P33.2 $\Delta V_{rms} = \frac{170\text{ V}}{\sqrt{2}} = 120\text{ V}$

(a) $\mathcal{P} = \frac{(\Delta V_{rms})^2}{R} \to R = \frac{(120\text{ V})^2}{75.0\text{ W}} = \boxed{193\ \Omega}$

(b) $R = \frac{(120\text{ V})^2}{100\text{ W}} = \boxed{144\ \Omega}$

P33.6 $\mathcal{P} = I_{rms}(\Delta V_{rms})$ and $\Delta V_{rms} = 120\text{ V}$ for each bulb (parallel circuit), so:

$I_1 = I_2 = \frac{\mathcal{P}_1}{\Delta V_{rms}} = \frac{150\text{ W}}{120\text{ V}} = \boxed{1.25\text{ A}}$, and $R_1 = \frac{\Delta V_{rms}}{I_1} = \frac{120\text{ V}}{1.25\text{ A}} = \boxed{96.0\ \Omega} = R_2$

$I_3 = \frac{\mathcal{P}_3}{\Delta V_{rms}} = \frac{100\text{ W}}{120\text{ V}} = \boxed{0.833\text{ A}}$, and $R_3 = \frac{\Delta V_{rms}}{I_3} = \frac{120\text{ V}}{0.833\text{ A}} = \boxed{144\ \Omega}$.

P33.8 For $I_{max} = 80.0\text{ mA}$, $I_{rms} = \frac{80.0\text{ mA}}{\sqrt{2}} = 56.6\text{ mA}$

$(X_L)_{min} = \frac{V_{rms}}{I_{rms}} = \frac{50.0\text{ V}}{0.0566\text{ A}} = 884\ \Omega$

$X_L = 2\pi fL \to L = \frac{X_L}{2\pi f} \geq \frac{884\ \Omega}{2\pi(20.0)} \geq \boxed{7.03\text{ H}}$

P33.14 (a) $X_C = \frac{1}{2\pi fC}: \frac{1}{2\pi f(22.0\times10^{-6})} < 175\ \Omega$

$\frac{1}{2\pi(22.0\times10^{-6})(175)} < f$ $\qquad \boxed{f > 41.3\text{ Hz}}$

(b) $X_C \propto \frac{1}{C}$, so $X(44) = \frac{1}{2}X(22)$: $\boxed{X_C < 87.5\ \Omega}$

P33.15 $I_{max} = \sqrt{2}I_{rms} = \frac{\sqrt{2}(\Delta V_{rms})}{X_C} = \sqrt{2}(\Delta V_{rms})2\pi fC$

(a) $I_{max} = \sqrt{2}(120\text{ V})2\pi(60.0/\text{s})(2.20\times10^{-6}\text{ C/V}) = \boxed{141\text{ mA}}$

(b) $I_{max} = \sqrt{2}(240\text{ V})2\pi(50.0/\text{s})(2.20\times10^{-6}\text{ F}) = \boxed{235\text{ mA}}$

P33.20 $\omega L = \frac{1}{\omega C} \to \omega = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{(57.0\times10^{-6})(57.0\times10^{-6})}} = 1.75\times10^4\text{ rad/s}$

$f = \frac{\omega}{2\pi} = \boxed{2.79\text{ kHz}}$

P33.21 (a) $X_L = \omega L = 2\pi\left(50.0\ \text{s}^{-1}\right)\left(250\times10^{-3}\ \text{H}\right) = \boxed{78.5\ \Omega}$

(b) $X_C = \dfrac{1}{\omega C} = \left[2\pi\left(50.0\ \text{s}^{-1}\right)\left(2.00\times10^{-6}\ \text{F}\right)\right]^{-1} = \boxed{1.59\ \text{k}\Omega}$

(c) $Z = \sqrt{R^2 + \left(X_L - X_C\right)^2} = \boxed{1.52\ \text{k}\Omega}$

(d) $I_{\max} = \dfrac{\Delta V_{\max}}{Z} = \dfrac{210\ \text{V}}{1.52\times10^3\ \Omega} = \boxed{138\ \text{mA}}$

(e) $\phi = \tan^{-1}\left[\dfrac{X_L - X_C}{R}\right] = \tan^{-1}(-10.1) = \boxed{-84.3°}$

P33.26 $X_C = \dfrac{1}{\omega C} = \dfrac{1}{2\pi(50.0)\left(65.0\times10^{-6}\right)} = 49.0\ \Omega$

$X_L = \omega L = 2\pi(50.0)\left(185\times10^{-3}\right) = 58.1\ \Omega$

$Z = \sqrt{R^2 + \left(X_L - X_C\right)^2} = \sqrt{(40.0)^2 + (58.1 - 49.0)^2} = 41.0\ \Omega$

$I_{\max} = \dfrac{\Delta V_{\max}}{Z} = \dfrac{150}{41.0} = 3.66\ \text{A}$

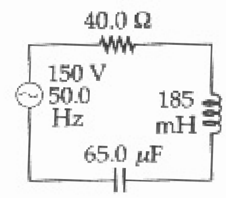

FIG. P33.26

(a) $\Delta V_R = I_{\max}R = (3.66)(40) = \boxed{146\ \text{V}}$

(b) $\Delta V_L = I_{\max}X_L = (3.66)(58.1) = 212.5 = \boxed{212\ \text{V}}$

(c) $\Delta V_C = I_{\max}X_C = (3.66)(49.0) = 179.1\ \text{V} = \boxed{179\ \text{V}}$

(d) $\Delta V_L - \Delta V_C = 212.5 - 179.1 = \boxed{33.4\ \text{V}}$

P33.44 (a) $\Delta V_{2,\,\text{rms}} = \dfrac{1}{13}(120\ \text{V}) = \boxed{9.23\ \text{V}}$

(b) $\Delta V_{1,\,\text{rms}} I_{1,\,\text{rms}} = \Delta V_{2,\,\text{rms}} I_{2,\,\text{rms}}$

$(120\ \text{V})(0.350\ \text{A}) = (9.23\ \text{V})I_{2,\,\text{rms}}$

$I_{2,\,\text{rms}} = \dfrac{42.0\ \text{W}}{9.23\ \text{V}} = \boxed{4.55\ \text{A}}$ for a transformer with no energy loss.

(c) $\mathscr{P} = \boxed{42.0\ \text{W}}$ from part (b).