

## 2.3.2: Series and Parallel Resistances and Circuit Reduction

### Overview:

In this lab assignment, we will perform some simple design-related exercises. Specifically, we will design resistive networks, composed of the available fixed resistors, to provide specified resistances.

#### Before beginning this lab, you should be able to:

- State Ohm's law
- Determine the equivalent resistance of series and parallel resistive networks
- State the voltage divider and current divider formulae
- Use a digital multimeter to measure resistance, voltage, and current
- Use the Analog Discovery's waveform generator to apply constant voltages
- Use the Analog Discovery oscilloscope to measure a constant voltage
- Use color codes on resistors to determine the resistor's nominal resistance

#### After completing this lab, you should be able to:

- Measure the equivalent resistance of a resistive network
- Measure the voltage and/or current in a resistor in a series or parallel resistance combination

#### This lab exercise requires:

- Digilent Analog Parts Kit
- Digital multimeter

### Symbol Key:

- DEMO** Demonstrate circuit operation to teaching assistant; teaching assistant should initial lab notebook and grade sheet, indicating that circuit operation is acceptable.
- ANALYSIS** Analysis; include principle results of analysis in laboratory report.
- SIM** Numerical simulation (using PSPICE or MATLAB as indicated); include results of MATLAB numerical analysis and/or simulation in laboratory report.
- DATA** Record data in your lab notebook.

### General Discussion:

We need resistors with the following resistance values and tolerances:

1.  $9\text{K}\Omega \pm 5\%$
2.  $800\Omega \pm 5\%$
3.  $35\text{K}\Omega \pm 5\%$

Resistors with these resistances are not included in the analog parts kit; we will use available fixed resistors to construct circuits with the required equivalent resistance.

### Pre-lab:

**ANALYSIS** Using only fixed-value resistors available in your analog parts kit, design circuits which have the equivalent resistances listed above.

### Lab Procedures:

- DATA** 1. Construct the three circuits you designed in the pre-lab. Use an ohmmeter to measure the equivalent resistance of each of the circuits. Comment on your results – specifically, whether the design requirements were met.
- DEMO** 2. Demonstrate operation of your circuit to the Teaching Assistant. Have the TA initial the appropriate page(s) of your lab notebook and the lab checklist.

### Note:

As always, measure and record the resistance of the individual resistors used in your circuits.