

Signature

Name (print, please)

ECE 2300 Circuit Analysis

Summer 2011

Quiz 6

**DO NOT OPEN THIS QUIZ BOOKLET UNTIL INSTRUCTED
TO DO SO**

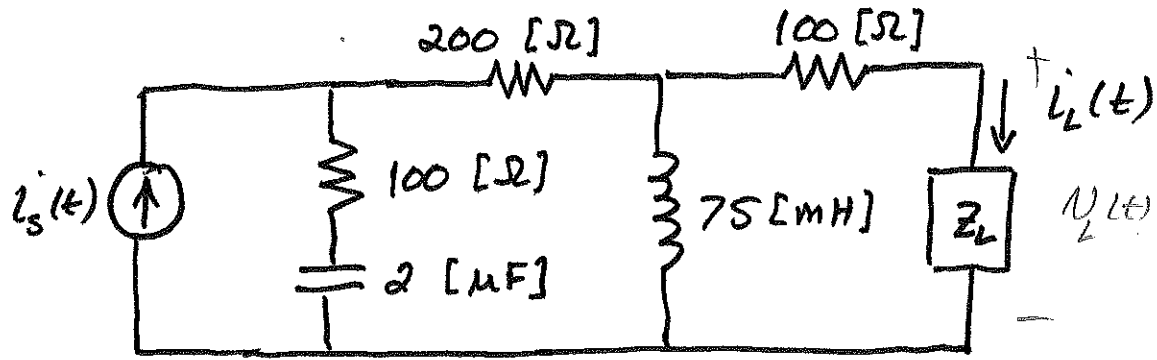
This quiz has 3 pages including this cover page. If you are missing any pages, raise your hand. You have 30 minutes to complete the quiz.

Notes

1. Be sure your name and signature appear above.
2. The quiz is closed-book. You may have a calculator and one 8 ½" x 11" crib sheet.
3. To receive full credit for a problem, you must:
 - Show all work necessary to solve the problem;
 - Define all variables and parameters and label them on circuit diagrams;
 - Use the proper notation for all variables.
 - Show all units explicitly in intermediate and final results;
 - Indicate clearly whether power being calculated is absorbed or delivered;

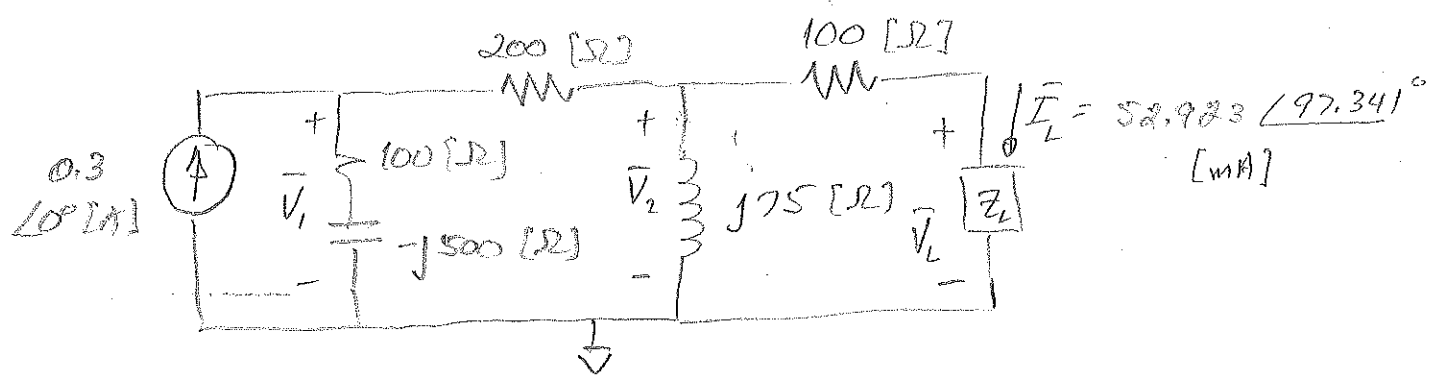
A load impedance Z_L is connected to a circuit, as shown below. The load current is known to be $i_L(t) = 52.923 \cos(1000t + 97.341^\circ)$ [mA]. Further, the load impedance is known to be a resistance in series with a capacitance.

Find the value of the load capacitance.



$i_s(t) = 0.3 \cos(1000t)$ [A] $\omega = 1000$ [rad/s]

If we have $v_L(t)$ we can find $Z_L = \frac{V_L}{I_L}$, Phasor domain:



Node Voltage:

$$-0.3 + \frac{V_1}{100 - j500} + \frac{V_1 - V_2}{200} = 0$$

$$\frac{V_2 - V_1}{100} + \frac{V_2}{j75} + 0.052923 \angle 97.341^\circ = 0$$

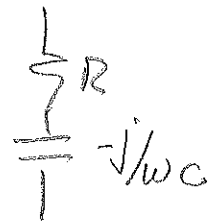
$\Rightarrow V_1 = 66.6 \angle -4.11^\circ$ [V] $V_2 = 24.4 \angle 56.74^\circ$ [V]

Room for Extra Work

$$\begin{aligned}\text{Now } \bar{V}_L &= \bar{V}_2 - 100 \bar{I}_L \\ &= 20.67 \angle 47.15^\circ \text{ [V]}\end{aligned}$$

$$Z_L = \frac{\bar{V}_L}{\bar{I}_L} = 390.6 \angle -50.19^\circ \text{ [\Omega]}$$

$$= 249.5 - j300.5 \text{ [\Omega]} \iff$$



$$\therefore \left[R = 249.5 \Omega \right.$$

$$\left. C = \frac{1}{300.5 \omega} = \frac{1}{(300.5)(1000)} = 3.33 \text{ [\mu F]} \right]$$