Name:	Major: ☐ ELEC ☐ CSEN

ECEG 201 – Homework 03

Due on 2020-01-31

All of your answers should be given in engineering format, using the correct symbols for the unit and prefix. If you round an answer, keep at least three correct significant digits. Show your work for calculations.

1. A particular voltmeter has a $3\frac{1}{2}$ digit display, meaning that the largest numerical value that can be displayed is 1999. When used on the $20\,\mathrm{V}$ range, the meter has a specified uncertainty of 0.3% of the range plus 0.2% of the reading.

   (a) What is the voltage resolution of the meter in this case?

   (b) What is the uncertainty in a reading of $2.50\,\mathrm{V}$?

   (c) What is the uncertainty in a reading of $12.00\,\mathrm{V}$?

2. A particular ohmmeter has a 3 digit display, meaning that the largest numerical value that can be displayed is 999. When used on the $100\,\mathrm{k\Omega}$ range, the meter has a specified uncertainty of 0.4% of the range plus 5 counts.

   (a) What is the resistance resolution of the meter in this case?

   (b) What is the uncertainty in a reading of $11.0\,\mathrm{k\Omega}$?

   (c) What is the uncertainty in a reading of $81.0\,\mathrm{k\Omega}$?

3. Suppose that we have an ideal voltage source of exactly $5\,\mathrm{V}$ and two ideal resistors of exactly $100\,\mathrm{k\Omega}$. We connect all three of these elements in series. Using KVL and Ohm's Law we can calculate that a voltage of exactly $2.5\,\mathrm{V}$ should appear across both resistors.

   Suppose you measure the voltage across one of the resistors using a 4-digit digital voltmeter. If the meter was ideal you would expect a reading of $2.500\,\mathrm{V}$.

   (a) If voltmeter has an input resistance of $1\,\mathrm{M\Omega}$, what would be the displayed voltage value? What is the percentage error for this case?

   (b) If voltmeter has an input resistance of $10\,\mathrm{M\Omega}$, what would be the displayed voltage value? What is the percentage error for this case?