

# ECE 209 — Exam # 1

Estimated time for completion: <1.25 hour  
30 September 2014

## Rules of the Exam

**Rule 1:** The examination period begins at 11:00am on Tuesday 30 September 2014 and ends at 12:15pm on Tuesday 30 September 2014.

**Rule 2:** There are four problems.

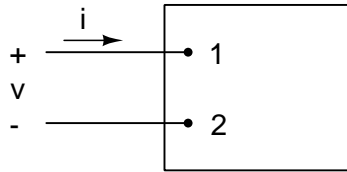
**Rule 3:** The exam is closed book and closed notes. You may have an 8.5" x 11" sheet of paper with notes and a calculator.

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Name

**Problem 1** (20 points)

In the circuit below, the current entering the upper terminal is:  $i(t) = 20\cos(5000t)$  A.



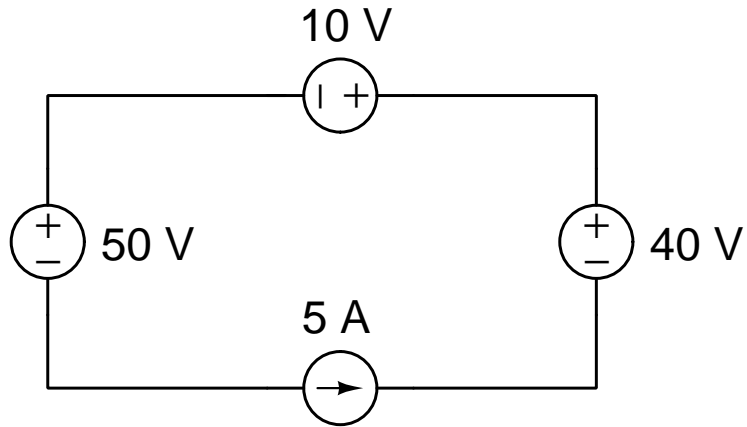
Ideal Basic Circuit Element

Assume the charge at the upper terminal is zero at the instant the current is passing through its maximum value. What is the expression of  $q(t)$ ? Make sure you include the units.

For reference:  $i(t) = \frac{dq(t)}{dt}$ .

**Problem 2** (20 points)

Consider the circuit below:



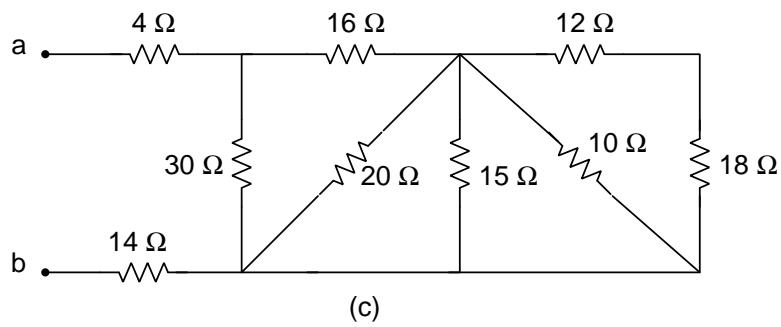
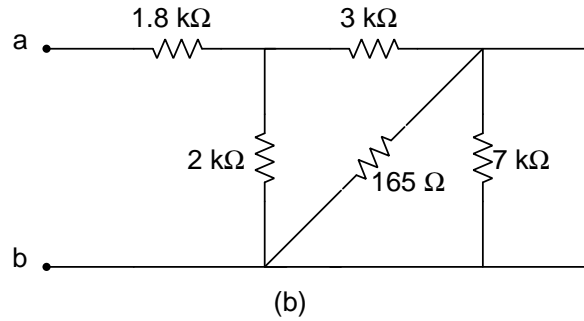
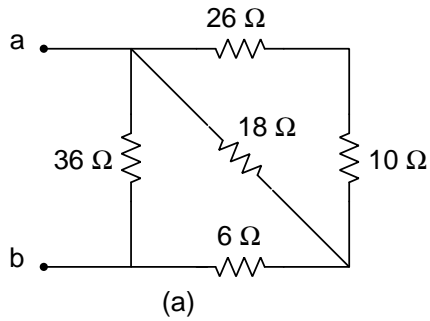
Is the interconnection valid (yes/no)? \_\_\_\_\_

If the circuit is valid, what is the total power generated by the circuit? \_\_\_\_\_

If the circuit is not valid, explain why:

**Problem 3** (30 points)

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



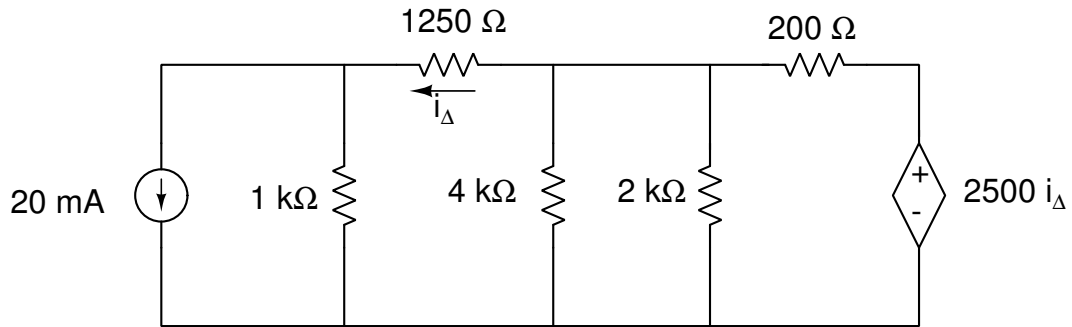
$R_{ab}$  for circuit (a): \_\_\_\_\_

$R_{ab}$  for circuit (b): \_\_\_\_\_

$R_{ab}$  for circuit (c): \_\_\_\_\_

**Problem 4** (30 points)

In the circuit shown below, calculate the power associated with each circuit component, the total power generated and the total power dissipated (or absorbed).



Power associated with the 20 mA independent source? \_\_\_\_\_

Power associated with the  $2500i_{\Delta}$  dependent source? \_\_\_\_\_

Power associated with the  $1250\Omega$  resistor? \_\_\_\_\_

Power associated with the  $200\Omega$  resistor? \_\_\_\_\_

Power associated with the  $1k\Omega$  resistor? \_\_\_\_\_

Power associated with the  $2k\Omega$  resistor? \_\_\_\_\_

Power associated with the  $4k\Omega$  resistor? \_\_\_\_\_

How much power is generated in the circuit? \_\_\_\_\_

How much power is dissipated or absorbed in the circuit? \_\_\_\_\_