EENG 281 Homework #11 Solutions
Fall 2013

P 9.11 **[a]** $\mathbf{Y} = 50\underline{/60^\circ} + 100\underline{/-30^\circ} = 111.8\underline{/-3.43^\circ}$

$y = 111.8\cos(500t - 3.43^\circ)$

[b] $\mathbf{Y} = 200\underline{/50^\circ} - 100\underline{/60^\circ} = 102.99\underline{/40.29^\circ}$

$y = 102.99\cos(377t + 40.29^\circ)$

[c] $\mathbf{Y} = 80\underline{/30^\circ} - 100\underline{/-225^\circ} + 50\underline{/-90^\circ} = 161.59\underline{/-29.96^\circ}$

$y = 161.59\cos(100t - 29.96^\circ)$

[d] $\mathbf{Y} = 250\underline{/0^\circ} + 250\underline{/120^\circ} + 250\underline{/-120^\circ} = 0$

$y = 0$

P 9.12 **[a]** $\mathbf{V}_g = 300\underline{/78^\circ}; \qquad \mathbf{I}_g = 6\underline{/33^\circ}$

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

[b] i_g lags v_g by 45°:

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

$$\therefore \quad i_g \text{ lags } v_g \text{ by } \frac{45^\circ}{360^\circ}(400\,\mu\text{s}) = 50\,\mu\text{s}$$

P 9.27 $Z_{\text{ab}} = 1 - j8 + (2 + j4)\|(10 - j20) + (40\|j20)$

$= 1 - j8 + 3 + j4 + 8 + j16 = 12 + j12\,\Omega = 16.97\underline{/45^\circ}\,\Omega$

P 9.28 $\mathbf{V}_g = 40\underline{/-15^\circ}\,\text{V}; \qquad \mathbf{I}_g = 40\underline{/-68.13^\circ}\,\text{mA}$

$$Z = \frac{\mathbf{V}_g}{\mathbf{I}_g} = 1000\underline{/53.13^\circ}\,\Omega = 600 + j800\,\Omega$$

$$Z = 600 + j\left(3.2\omega - \frac{0.4 \times 10^6}{\omega}\right)$$

$$\therefore \quad 3.2\omega - \frac{0.4 \times 10^6}{\omega} = 800$$

$$\therefore \quad \omega^2 - 250\omega - 125{,}000 = 0$$

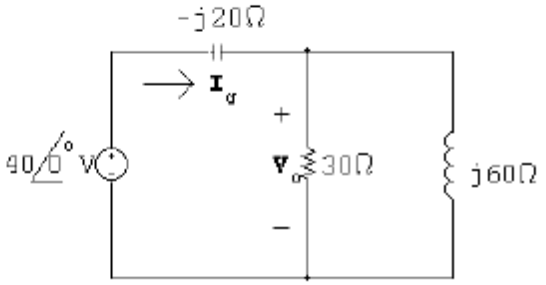
Solving,

$$\omega = 500\,\text{rad/s}$$

P 9.29 $\dfrac{1}{j\omega C} = \dfrac{1}{(1\times 10^{-6})(50\times 10^{3})} = -j20\,\Omega$

$j\omega L = j50\times 10^{3}(1.2\times 10^{-3}) = j60\,\Omega$

$\mathbf{V}_g = 40\underline{/0^\circ}\ \text{V}$



$Z_e = -j20 + 30\|j60 = 24 - j8\,\Omega$

$\mathbf{I}_g = \dfrac{40\underline{/0^\circ}}{24 - j8} = 1.5 + j0.5\,\text{mA}$

$\mathbf{V}_o = (30\|j60)\mathbf{I}_g = \dfrac{30(j60)}{30 + j60}(1.5 + j0.5) = 30 + j30 = 42.43\underline{/45^\circ}\ \text{V}$

$v_o = 42.43\cos(50{,}000t + 45^\circ)\ \text{V}$