

**Homework Assignment #2**

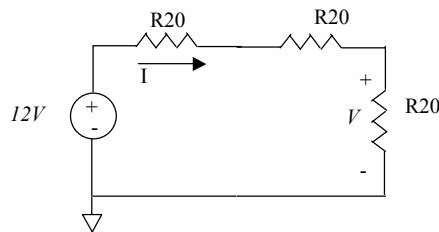
Due at 11 AM in 240 Cory on Friday, 9/12/03

\* Be sure to put your name and section number on your paper

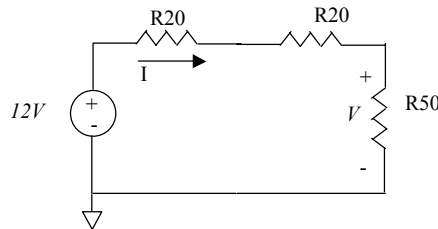
**Problem 1: Circuit model of practical system**

Incandescent light bulbs (modeled electrically as resistors) used in automobiles are designed to work with a 12 Volt dc voltage supply.

- Consider an interior light bulb that is rated for 20W operation. What is its resistance? What is the resistance of a light bulb that is rated for 50W operation?
- If three of the 20W bulbs are connected in series, as shown in the circuit below, find  $I$  and  $V$ . What is the power dissipated in each bulb?



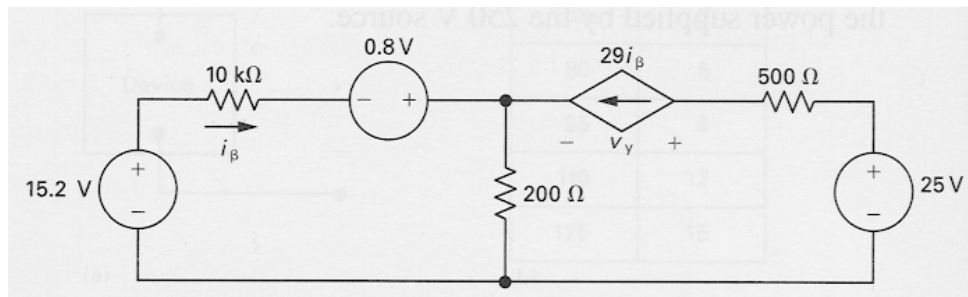
- Suppose a 50W bulb is used in place of one of the 20W bulbs. Find  $I$  and  $V$ . What is the power dissipated in the 50W bulb?



**Problem 2: Analysis of a circuit with dependent sources (using KCL and KVL)**

(Problem in 2.25 in the textbook)

- Find the voltage  $v_y$  in the circuit below.



- Show that the total power generated in the circuit equals the total power absorbed.

**Problem 3: Equivalent Resistance**

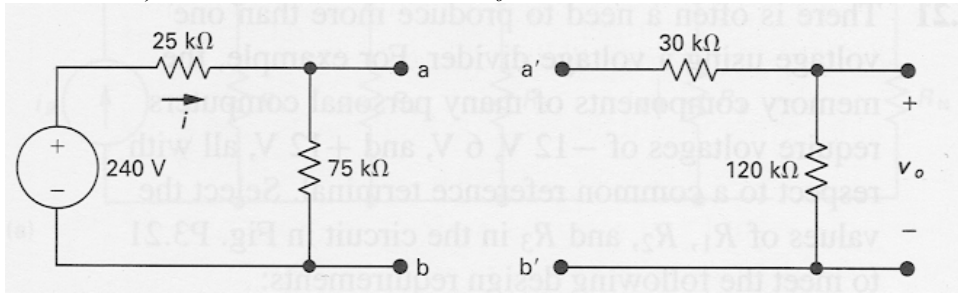
(Problem 3.5, abbreviated, in the textbook)

- Find an expression for the equivalent resistance of two resistors of value  $R$  in parallel.
- Find an expression for the equivalent resistance of  $n$  resistors of value  $R$  in parallel.
- Using your result in (b), design a resistive network with an equivalent resistance of  $5.5 \text{ k}\Omega$  using  $2 \text{ k}\Omega$  resistors.

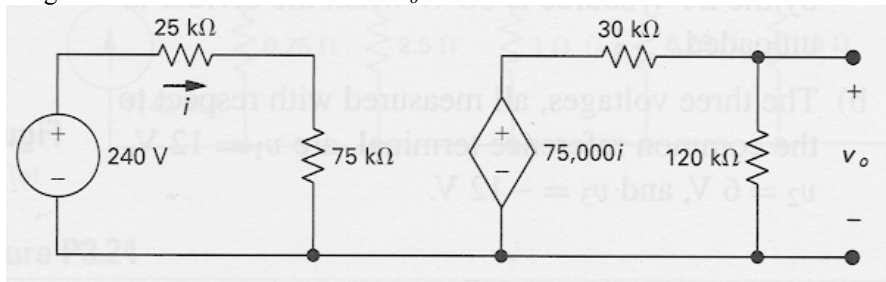
**Problem 4: Voltage-Divider Circuit**

(Problem 3.17 in the textbook)

- a) The voltage divider shown below on the left is loaded with a second voltage divider shown below on the right; that is, a is connected to a', and b is connected to b'. Find  $v_o$ .



- b) Now assume that the second voltage divider is instead connected to the voltage divider by means of a current-controlled voltage source as shown below. Find  $v_o$ .



- c) What effect does adding the dependent-voltage source have on the operation of the voltage divider that is connected to the 240V source?

**Problem 5: Current-Divider Circuit**

Find the current  $i^*$  in terms of  $I$ , in the circuit below.

