

# Homework 1

Answer all the required problems for each assignment and round your final solutions to two decimal places, if needed. The assignments correspond to the lecture day (e.g. assignment 1 = lecture 1, and so on.). The optional problems will not be graded but may show up on an exam.

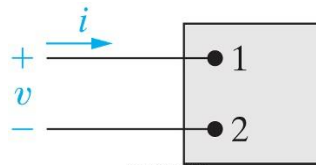
## Assignment 1

1. The current at the terminals of element shown in the following circuit is

$$i(t) = 0, \quad t < 0$$

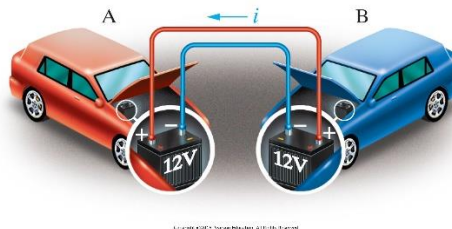
$$i(t) = 4e^{-2t} \text{ A}, \quad t \geq 0$$

- a) Find the expression,  $q(t)$ , the charge accumulating at the upper terminal.  
 b) Find the charge that has accumulated at  $t = 1$  s.  
 (25 pts)



2. When a car has a dead battery, it can often be started by connecting the battery from another car across its terminals. The positive terminals are connected as are the negative terminals. The connection is illustrated in the figure shown below. Assume the current  $I$  in the figure is measured and found to be 10 A.

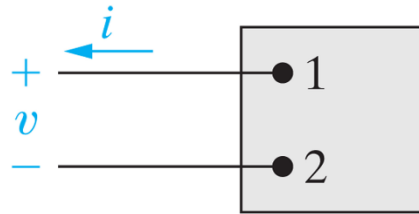
- a) Which car has the dead battery?  
 b) If this connection is maintained for 1 min, how much energy is transferred to the dead battery?  
 (25 pts)



3. The voltage and current at the terminals of the circuit element shown on the following circuit are zero for  $t < 0$ . For  $t > 0$ , they are:

$$v(t) = 2e^{-2t} \text{ V}$$

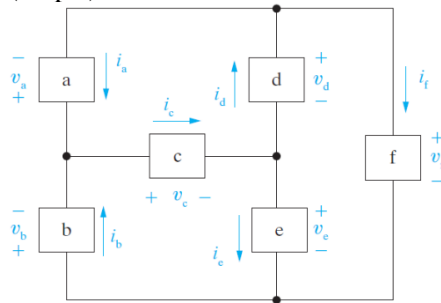
$$i(t) = 10e^{-4t} \text{ A}$$



- Find the power associated with the element at  $t = 10$  ms.
  - Find the total energy delivered by the element.
- (25 pts)

4. The numerical values for the currents and voltages in the circuit in the following circuit are given in the following table.

- Find the total power developed in the circuit.
  - Do the numerical values indicate in the table satisfy the power check?
  - Which value(s) in the table is(are) possibly wrong?
- (25 pts)



Element	Voltage (V)	Current (mA)
a	-18	-51
b	-18	45
c	2	-6
d	20	-20
e	16	-14
f	36	31

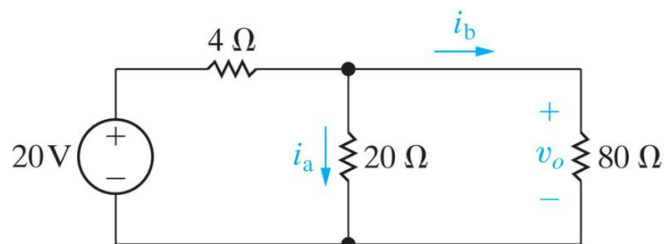
### Optional Problems

1.6, 1.18, 1.27

## Assignment 2

1. Given the circuit shown below, find:

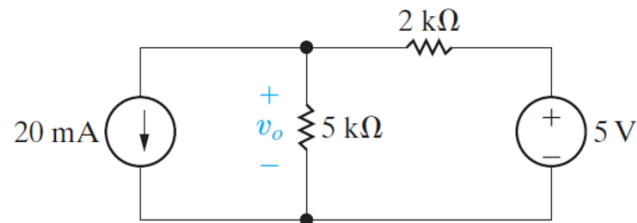
- the value of  $i_a$ ,
- the value of  $i_b$ ,
- the value of  $v_o$
- the power dissipated in each resistor, and
- the power delivered by the 20 V source.



2. Given the circuit shown below,

a) find  $v_o$  using Kirchoff's laws and Ohm's law

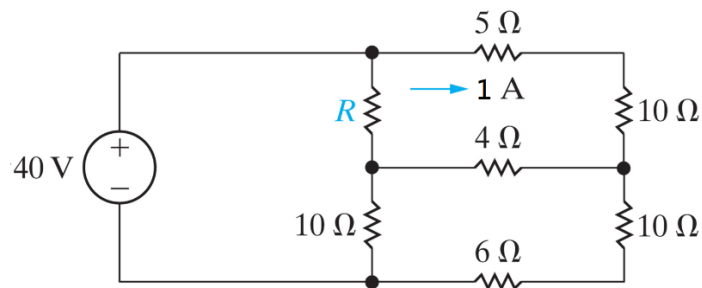
b) test the solution for  $v_o$  by verifying that the total power delivered is equal to the total power absorbed.



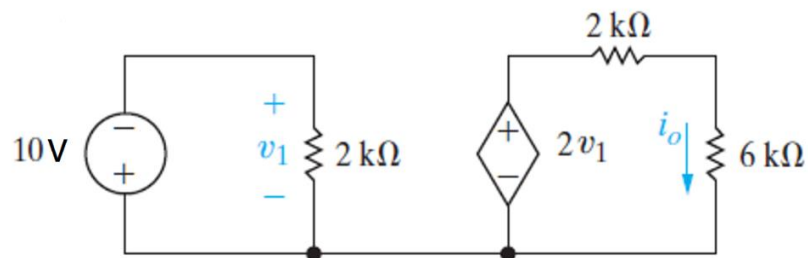
3. In the following circuit, find:

a) the resistance  $R$ , and

b) the power delivered by the 40 V source.



4. For the circuit shown below, find  $i_o$  and the total power delivered to the circuit.



### Optional Problems

2.6, 2.9, 2.15