Module 06 Homework

1. Assume you have a $1.12\,\text{k}\Omega$, a $3.83\,\text{k}\Omega$, and a $6.91\,\text{k}\Omega$ resistor.
    1. What is the smallest effective resistance you could obtain by connecting these three resistors together?
    2. What is the largest effective resistance you could obtain by connecting these three resistors together?
    3. Is it possible to connect the resistors together in such a way that the effective resistance is between $1.12\,\text{k}\Omega$ and $3.83\,\text{k}\Omega$? If so, what are the possible resistances that could be obtained?
2. For this question, consider Figure 3. Assume you all resistors have the same resistance and that the two EMF's have the same voltage.
    1. Consider resistors 1 and 2 in circuit A, which would have more current running through them?
    2. Consider resistors 1 in circuits A and B, which would have a larger voltage across it?
3. Consider the circuit pictured in Figure 1 with five resistors connected together. Assume that all 5 resistors have the same resistance and an emf is connected to the circuit across points a and b. Which resistor(s) will have the smallest current running through it?
4. Consider the circuit pictured in Figure 1 with five resistors connected together. Assume that $R_1 = 1\,\Omega$, $R_2 = 2\,\Omega$, $R_3 = 3\,\Omega$, $R_4 = 4\,\Omega$, and $R_5 = 5\,\Omega$.
    1. A $20\,\text{V}$ emf is connected to points a and b. How much current will run through each resistor?
    2. A $20\,\text{V}$ emf is connected to points c and d. How much current will run through each resistor?
5. For this question, consider Figure 4. Assume that $r_1 = 1\,\Omega$, $r_1 = 1\,\Omega$, $r_2 = 1\,\Omega$, $R_1 = 2\,\Omega$, $R_2 = 2\,\Omega$, $R_3 = 2\,\Omega$, $\mathcal{E}_1 = 10\,\text{V}$, and $\mathcal{E}_2 = 20\,\text{V}$. Determine the current that runs through and the voltage across each resistor.
6. Two $3.00\,\Omega$ resistors are connected to a $9.00\,\text{V}$ battery (in parallel) that has an internal resistance of $1.00\,\Omega$.
    1. How much power is dissipated by each resistor?
    2. How much power is dissipated by the internal resistance of the battery?
    3. What is the potential difference across the terminals of the battery?
7. Consider the circuit shown in Figure 2. Assume that $\mathcal{E} = 10.00\,\text{V}$, $r = 1.00\,\Omega$, and $R_1 = 10.00\,\Omega$. When the switch is closed, the current through the *emf* doubles. What is the resistance of R_2?
8. **Example Problem Writeup:** Two resistors are connected to a $2.00 \times 10^1\,\text{V}$ power supply and draw a $1.00\,\text{A}$ current. If the potential difference across one of the resistors is $2.00\,\text{V}$, what is the resistance of the two resistors?

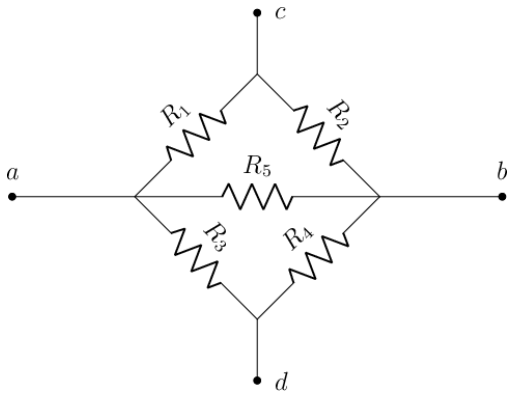

Figure 1: A portion of a circuit containing 5 resistors.

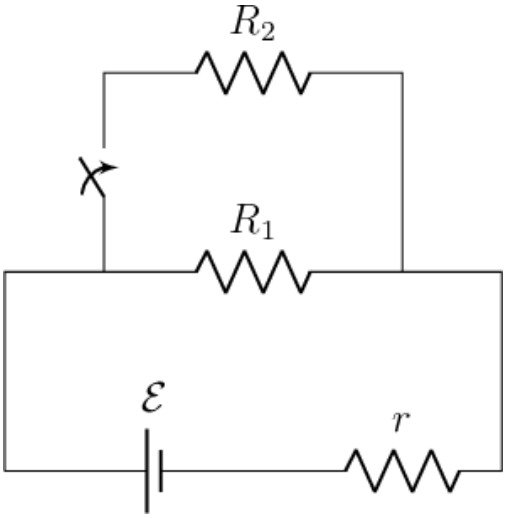

Figure 2:

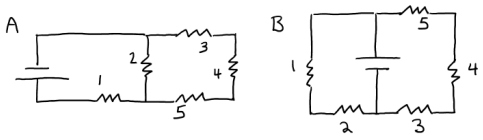

Figure 3:

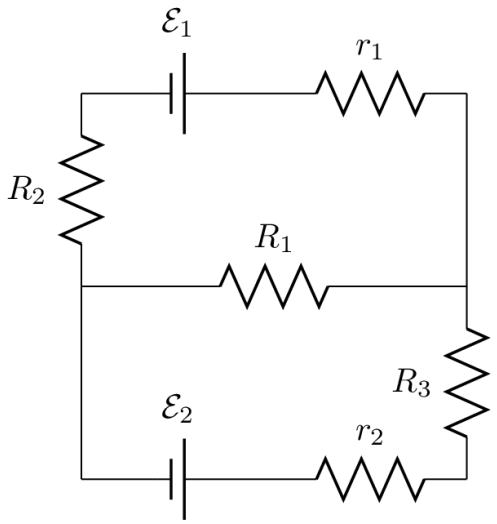

Figure 4: