EQUIVALENT CIRCUITS

Just as networks of resistors between two nodes may be replaced by a single equivalent resistance, entire circuits can be replaced by a combination of a single resistor and an ideal power source in two ways.

1. **Thevenin Equivalent Circuits**

   Construct, in your own words, a step by step method of finding the Thevenin equivalent voltage and resistance. Include an example circuit diagram. (Acknowledge the resources you use.)

2. **Norton Equivalent Circuits**

   Construct, in your own words, a step by step method of finding the Norton equivalent current and resistance. Include an example circuit diagram. (Acknowledge the resources you use.)

3. **Exercises**

   Find the Thevenin and Norton equivalent circuits for terminals A and B of circuits (a) and (b) in Figure 4.

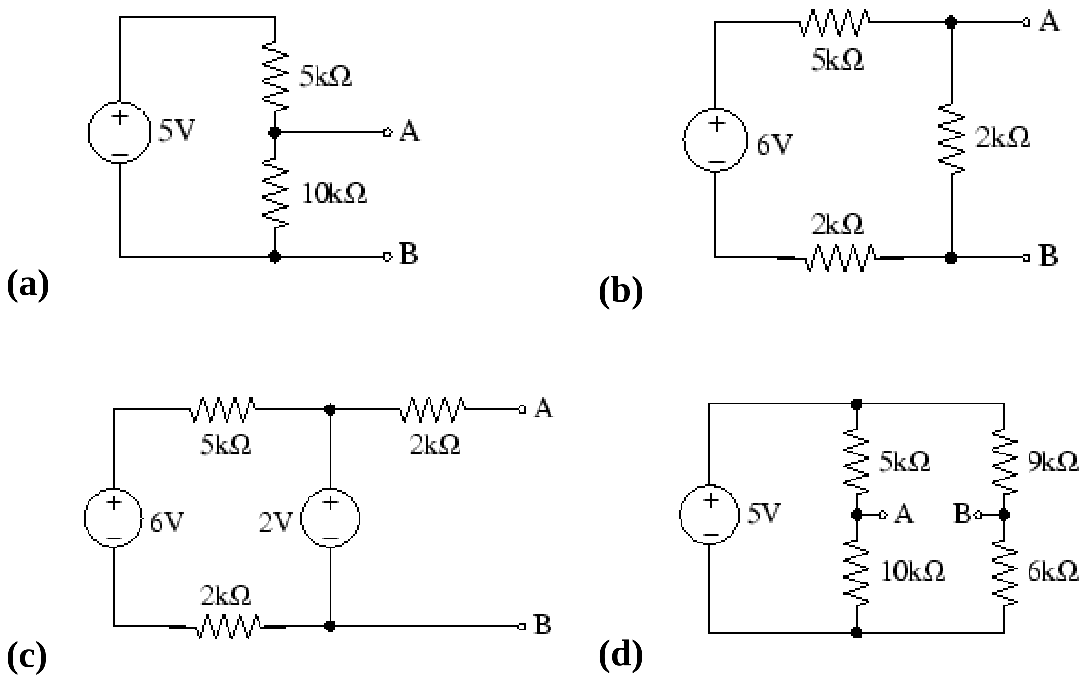

Figure 4: Circuits to be replaced with Thevenin and Norton equivalent circuits for terminals A and B.

4. **Experiment**

Build the circuit shown in Figure 4(a), and check your predictions for the voltage across and current through a 500 Ω load resistor.

Appendix: Resistor Color Codes

Most resistors you will encounter are marked with a set of bands, according to a standard color code, which you can use to determine their resistances.

There are ten colors corresponding to numerical digits 0-9 (see the table below), and gold and silver bands indicating 5% and 10% accuracy in the coded resistance, respectively. Starting at the far end of the resistor from the gold/silver band, the first two bands are the first two digits in the resistance. The third band gives the power of ten by which you multiply the first two digits to obtain the resistance.

color	black	brown	red	orange	yellow	green	blue	violet	gray	white	
digit	0	1	2	3	4	5	6	7	8	9	
multiplier	1	10	100	1k	10k	100k	1M	10M	100M	1000M	

$$R = [band1][band2] \times 10^{[band3]} \pm 5\%(gold) \quad (2)$$

$$\pm 10\%(silver)$$

For example, Blue Yellow Red Gold

gives $R = 64 \times 10^2\ \Omega = 64 \times 100\ \Omega = 6400\ \Omega$ with a tolerance of 5%, or $320\ \Omega$.

Source: http://webpages.ursinus.edu/lriley/ref/circuits/node2.html