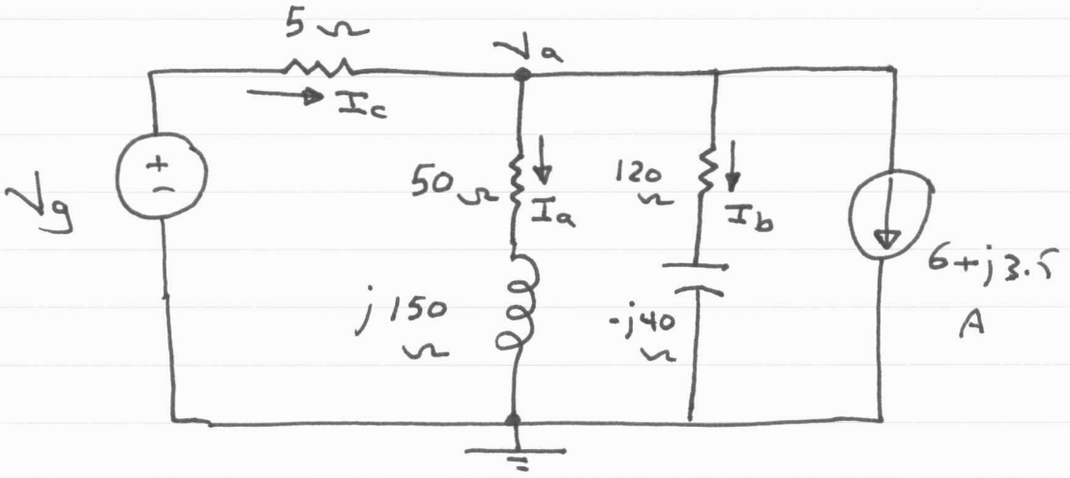
Homework Solution Ch. 9 EE 231

9.32



$$\vec{V}_a = (50+j150)\vec{I}_a = (50+j150)(2\angle 0^\circ)$$

$$\vec{V}_a = 100+j300 \quad V$$

$$\vec{I}_b = \frac{\vec{V}_a}{120-j40} = j2.5 \ A$$

$$\vec{I}_c = \vec{I}_a + \vec{I}_b + (6+j3.5) = 8+j6 \ A$$

$$\vec{V}_g = 5\vec{I}_c + \vec{V}_a$$

$$\vec{V}_g = 140+j330 \quad V$$

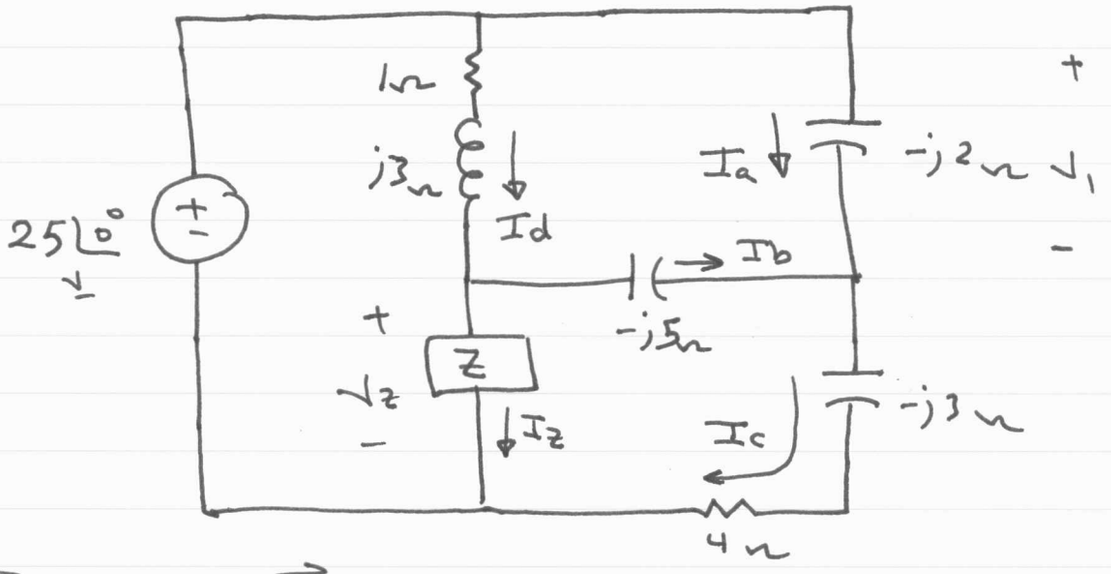
b)

$$i_b(t) = 2.5\cos(800t+90^\circ) \ A$$

$$i_c(t) = 10\cos(800t+36.87^\circ) \ A$$

$$v_g(t) = 358.47\cos(800t+67^\circ) \ V$$

9.36



$$\vec{V}_1 = (-j2)\vec{I}_a = (-j2)5\angle 90^\circ = 10\angle 0^\circ \text{ V}$$

$$\vec{I}_c = \frac{25\angle 0^\circ - 10\angle 0^\circ}{4-j3} = 2.4 + j1.8 \text{ A}$$

$$\vec{I}_b = \vec{I}_c - \vec{I}_a = 2.4 - j3.2 \text{ A}$$

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

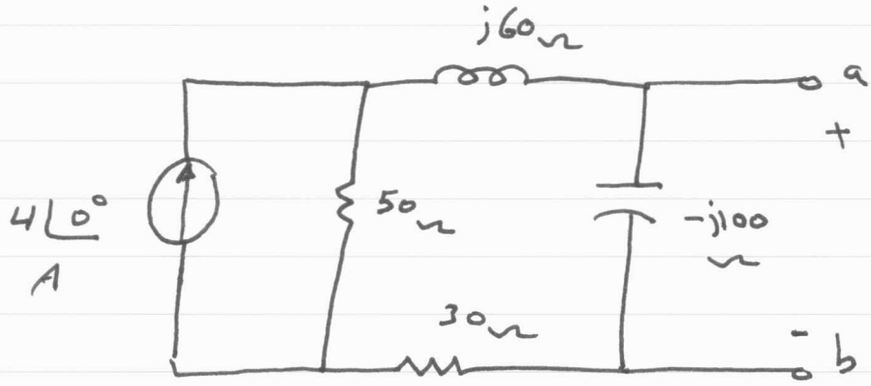
$$\vec{V}_z = -1 - j12 \text{ V}$$

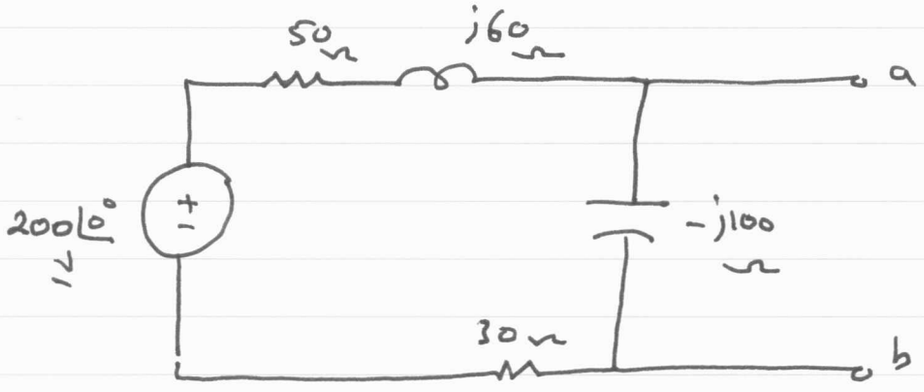
$$\vec{I}_d = \frac{\vec{V}_1 - \vec{I}_b(-j5)}{1+j3} = 6.2 - j6.6 \text{ A}$$

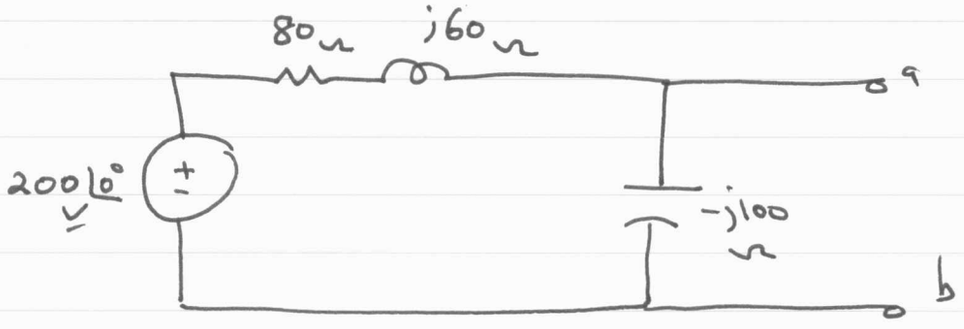
$$\vec{I}_z = \vec{I}_d - \vec{I}_b = 3.8 - j3.4 \text{ A}$$

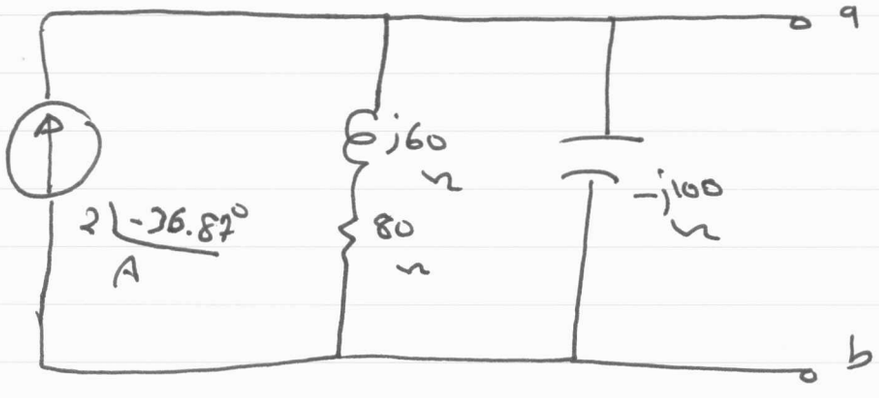
$$Z = \frac{\vec{V}_z}{\vec{I}_z} = 1.42 - j1.88 \ \Omega$$

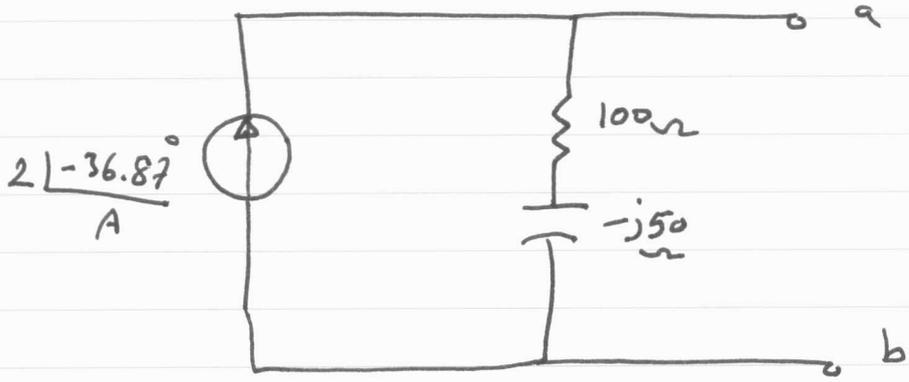
9.46


j60Ω
a
+
4∠0°
A
50Ω
-j100Ω
30Ω
-
b

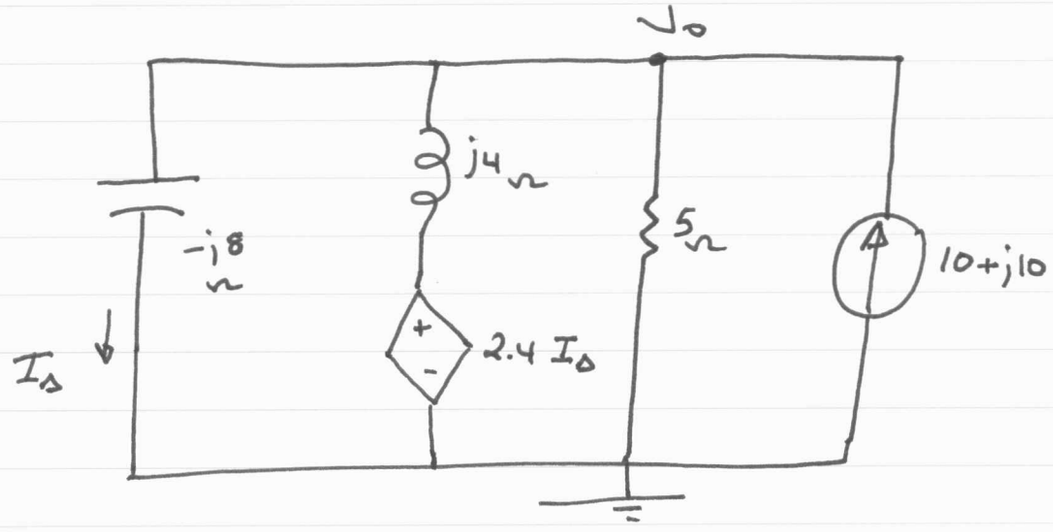

50Ω
j60Ω
a
200∠0°
V
+
-
-j100Ω
30Ω
b


80Ω
j60Ω
a
200∠0°
V
+
-
-j100Ω
b


a
j60Ω
2∠-36.87°
A
80Ω
-j100Ω
b



9.59



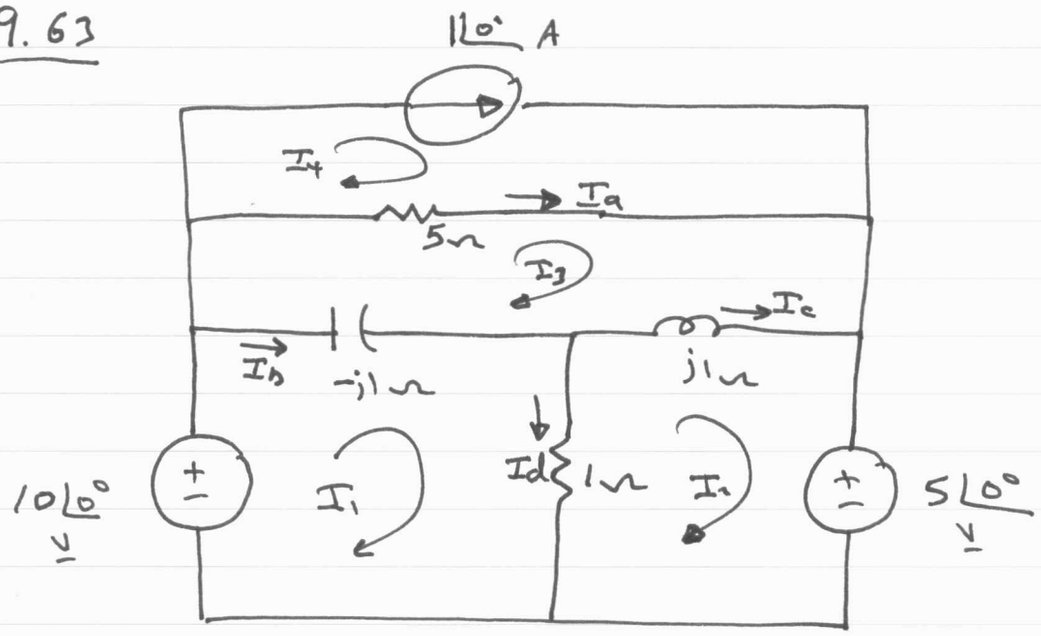
KCL

$$\frac{\vec{V}_o}{-j8} + \frac{\vec{V}_o - 2.4\,I_\Delta}{j4} + \frac{\vec{V}_o}{5} = 10 + j10$$

$$\vec{I}_\Delta = \frac{\vec{V}_o}{-j8}$$

$$\therefore \vec{V}_o = 80 \angle 90^\circ \text{ V}$$

9.63



$I_4 = 1\angle 0°$

$$0 = (5 - j1 + j1)\vec{I_3} - (-j1)\vec{I_1} - (j1)\vec{I_2} - 5\vec{I_4}$$

$$10\angle 0° = (1 - j1)\vec{I_1} - (1)\vec{I_2} - (-j1)\vec{I_3}$$

$$-5\angle 0° = (-1)\vec{I_1} + (1 + j1)\vec{I_2} - (j1)\vec{I_3}$$

Solving

$\vec{I_4} = 1\angle 0°$ A , $\vec{I_2} = 7 + j5$ A

$\vec{I_3} = 2\angle 0°$ A , $\vec{I_1} = 7 + j10$ A

$\vec{I_a} = \vec{I_3} - \vec{I_4} = 1\angle 0°$ A
$\vec{I_b} = \vec{I_1} - \vec{I_3} = 5 + j10$ A
$\vec{I_c} = \vec{I_2} - \vec{I_3} = 5 + j5$ A
$\vec{I_d} = \vec{I_1} - \vec{I_2} = j5$ A