

Name: _____ (please print)

Signature: _____

ECE 2300 – Quiz #6
April 29, 2013

**Keep this quiz closed and
face up until you are told to
begin.**

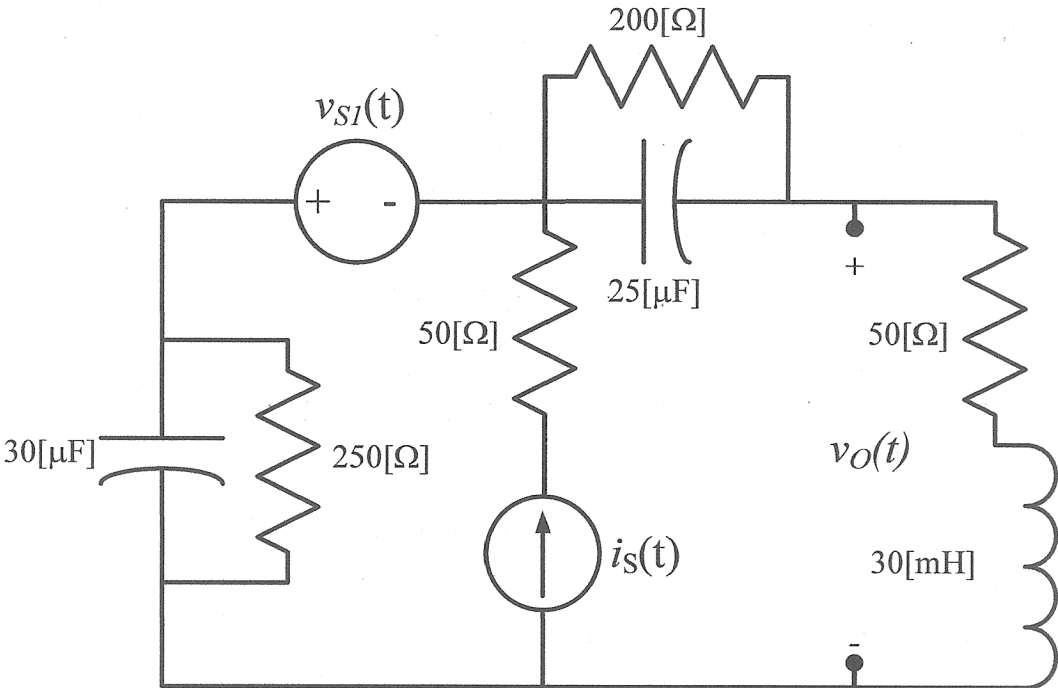
1. This quiz is closed book, closed notes. You may use one 8.5" x 11" crib sheet, or its equivalent.
2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**
4. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
5. Do not use red ink. Do not use red pencil.
6. You will have **30 minutes** to work on this quiz.

_____ /20

Find the voltage $v_o(t)$. The sources are as follows.

$$v_{s1}(t) = 12[V]$$

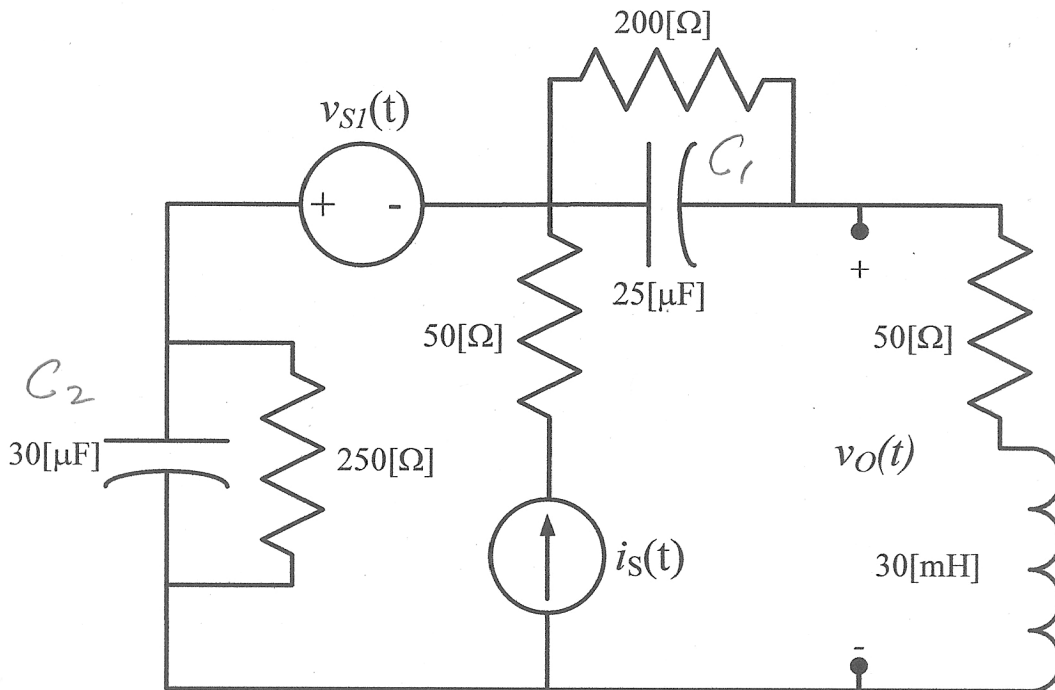
$$i_s(t) = 65[mA] \cos(377t)$$



Find the voltage $v_o(t)$. The sources are as follows.

$$v_{s1}(t) = 12[V]$$

$$i_s(t) = 65[\text{mA}] \cos(377t)$$

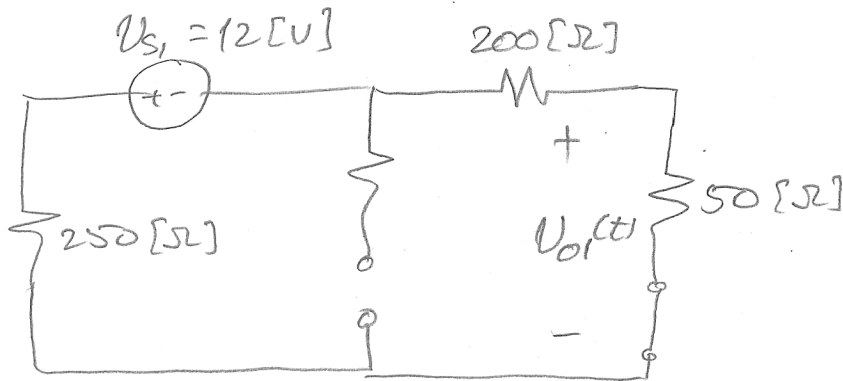


We have sources with two different frequencies:
 for $v_{s1}(t)$, $\omega = 0$ (dc). For $i_s(t)$, $\omega = 377$ [rad/s]. We
 must therefore use superposition.

Let's start by deactivating $i_s(t)$, and solve for
 $v_{o1}(t)$ using the voltage source.

$$\begin{aligned} \omega = 0 &\Rightarrow j\omega L = 0 \text{ so } L \rightarrow \text{short} \\ &\Rightarrow 1/j\omega C = \infty \text{ so } C \rightarrow \text{open} \end{aligned}$$

Room for extra work



$$U_{o1}(t) = -12 \cdot \frac{50}{50 + 250 + 200} = -1.2 [V]$$

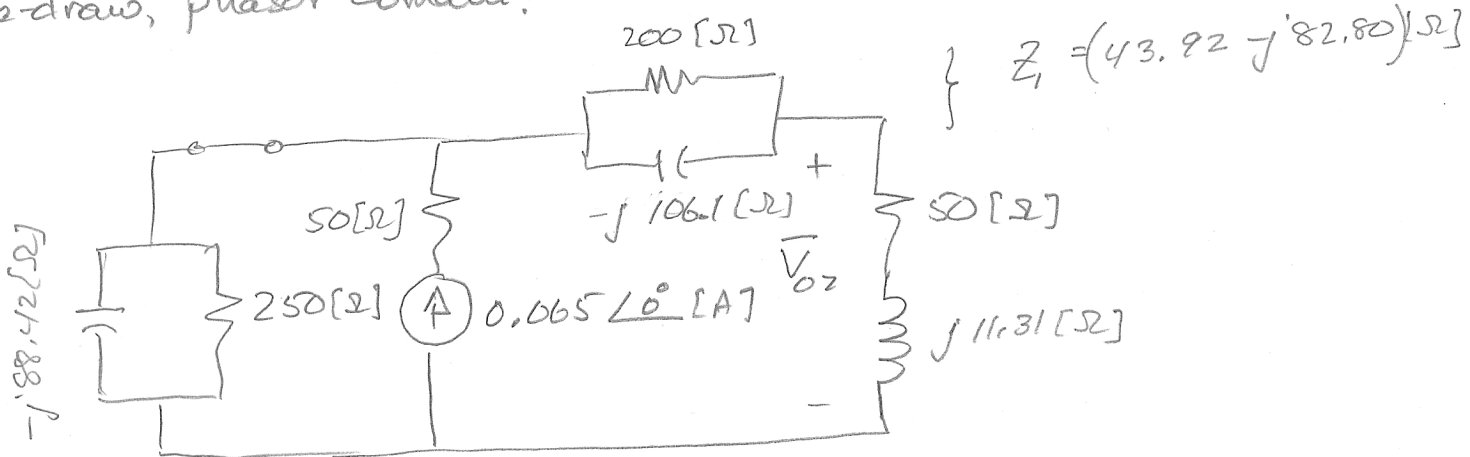
Now we deactivate $U_{s1}(t)$ and solve with $U_s(t)$.

$$\omega = 377 [\text{rad/s}] \Rightarrow j\omega L = j(377)(0.03) = j11.31 [\Omega]$$

$$1/j\omega C_1 = -j/(377)(25 \times 10^{-6}) = -j106.1 [\Omega]$$

$$1/j\omega C_2 = -j/377(30 \times 10^{-6}) = -j88.42 [\Omega]$$

Re-draw, phasor domain:



$$Z_2 = (27.80 - j78.59) [\Omega]$$

P.2 \rightarrow

Room for extra work

$$\begin{aligned} \text{So... } \bar{V}_{o2} &= 0.065 \cdot \frac{Z_2}{Z_1 + Z_2 + (50 + j11.31)} \cdot (50 + j11.31) \\ &= 1.4273 - j0.1706 \text{ [V]} \\ &= 1.4375 \angle \underline{-6.817^\circ} \text{ [V]} \end{aligned}$$

$$\begin{aligned} \text{So } v_o(t) &= v_{o1}(t) + v_{o2}(t) \\ &= -1.2 \text{ [V]} + 1.438 \text{ [V]} \cos(377t - 6.82^\circ) \end{aligned}$$