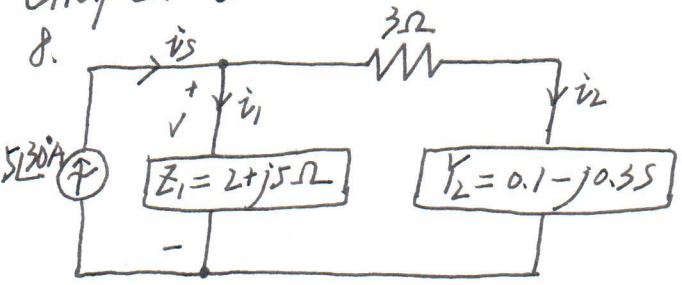
chapter 8

8.



(a) dissipated in the 3-Ω resistor

(b) generated by the source

$$Z_2 = \frac{1}{Y_2} = \frac{1}{0.1-j0.35} = 1+j3\,\Omega$$

$$\begin{cases} i_1 + i_2 = 5\angle 30^\circ = \frac{5\sqrt{3}}{2} + j\frac{5}{2} \\ i_1 \cdot Z_1 = i_2 \cdot (Z_2 + 3) \Rightarrow i_1(2+j5) = i_2(1+j3+3) \end{cases}$$

$$\therefore i_2 = 1.9 + j1.9\,A = 2.7\angle 45^\circ$$

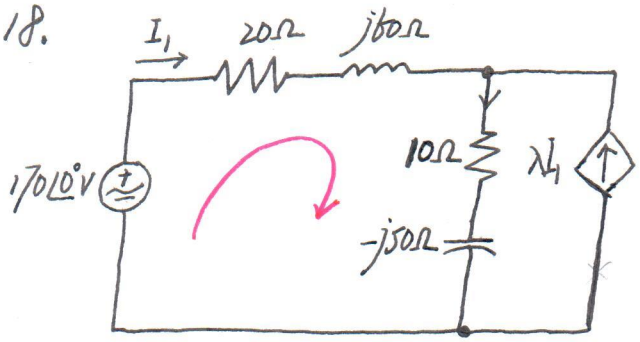
(a) $P_R = \frac{1}{2} I_m^2 R = \frac{1}{2} \cdot 2.7^2 \cdot 3 = 10.935\,W$

(b) $P = \frac{1}{2} V_m I_m \cos(\theta - \phi)$

$V = i_2 \cdot (3 + 1 + j3) = 2.7\angle 45^\circ \cdot 5\angle 36.9^\circ = 13.5\angle 81.9^\circ$

$$\therefore P = \frac{1}{2} \cdot 13.5 \cdot 5 \cos(81.9^\circ - 30^\circ) = 20.82\,W$$

18.



(a) $\lambda = 0$ open circuit

$Z_{all} = 20 + j60 + 10 - j50 = 30 + j10\,\Omega$

$$I_1 = \frac{170\angle 0^\circ}{30+j10} = 5.1 - j1.7 = 5.38\angle -18.43^\circ$$

$P_{20} = \frac{1}{2}(5.38)^2 \cdot 20 = 289.4\,W$

$P_{10} = \frac{1}{2}(5.38)^2 \cdot 10 = 144.7\,W$

(b) $\lambda = 1$

KVL:

$170 = 20I_1 + j60I_1 + (10 - j50) \cdot 2I_1$

$$\therefore I_1 = \frac{170}{40 - j40} = 2.125 + j2.125 = 3\angle 45^\circ$$

$P_{20} = \frac{1}{2}(3)^2 \cdot 20 = 90\,W$

$P_{10} = \frac{1}{2}(3+3)^2 \cdot 10 = 180\,W$