ECE 209 — Exam # 1

Estimated time for completion: <50 minutes
4 February 2015

Rules of the Exam

Rule 1: The examination period begins at 1:10pm on Wednesday 4 February 2015 and ends at 2:00pm on Wednesday 4 February 2015.

Rule 2: There are four problems plus one bonus problem.

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.

Rule 5: Please put your name on each page of the exam.

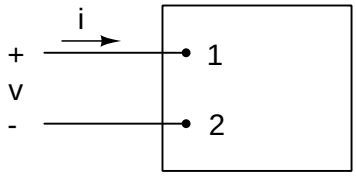
_____

Name

Name: _____

Problem 1 (20 points)

Consider the circuit below:



Ideal Basic Circuit Element

For $t < 0$, the voltage and current at the terminals are both zero. For $t > 0$, the voltage and current are given by:

$$v(t) = 50(e^{-1600t} - e^{-400t}) \text{ V}$$

$$i(t) = 20(e^{-1600t} - e^{-400t}) \text{ mA}$$

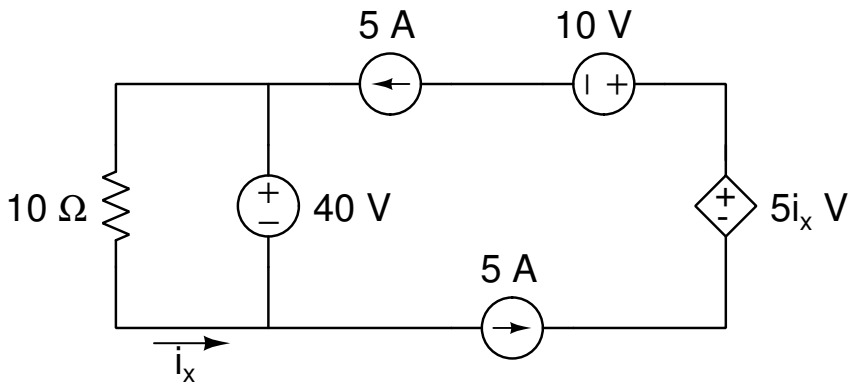
What is the power dissipated by the circuit at $t = 625\mu$s? _____

What is the total energy delivered to the circuit element? _____

Name: _____

Problem 2 (30 points)

Consider the circuit below:



Is the interconnection valid (yes/no)? _____

If the circuit is valid:

How much power is dissipated by the 10Ω resistor? _____

How much power is associated with the dependent voltage source? _____

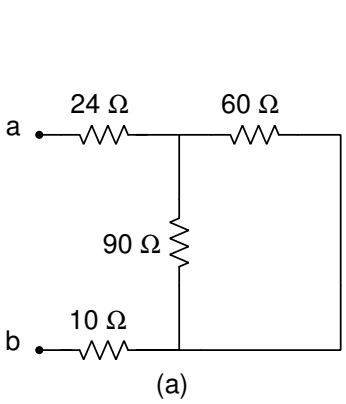
Does the dependent voltage source absorb or generate power? _____

If the circuit is not valid, explain why:

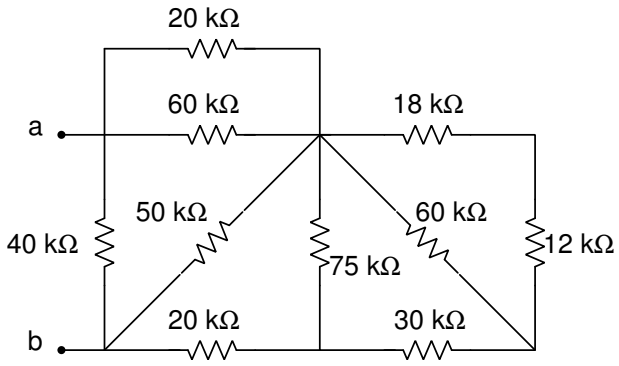
Name: _____

Problem 3 (30 points)

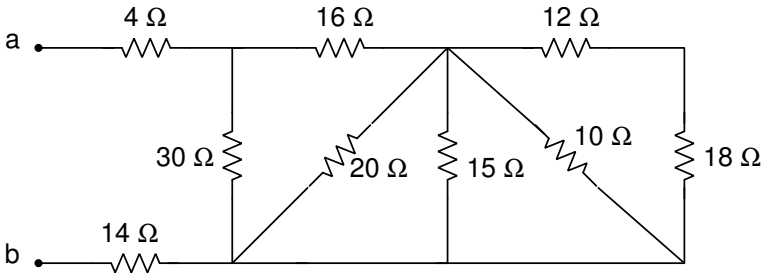
For each circuit below, calculate R_{ab}, the equivalent resistance between terminal a and terminal b:



(a)



(b)



(c)

R_{ab} for circuit (a): _____

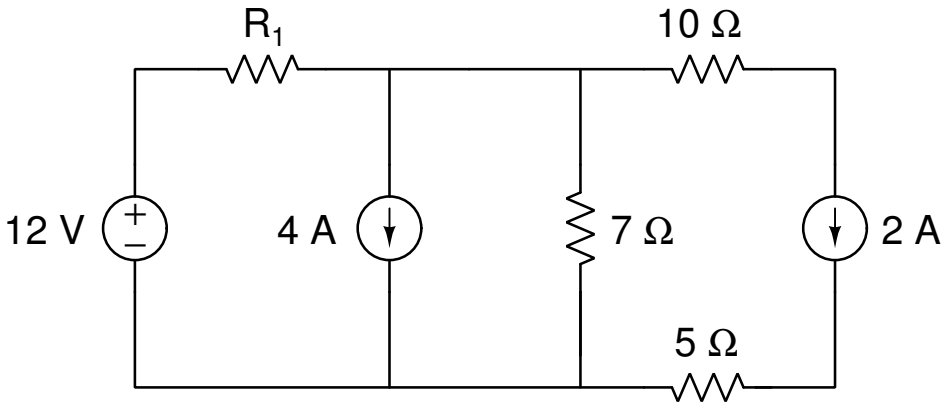
R_{ab} for circuit (b): _____

R_{ab} for circuit (c): _____

Name: _____

Problem 4 (20 points)

In the circuit below, the 4 A source delivers no power and absorbs no power. Determine the value of R_1 and the amount of power generated by the 2 A source.



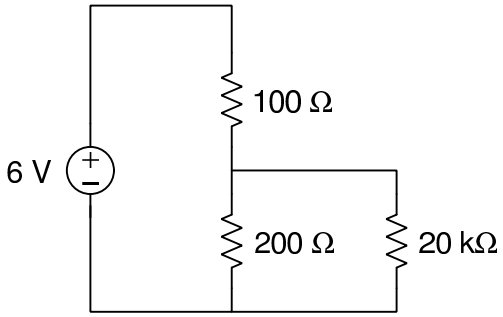
R_1 = _____

Power generated by the 2 A source = _____

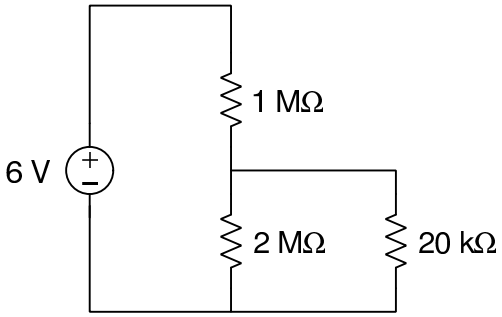
Name: _____

Bonus Problem (10 points)

Consider the circuits below. Assume all components are ideal.



Circuit A



Circuit B

Is the absolute value of the voltage across the 20 kΩ resistor in "Circuit A" *greater than*, *less than*, or *equal to* that across the 20 kΩ resistor in "Circuit B?" Explain.