Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (please print)

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Section (underline one): Trombetta Shattuck

ECE 2300 – Exam #1

February 25, 2012

Keep this exam closed and face up until you are told to begin.

1. This exam is closed book, closed notes. You may use one 8.5” x 11” crib sheet, or its equivalent.

2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.

3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**

4. Show all units in solutions, intermediate results, and figures. Units in the exam will be included between square brackets.

5. Do not use red ink. Do not use red pencil.

6. You will have 90 minutes to work on this quiz.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/35

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/35

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/30

Total\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/100

Room for extra work

1. (35 points) In the circuit below, the voltmeter VM1 is a d’Arsonval-based voltmeter with an equivalent resistance of 200 [k]. It was constructed from a d’Arsonval meter movement rated at 100 [mV] and 2.5 [mA]. For this circuit, do the following.

a) Find the power delivered to the circuit by the voltage source *vS1*;

b) Find the power delivered to the circuit by the dependent current source.



Room for extra work

2. (35 points) The device shown in Figure 1 below can be modeled by a voltage source in series with a resistance. Figure 2 shows the relationship between the current *iA* and the voltage *vA* at the terminals of this device. Three identical copies of the device are connected into the circuit shown in Figure 3. The devices are connected so that terminal A of each device is connected to A1, A2, or A3. For the circuit in Figure 3, do the following.



a) Find the voltage *vX*.

b) Find the current *iX*.



Room for extra work

3. (30 points) A student wishes to measure the current ix in the circuit of Figure 1. To do this she uses the d’Arsonval meter movement shown in Figure 2. She measures ix using two methods. In method #1, she constructs a d’Arsonval-based voltmeter with a full-scale reading of 50 [V]. She uses this to measure *vX*, and then divides the result by RX to get the current. In method #2, she uses the same d’Arsonval meter movement to construct an ammeter with a full-scale reading of 2 [mA], and uses this to measure *iX* directly.

What is the percent error in measuring *iX* in each case? To calculate error, use the formula below, where “actual current” refers to the value of *iX* with no meter. Keep at least four significant figures in your work.



Room for extra work