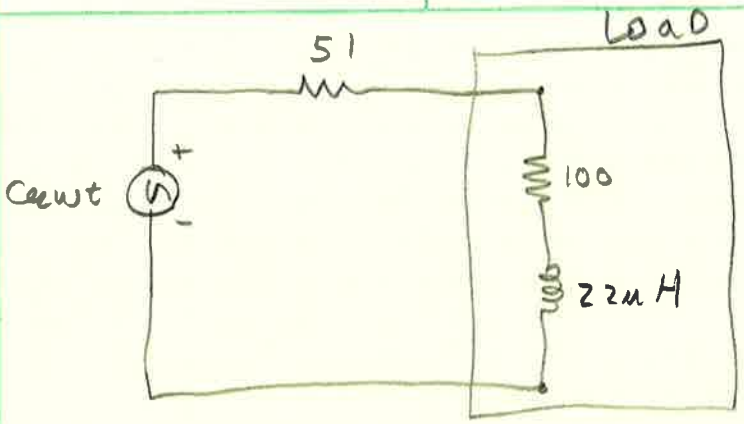
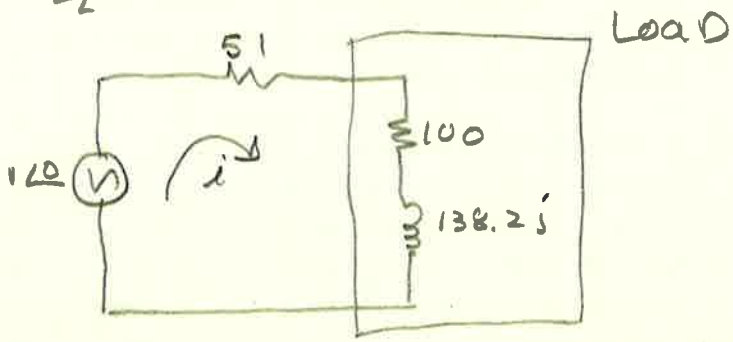


$F = 1MHz \Rightarrow \omega = 2\pi F$

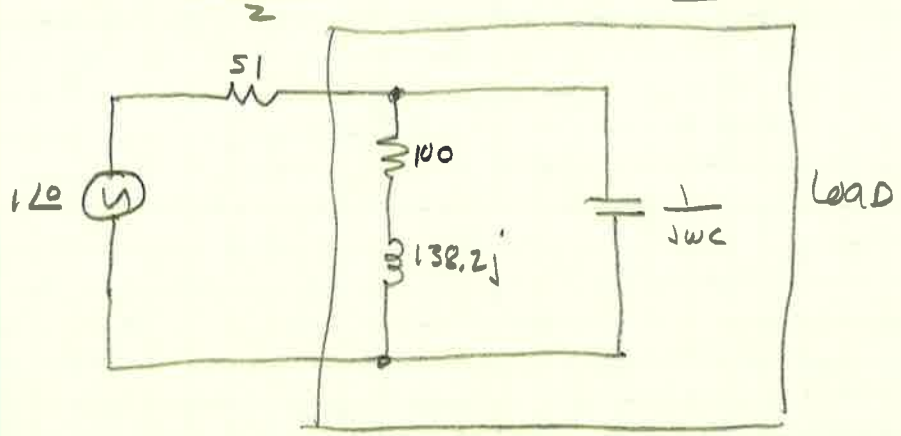
$Z_L = j\omega L = j138.2\,\Omega$



$$i = \frac{120}{151 + 138.2j} = 4.885\angle -42.47 \text{ mA}$$

$$V_{R_L} = i(100) = 0.4885\angle -42.47 \text{ V}$$

$$P_L = \frac{V_m I_m}{2}\cos(\theta_v - \theta_i) = \underline{1.1932 \text{ mW}}$$



$$Z_L = (100 + 138.2j) \,||\, \frac{1}{j\omega C} = \frac{(170.59\angle 54.11)\left(\frac{1}{\omega C}\angle -90^\circ\right)}{170.59\angle 54.11 + \frac{1}{\omega C}\angle -90^\circ}$$

$$= \frac{\frac{170.59}{\omega C}\angle -35.889^\circ}{100 + 138.2j - \frac{1}{\omega C}j} = \frac{\frac{170.59}{\omega C}\angle -35.889^\circ}{100 + j\left(138.2 - \frac{1}{\omega C}\right)}$$

$$\theta_{Z_L} = \left(-35.889 - \tan^{-1}\left[\frac{138.2 - \frac{1}{\omega C}}{100}\right]\right)$$

$$-35.889 = \tan^{-1}[\ ]$$

$$-.7236 = \frac{138.2 - \frac{1}{\omega C}}{100}$$

$$\frac{1}{\omega C} = 210.559 \Rightarrow C = \frac{1}{\omega(210.559)} = \boxed{756\ pF}$$

$$C = \frac{P(\tan\theta_1 - \tan\theta_2)}{\omega V_{RMS}^2}$$