

ECE 209 — Exam # 3

Estimated time for completion: <1.25 hour
25 November 2014

Rules of the Exam

Rule 1: The examination period begins at 11:00am on Tuesday 25 November 2014 and ends at 12:15pm on Tuesday 25 November 2014.

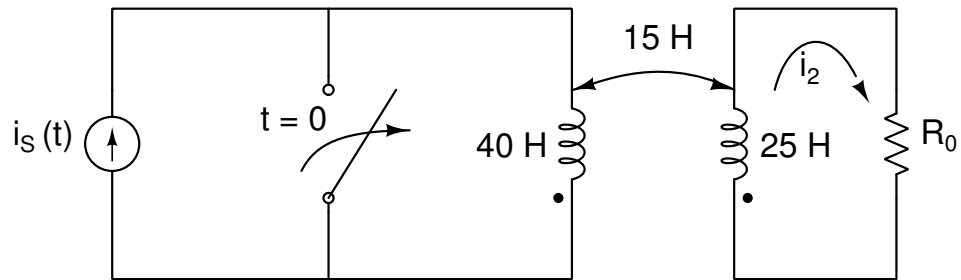
Rule 2: There are five problems plus an extra credit problem.

Rule 3: The exam is closed book and closed notes. You may have an 8.5" x 11" sheet of paper with notes and a calculator.

Rule 4: Show all work and state all assumptions.

Name

Problem 1 (20 points) In the circuit below, the switch has been closed for a very long time and there is no energy stored in the circuit at the time the switch opens.



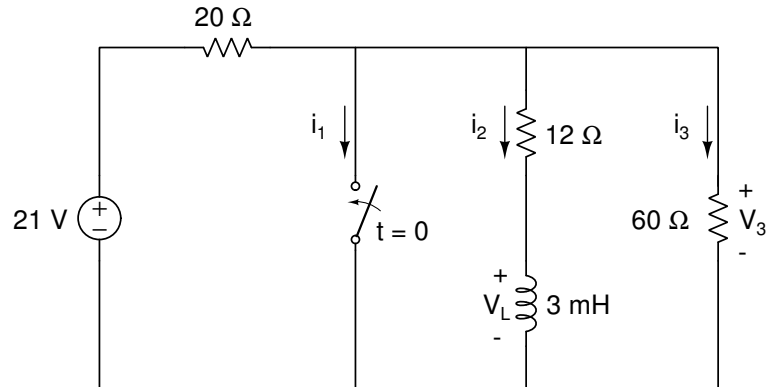
What is $i_2(0^-)$ _____

What is $i_2(0^+)$ _____

For $t \geq 0$, write the differential equation that governs the behavior of $i_2(t)$ _____
 (Note: you do not need to solve the equation)

Problem 2 (20 points)

In the circuit below, the switch has been open for a very long time and closes at $t = 0$.

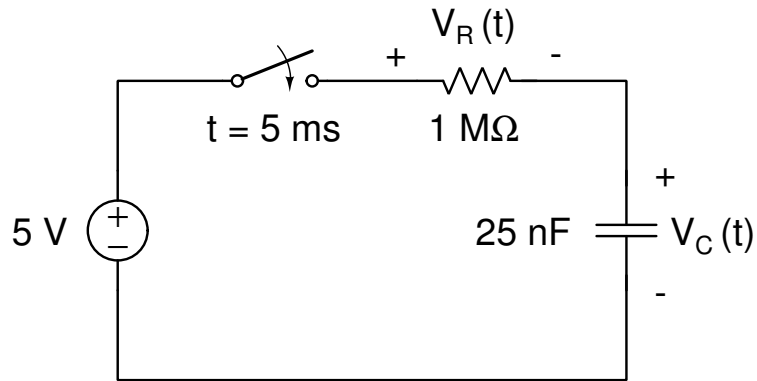


Complete the table below:

$i_1(0^-) =$	$i_1(0^+) =$
$i_2(0^-) =$	$i_2(0^+) =$
$i_3(0^-) =$	$i_3(0^+) =$
$V_L(0^-) =$	$V_L(0^+) =$
$V_3(0^-) =$	$V_3(0^+) =$

Problem 3 (20 points)

Consider the circuit below:



The switch has been open for a very long time and there is no energy stored in the capacitor before the switch closes at $t = 5$ ms.

Write the expression for $V_C(t)$ for $t \geq 5$ ms _____

Write the expression for $V_R(t)$ for $t \geq 5$ ms _____

Problem 4 (20 points)

What is the Phasor representation of the following time-domain signals:

$$v(t) = 4 \cos(2000t + 45^\circ) \text{ V} \quad \underline{\hspace{2cm}}$$

$$i(t) = 25 \sin(3500t + 80^\circ) \text{ mA} \quad \underline{\hspace{2cm}}$$

If the frequency is 5 kHz, what is the time-domain representation of the following Phasor signals:

$$\mathbf{V} = 6 \angle 40^\circ \text{ V} \quad \underline{\hspace{2cm}}$$

$$\mathbf{I} = 21 \angle 65^\circ \text{ A} \quad \underline{\hspace{2cm}}$$

Perform the following operations:

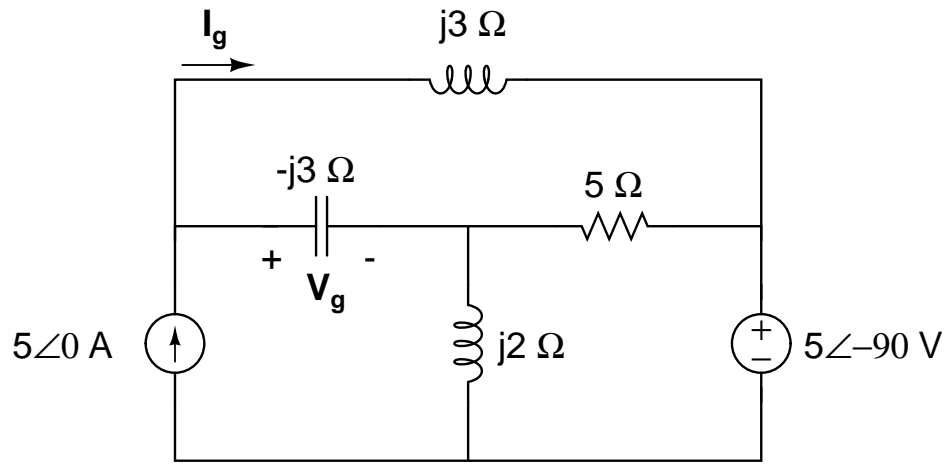
$$2 \angle 45^\circ + 5 = \underline{\hspace{2cm}}$$

$$4 \angle 30^\circ \times 2.5 \angle 40^\circ = \underline{\hspace{2cm}}$$

$$(3 - j8) \times 4 = \underline{\hspace{2cm}}$$

Problem 5 (20 points)

Consider the circuit below:



What is the phasor voltage V_g ? _____

What is the phasor current I_g ? _____

Problem 6. (15 points – extra credit)

Draw the Thévenin Equivalent circuit at terminals “A” and “B” for the circuit below:

