ECE 209 — Final Exam

Estimated time for completion: <120 minutes
15 December 2015

Rules of the Exam

Rule 1: The examination period begins at 12:15pm on Tuesday 15 December 2015 and ends at 2:15pm on Tuesday 15 December 2015.

Rule 2: There are four problems.

Rule 3: Show all work and state all assumptions. Make sure to include the units along with a numerical answer.

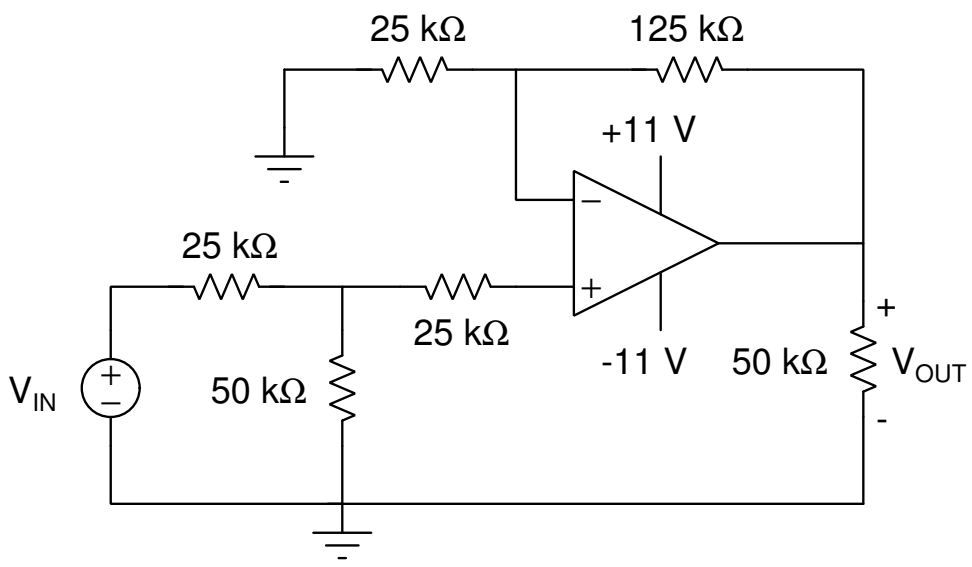
Rule 4: The exam is closed book and closed notes. You may have an 8.5" x 11" sheet of paper with notes. You may use a calculator.

_____

Name

Problem 1 (25 points)

Consider the ideal Op Amp circuit below:



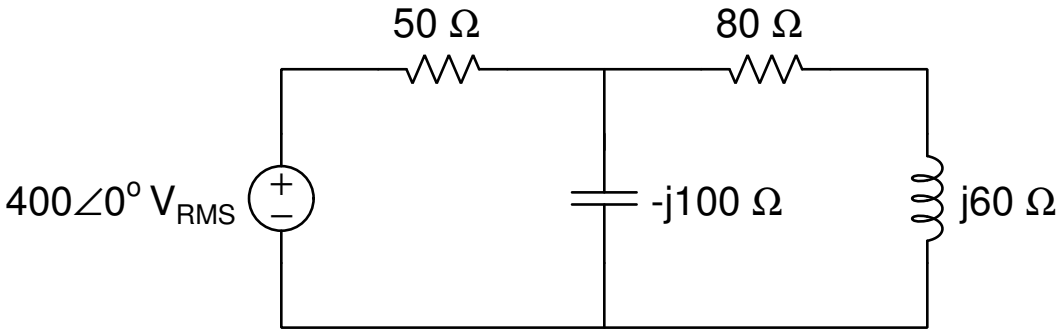
Part A: Derive the expression for V_{OUT} as a function of V_{IN}: _____

Part B: Complete the table below:

V_{IN}	V_{OUT}
-6 V	
-3 V	
0 V	
3 V	
6 V	

Problem 2 (25 points)

Consider the circuit below:



What is the average real power associated with the voltage source? _____

What is the reactive power associated with the voltage source? _____

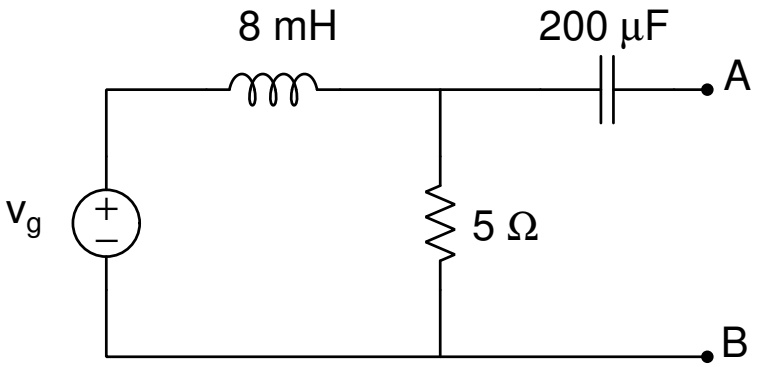
Does the voltage source deliver or absorb average real power? _____

What is the average real power associated with the $j60\Omega$ inductor? _____

What is the reactive power associated with the $j60\Omega$ inductor? _____

Problem 3 (25 points)

In the circuit below, $V_g = 150cos(100\pi t - 45°)$ V.

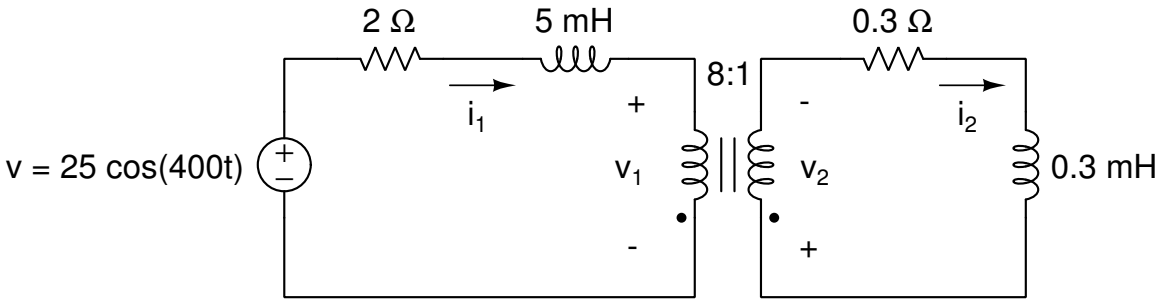


Part A: Draw the Phasor (frequency domain) representation of the circuit

Part B: Draw the Thévenin equivalent circuit at terminals **A** and **B**

Problem 4 (25 points)

For the ideal transformer circuit shown below, derive the equations needed to calculate $i_1(t)$, $i_2(t)$, $v_1(t)$, and $v_2(t)$. For extra credit, solve the equations.



Equations needed to calculate $i_1(t)$, $i_2(t)$, $v_1(t)$, and $v_2(t)$.

Extra Credit:

$i_1(t) =$ _____

$i_2(t) =$ _____

$v_1(t) =$ _____

$v_2(t) =$ _____

Name: _____

Name: _____

Name: _____