(1 + j3)$$

$$= (11.384 \angle -71.565^\circ)(3.162 \angle 71.565^\circ)$$

$$= 36 \angle 0^\circ$$

$$\therefore\ v_o(t) = 36\cos(2000t)\ \text{V}$$