24. (*a*) What load impedance $\mathbf{Z}_L$ will draw the maximum average power from the source shown in Fig. 11.38? (*b*) Calculate the maximum average power supplied to the load.

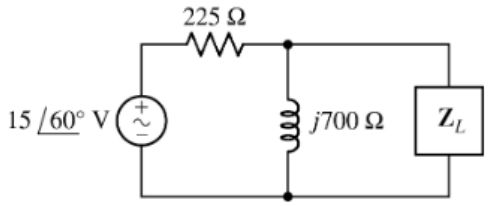
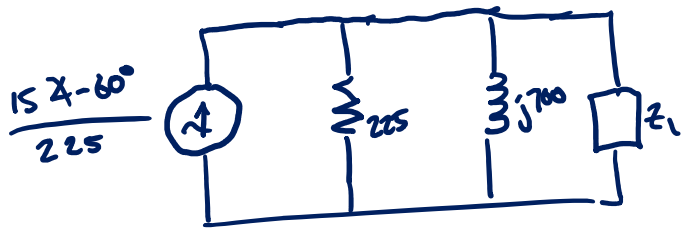


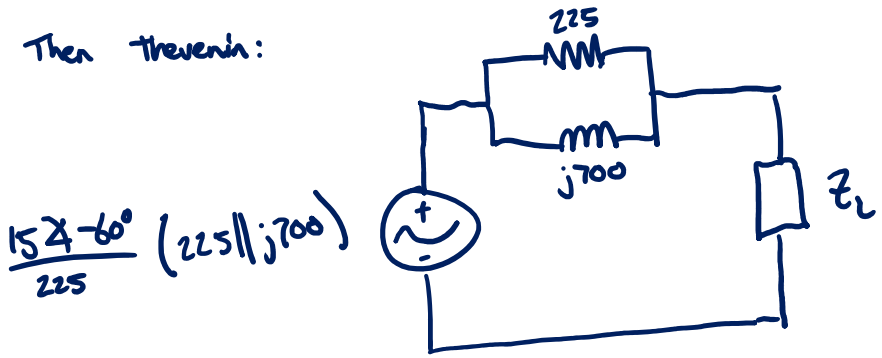
FIGURE 11.38

Let's actually do the source transformations. First Norton:

(a)



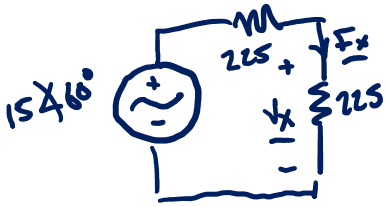
Then Thevenin:



so we want $Z_L^* = 225 \| j700 = 204 + j65.5\ \Omega$

for max power, $\boxed{Z_L = 204 - j65.5\ \Omega}$

(b) As long as we did (a) correctly, we have a matched circuit. We can calculate the value of the Thevenin source, above, and solve. But an easier approach is to note that $Z_L \| j700$ must be $225\ \Omega$ for the matching to work, and real power only goes to the real part of Z_L, so:



$$P_L = \frac{|V_x||I_x|}{2}\cos(0°) = \frac{\left(\frac{15}{2}\right)\left(\frac{15}{450}\right)}{2}$$

$$\boxed{P_L = 125\text{ mW}}$$