

Homework Assignment #2

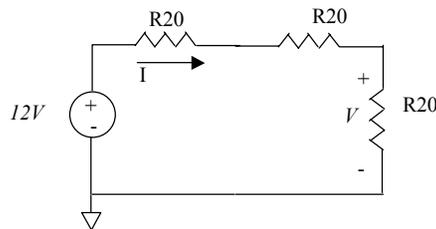
Due at 11 AM in 240 Cory on Friday, 9/12/03

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

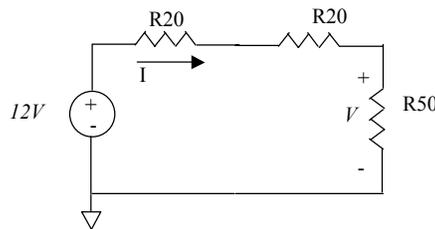
Problem 1: Circuit model of practical system

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

- a) 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?
- b) 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?



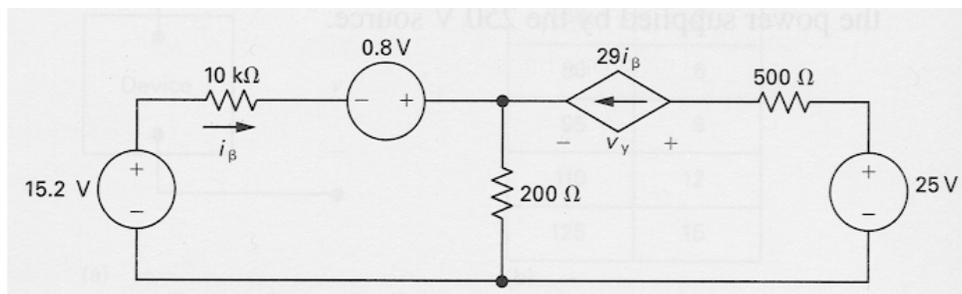
- c) Suppose a 50W bulb is used in place of one of the 20W bulbs. Find I and V . What is the power dissipated in the 50W bulb?



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

(Problem in 2.25 in the textbook)

- a) Find the voltage v_y in the circuit below.



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

Problem 3: Equivalent Resistance

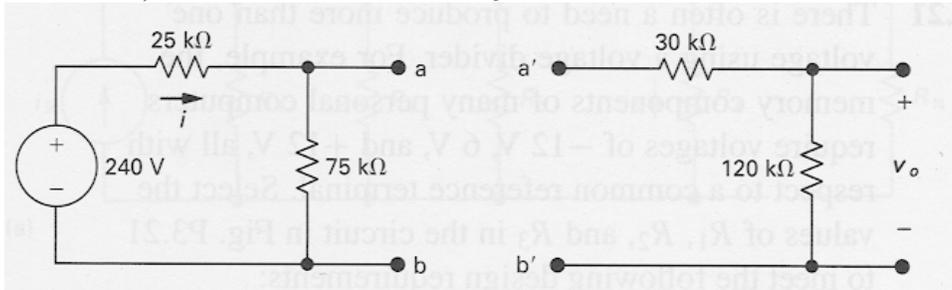
(Problem 3.5, abbreviated, in the textbook)

- a) Find an expression for the equivalent resistance of two resistors of value R in parallel.
- b) Find an expression for the equivalent resistance of n resistors of value R in parallel.
- c) 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.

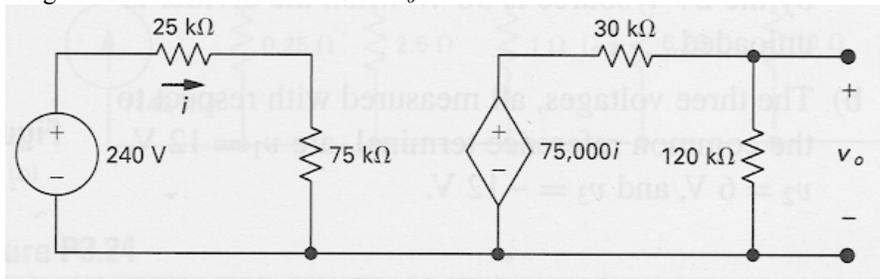
Problem 4: Voltage-Divider Circuit

(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.

