EENG382 HW02 – AUTHOR'S SOLUTIONS

NOTE: I have not yet verified that the author's solutions are, in fact, correct.

Prob 10.29

P 10.29 **[a]** $\mathbf{I} = \dfrac{465\underline{/0^\circ}}{124 + j93} = 2.4 - j1.8 = 3\underline{/-36.87^\circ}\,\text{A(rms)}$

$$P = (3)^2(4) = 36\,\text{W}$$

[b] $Y_\text{L} = \dfrac{1}{120 + j90} = 5.33 - j4\ \text{mS}$

$$\therefore \quad X_\text{C} = \frac{1}{-4 \times 10^{-3}} = -250\,\Omega$$

[c] $Z_\text{L} = \dfrac{1}{5.33 \times 10^{-3}} = 187.5\,\Omega$

[d] $\mathbf{I} = \dfrac{465\underline{/0^\circ}}{191.5 + j3} = 2.4279\underline{/-0.9^\circ}\,\text{A}$

$$P = (2.4279)^2(4) = 23.58\,\text{W}$$

[e] $\% = \dfrac{23.58}{36}(100) = 65.5\%$

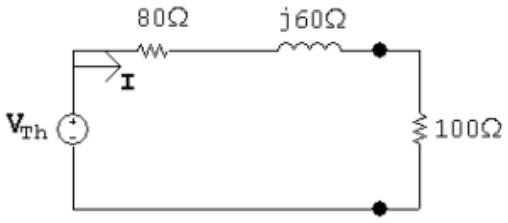
Thus the power loss after the capacitor is added is 65.5% of the power loss before the capacitor is added.

Prob 10.49

P 10.49 **[a]** $Z_{\text{Th}} = 20 + j60 + \dfrac{(j20)(6 - j18)}{6 + j2} = 80 + j60 = 100\underline{/36.87^\circ}\,\Omega$

$\therefore \quad R = |Z_{\text{Th}}| = 100\,\Omega$

[b] $\mathbf{V}_{\text{Th}} = \dfrac{j20}{6 - j18 + j20}(480\underline{/0^\circ}) = 480 + j1440\,\text{V(rms)}$



$\mathbf{I} = \dfrac{480 + j1440}{180 + j60} = 4.8 + j6.4 = 8\underline{/53.13^\circ}\ \text{A(rms)}$

$P = 8^2(100) = 6400\,\text{W}$

[c] Pick the $100\,\Omega$ resistor from Appendix H to match exactly.

Prob 10.69

P 10.69 $R_1 + R_2 + R_3 = \dfrac{(120)^2}{600} = 24\,\Omega$

$$R_2 + R_3 = \frac{(120)^2}{900} = 16\,\Omega$$

$$\therefore \quad R_1 = 24 - 16 = 8\,\Omega$$

$$R_3 + R_1 \| R_2 = \frac{(120)^2}{1200} = 12\,\Omega$$

$$\therefore \quad 16 - R_2 + \frac{8R_2}{8 + R_2} = 12$$

$$R_2 - \frac{8R_2}{8 + R_2} = 4$$

$$8R_2 + R_2^2 - 8R_2 = 32 + 4R_2$$

$$R_2^2 - 4R_2 - 32 = 0$$

$$R_2 = 2 \pm \sqrt{4 + 32} = 2 \pm 6$$

$$\therefore \quad R_2 = 8\,\Omega; \qquad \therefore \quad R_3 = 8\,\Omega$$