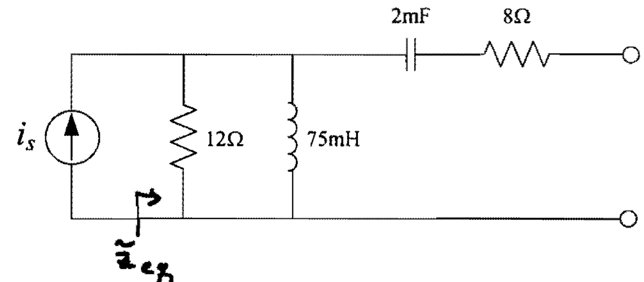
EE221 Quiz 5 Fall 2011 **Name:** KEY

Consider the circuit shown below. The source current is given by $i_s = 5\cos(~~40t~~ 40t + 20^\circ)$ A. $\omega = 40$ rad/s



$j\omega L = j40(75m) = j3\,\Omega$

$\frac{1}{j\omega C} = \frac{1}{j40(2m)} = -j12.5\,\Omega$

1) Solve for the real (or average) power delivered to the circuit **if no load is attached.**

$\vec{I}_s = 5\angle 20^\circ$ A

$\tilde{Z}_{eq} = 12 \| j3 = \frac{12(j3)}{12 + j3} = 0.706 + j2.82\,\Omega$

$P = \frac{|I_s|^2 R_{eq}}{2} = \frac{(5)^2(0.706)}{2} = ~~17.6\text{ W}~~ = \boxed{8.8\text{ W}}$

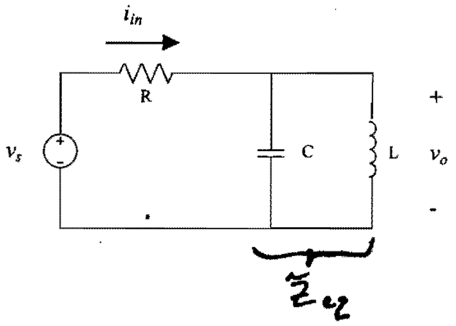
2) Solve for the load impedance that will draw maximum real (or average) power when placed across the output terminals.

$\tilde{Z}_{TH} = \tilde{Z}_{eq} + 8 - j12.5 = 0.706 + 8 + j(2.82 - 12.5)$

$= 8.706 - j9.68\,\Omega$

$\tilde{Z}_L = \tilde{Z}_{TH}^* = \boxed{8.706 + j9.68\,\Omega}$

3) Solve for the transfer function $\mathbf{H}(\omega) = V_o/I_{in}$ in the circuit below.



$H = \frac{\vec{V}_o}{\vec{I}_{in}} = \tilde{Z}_{eq}$ for $\|$ C, L, so...

$H = \frac{j\omega L\left(\frac{1}{j\omega C}\right)}{j\omega L + \frac{1}{j\omega C}} = \frac{j\omega L}{1 - \omega^2 LC}$