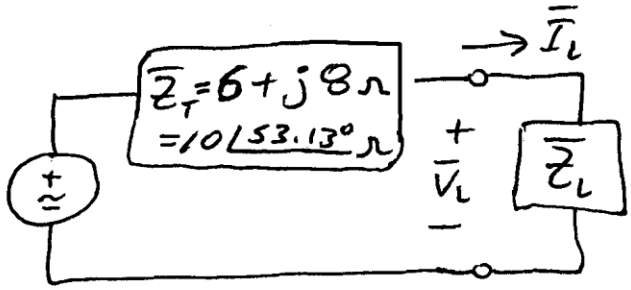
ex. Calculate $P_{ave,load}$ when $\bar{Z}_L$ is

a) $\bar{Z}_T^*$, b) $|\bar{Z}_T|$, & c) $4 + j10\,\Omega$



$\bar{V}_T = 120\angle 0^\circ\,V$

a) $\bar{Z}_L = \bar{Z}_T^* = 6 - j8\,\Omega$ ← complex conjugate match

$$\bar{I}_L = \frac{120\angle 0^\circ}{(6+j8)+(6-j8)} = \frac{120\angle 0^\circ}{12} = 10\angle 0^\circ\,A$$

$$P_{L,ave_a} = \tfrac{1}{2}|\bar{I}|^2 R_L = \tfrac{1}{2}(10)^2 6 = \underline{\underline{300\,W}} = P_{L,max}$$

b) $\bar{Z}_L = 10\,\Omega = |\bar{Z}_T|$ ← best possible for purely resistive

$$\bar{I}_L = \frac{120\angle 0^\circ}{(6+j8)+10} = 6.7082\angle -26.565^\circ\,A$$

$$P_{L,ave_b} = \tfrac{1}{2}|6.7082|^2 10 = \underline{\underline{225\,W}}$$

(75% of $P_{L,max}$)

c) $\bar{Z}_L = 4 + j10\,\Omega$

$$\bar{I}_L = \frac{120\angle 0^\circ}{(6+j8)+(4+j10)} = 5.827715174\angle -60.945^\circ\,A$$

$$P_{L,ave,c} = \tfrac{1}{2}(5.827715)^2 4 = \underline{\underline{67.9245\,W}}$$

(22.64% of $P_{L,max}$)