EECS 16A Designing Information Devices and Systems I
Summer 2017 D. Aranki, F. Maksimovic, V. Swamy Discussion 4A

1. Jumpstarting a Car

Your discussion TA left their lights on, and their car won't start. Lucky for them, a friendly former Governator happened to be driving by, and he has a few minutes to help.

(a) Given two cables (one red and one black), connect your TA's battery to the governor's.

(b) A fully charged car battery has a voltage of 12 V across its terminals. Your TA's battery is measuring a measly voltage of 10 V. What will happen when you connect the two?

(c) Your TA's car draws 100 A when you turn the ignition. Describe what happens if:

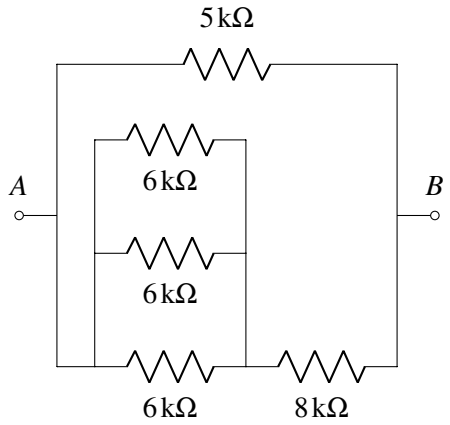
i. Immediately after connecting the two batteries, you attempt to start the car.

ii. You wait a long time between connecting the two batteries and then attempt to start the car.

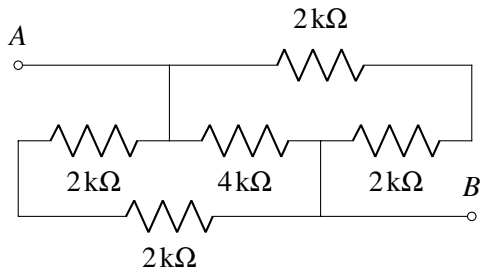
2. Series and Parallel Combinations

For the resistor networks shown below, find an equivalent resistance between the terminals A and B using the resistor combination rules for series and parallel resistors.

(a)

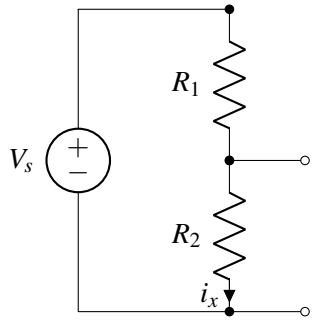


(b)

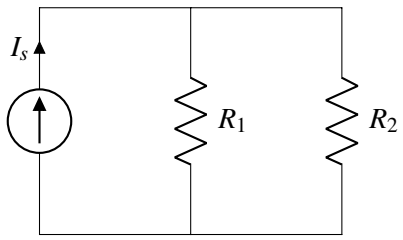


3. Voltage and Current Dividers

(a) For the circuit below, find the voltage V_{out} in terms of the resistances R_1, R_2, and V_s.

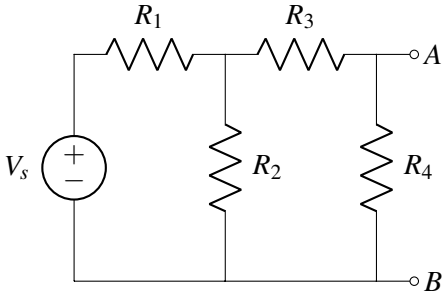


(b) For the circuit below, find the current through R_2.



4. KVL and KCL

For the circuit shown below, $V_s = 5\,\text{V}$, $R_1 = R_2 = 4\,\text{k}\Omega$ and $R_3 = R_4 = 2\,\text{k}\Omega$.



(a) For the circuit above, write KVL equations for each loop and KVL equations for each node.

(b) Solve for the voltage between A and B using resistor combination rules and divider rules.