P 9.17 [a]
$$Y = \frac{1}{3+j4} + \frac{1}{16-j12} + \frac{1}{-j4}$$

= $0.12 - j0.16 + 0.04 + j0.03 + j0.25$
= $0.16 + j0.12 = 200/36.87^{\circ}$ mS

[b]
$$G = 160 \,\mathrm{mS}$$

[c]
$$B = 120 \,\mathrm{mS}$$

[d]
$$I = 8/0^{\circ} A$$
, $V = \frac{I}{Y} = \frac{8}{0.2/36.87^{\circ}} = 40/-36.87^{\circ} V$

$$\mathbf{I}_C = \frac{\mathbf{V}}{Z_C} = \frac{40/-36.87^{\circ}}{4/-90^{\circ}} = 10/53.13^{\circ} \,\mathrm{A}$$

$$i_C = 10\cos(\omega t + 53.13^\circ) \,\mathrm{A}, \qquad I_m = 10 \,\mathrm{A}$$

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P 9.19 **[a]**
$$V_g = 300/78^\circ$$
; $I_g = 6/33^\circ$

$$\therefore \quad Z = \frac{\mathbf{V}_g}{\mathbf{I}_g} = \frac{300/78^{\circ}}{6/33^{\circ}} = 50/45^{\circ} \,\Omega$$

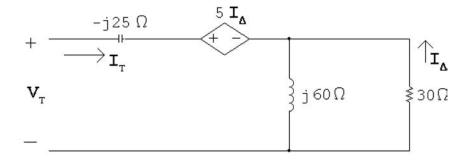
[**b**]
$$i_g$$
 lags v_g by 45°:

$$2\pi f = 5000\pi;$$
 $f = 2500 \,\mathrm{Hz};$ $T = 1/f = 400 \,\mu\mathrm{s}$

:.
$$i_g \log v_g$$
 by $\frac{45^{\circ}}{360^{\circ}} (400 \,\mu\text{s}) = 50 \,\mu\text{s}$

P 9.29 $j\omega L = j100 \times 10^3 (0.6 \times 10^{-3}) = j60 \Omega$

$$\frac{1}{j\omega C} = \frac{-j}{(100\times 10^3)(0.4\times 10^{-6})} = -j25\,\Omega$$



$$\mathbf{V}_T = -j25\mathbf{I}_T + 5\mathbf{I}_\Delta - 30\mathbf{I}_\Delta$$

$$\mathbf{I}_{\Delta} = \frac{-j60}{30 + j60} \mathbf{I}_{T}$$

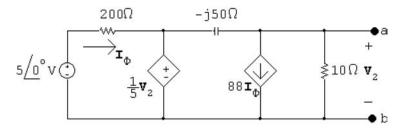
$$\mathbf{V}_T = -j25\mathbf{I}_T + 25\frac{j60}{30 + j60}\mathbf{I}_T$$

$$\frac{\mathbf{V}_T}{\mathbf{I}_T} = Z_{\text{ab}} = 20 - j15 = 25 / -36.87^{\circ} \,\Omega$$

$$\begin{aligned} \mathbf{P} \, 9.36 \quad \mathbf{V}_o &= \mathbf{V}_g \frac{Z_o}{Z_T} = \frac{500 - j1000}{300 + j1600 + 500 - j1000} (100 \underline{/0^\circ}) = 111.8 \underline{/-100.3^\circ} \, \mathbf{V} \\ v_o &= 111.8 \cos(8000t - 100.3^\circ) \, \mathbf{V} \end{aligned}$$

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P 9.43 Open circuit voltage:



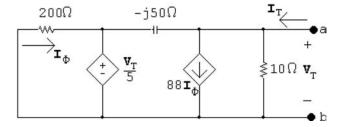
$$\frac{\mathbf{V}_2}{10} + 88\mathbf{I}_{\phi} + \frac{\mathbf{V}_2 - \frac{1}{5}\mathbf{V}_2}{-j50} = 0$$

$$\mathbf{I}_{\phi} = \frac{5 - (\mathbf{V}_2/5)}{200}$$

Solving,

$$\mathbf{V}_2 = -66 + j88 = 110/126.87^{\circ} \,\mathbf{V} = \mathbf{V}_{\mathrm{Th}}$$

Find the Thévenin equivalent impedance using a test source:



$$\mathbf{I}_T = \frac{\mathbf{V}_T}{10} + 88\mathbf{I}_\phi + \frac{0.8\mathbf{V}_t}{-j50}$$

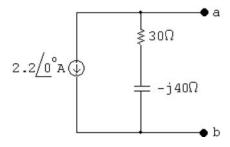
$$\mathbf{I}_{\phi} = \frac{-\mathbf{V}_T/5}{200}$$

$$\mathbf{I}_T = \mathbf{V}_T \left(\frac{1}{10} - 88 \frac{1/5}{200} + \frac{0.8}{-j50} \right)$$

$$\therefore \quad \frac{\mathbf{V}_T}{\mathbf{I}_T} = 30 - j40 = Z_{\mathrm{Th}}$$

$$\mathbf{I}_{\mathrm{N}} = \frac{\mathbf{V}_{\mathrm{Th}}}{Z_{\mathrm{Th}}} = \frac{-66 + j88}{30 - j40} = -2.2 + j0\,\mathrm{A} = 2.2 / 180^{\circ}\,\mathrm{A}$$

The Norton equivalent circuit:



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