# ECE 209 — Exam # 2

Estimated time for completion: <1.25 hour
28 October 2014

Rules of the Exam

**Rule 1**: The examination period begins at 11:00am on Tuesday 28 October 2014 and ends at 12:15pm on Tuesday 28 October 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.

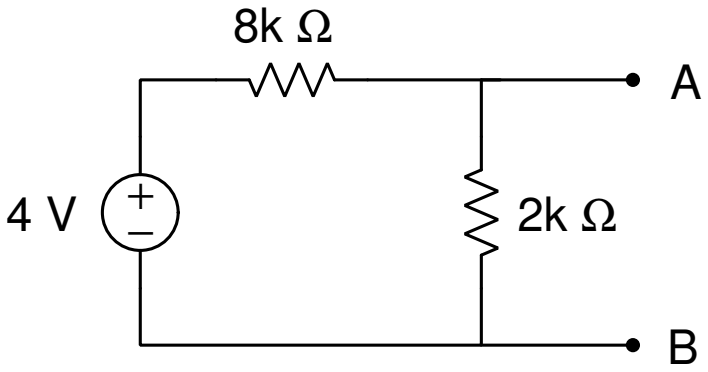
**Rule 4**: Show all work and state all assumptions.

_____

Name

**Problem 1** (30 points)

Consider the circuit below:




**Part A:** Draw the Thévenin equivalent circuit with respect to terminals A and B. Label the values of the circuit components.

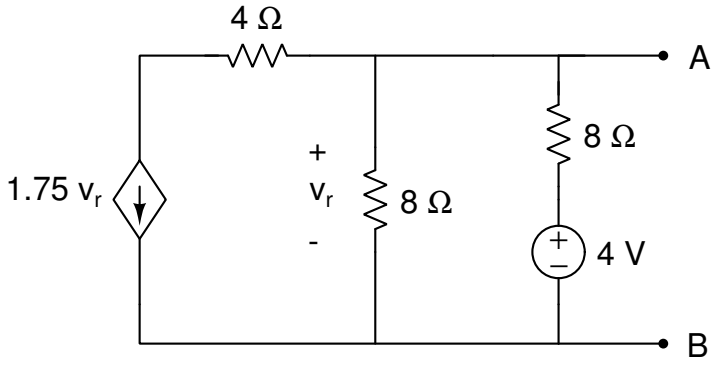
**Part B:** Draw the Norton equivalent circuit with respect to terminals A and B. Label the values of the circuit components.

**Part C:** A load resistor $R_L$ is placed between terminals A and B:
What value of $R_L$ produces maximum power transfer to the load? _____

What is the maximum power dissipated by $R_L$? _____

**Problem 2** (15 points)

Consider the circuit below:

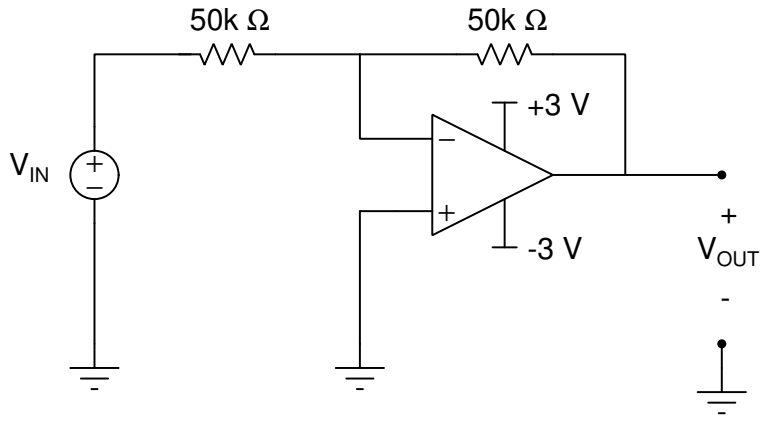



**Part A:** Draw the Thévenin equivalent circuit with respect to terminals A and B. Label the values of the circuit components.

**Part B:** Draw the Norton equivalent circuit with respect to terminals A and B. Label the values of the circuit components.

**Problem 3** (25 points)

Consider the ideal Op Amp circuit below:



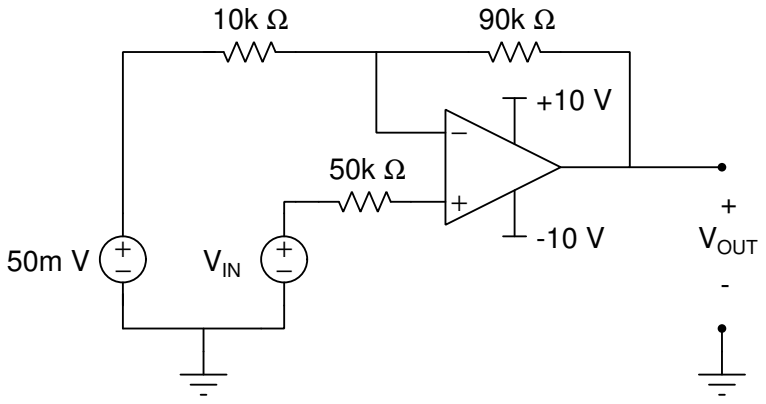

Derive an expression relating $V_{OUT}$ as a function of $V_{IN}$: _____

Complete the table below:

| $V_{IN}$ | $V_{OUT}$ |
|---|---|
| -5.0 V | |
| -2.5 V | |
| 0 V | |
| 2.5 V | |
| 5.0 V | |

**Problem 4** (10 points)

Consider the ideal Op Amp circuit below:



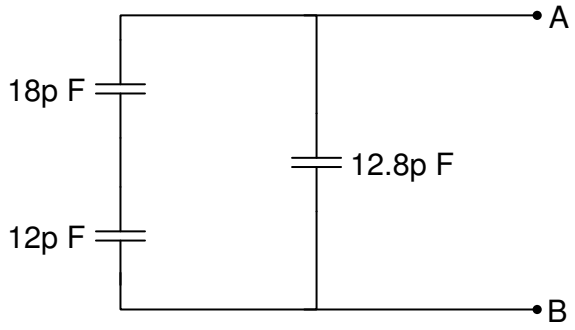

Derive an expression relating $V_{OUT}$ as a function of $V_{IN}$: _____

Complete the table below:

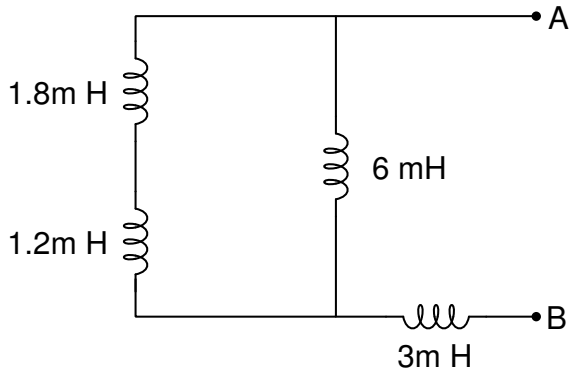
| $V_{IN}$ | $V_{OUT}$ |
|---|---|
| -1.0 V | |
| -0.5 V | |
| 0 V | |
| 0.5 V | |
| 1.0 V | |

**Problem 5** (20 points)

What is the equivalent capacitance between terminals A and B? _____

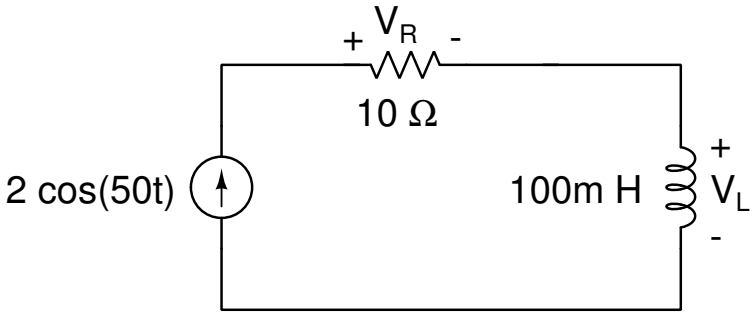



What is the equivalent inductance between terminals A and B? _____



**Problem 6** (10 points – extra credit)

Consider the circuit shown below:




What is $V_R$? _____

What is $V_L$? _____