

Electrical Circuits LAB #3 - Voltage and Current Dividers

Objectives

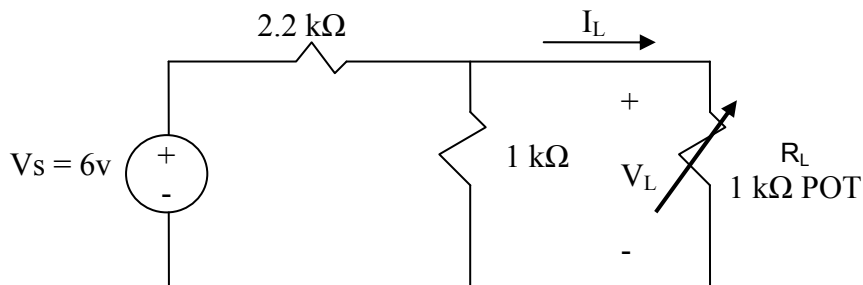
Understand and apply voltage/current dividers concepts.

Material

- Textbook: Electrical Circuits by Nilsson & Lecture material
- www.EngrCS.com
- Instruments: Power Supply & Multimeter
- Supplies:
 - Electrical Tool Box
 - Proto Board
 - Probes & Connecting Cables
 - 1 kΩ Potentiometer
 - Available Resistors

Experiment 1

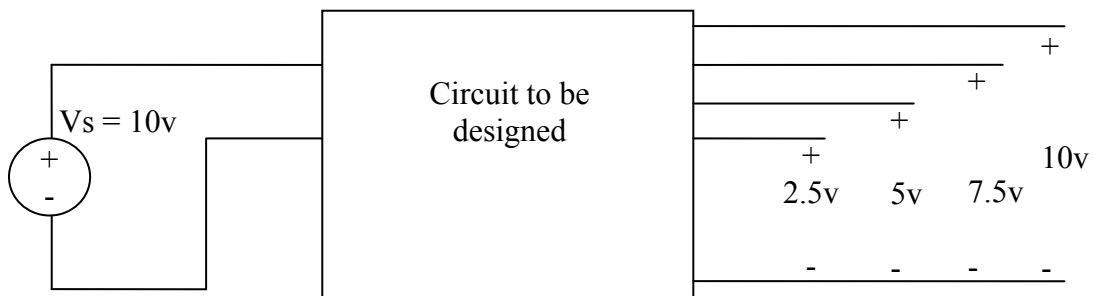
- a) For the following circuit, write the equation for I_L and V_L in terms of R_L . Plot the V_L vs. I_L as R_L changes from 0 to 1 kΩ.



- b) Implement the above circuit and measure the values of I_L and V_L for $R_L=100, 400, 600$ and 800Ω . Plot these data point on the plot from part a. It is important that you chose distinct representation for each point.
- c) Quantify the difference between the measured and calculated values in percentage error and explain how to mitigate the errors.

Experiment 2

- a) Using the available fixed resistors in the lab and a 10 v power supply, design a circuit that outputs 2.5v, 5v and 7.5v and 10v at no load. {10% tolerance is acceptable}

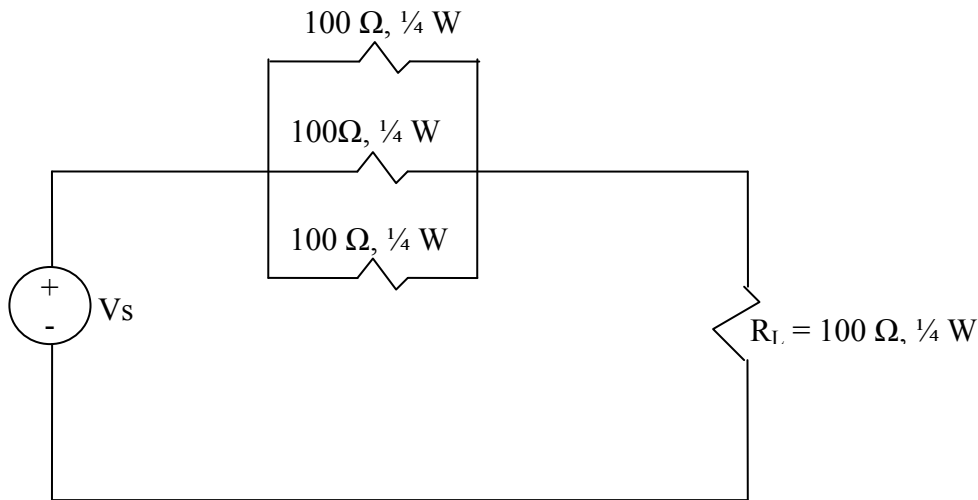


- b) Add a 10K load to each of the output ports. Calculate the percent difference between voltages of each when loaded and when unloaded.
- c) Describe how you would be able to reduce the percentage change observed in the part b.

Experiment 3

Power calculations are important considerations in component selection. For example resistors are available with power dissipation of 0.25 Watts (Diameter of 2 mm), 0.5 Watts (Diameter of 3 mm) and 2 Watts (Diameter of 5 mm), selecting an incorrect type may lead to catastrophic failure. This experiment demonstrates one type of failure in resistors.

- a) Implement the following circuit with V_s increasing from 2 to 20 volts in 3-volt steps. Calculate the power delivered to R_L at each V_s setting. Observe physical changes in R_L and stop at the first sign of any physical change in R_L . {USE CAUTION WHEN TOUCHING R_L }



- b) Explain your observations of physical changes and their correlation to R_L 's current, voltage and power.
- c) Explain the reason for the three parallel $100\ \Omega$ resistors not being affected the same way as R_L ? Support your reason with data.

Report Requirements

Reports must be prepared individually even if the experiments are performed as a team. All reports must be computer printed (formulas and diagrams may be hand drawn) and at minimum:

For each experiment include:

- a) Clear problem statement; specify items given and to be found
- b) Theory and process used
- c) Resulting circuit diagram, tables, graphs, calculations and other results

For the overall report include:

- a) Cover sheet with your name, lab, date of completion and team members' names
- b) Lessons learned from this lab
- c) A new experiment and expected results which provide additional opportunity to practice the concepts in this lab