

Homework #1  
Due Th. 9/06

## 1. (Hambley P1.13)

The current through a given circuit element is given by  $i(t) = 10 \sin(200\pi t)$  A in which  $t$  is in seconds and the angle is in radians.

- (a) Sketch  $i(t)$  to scale versus time for  $t$  ranging from 0 to 15 ms.
- (b) Determine the net charge that passes through the element between  $t = 0$  and  $t = 10$  ms.
- (c) Repeat for the interval from  $t = 0$  to  $t = 5$  ms.

## 2. (Hambley P1.18)

We have a circuit element with terminals  $a$  and  $b$ . Furthermore, the element has  $v_{ab} = 5$  V and  $i_{ab} = 2$  A.

- (a) Over a period of 10 seconds, how much charge moves through the element?
- (b) If electrons carry the charge, which terminal do they enter?
- (c) How much energy is transferred?
- (d) Is it delivered to the element or taken from it?

## 3. (Hambley P1.25)

The element shown in Figure P1.25 has  $v(t) = 10$  V, and  $i(t) = 3e^{-t}$  A.

- (a) Compute the power for the circuit element.
- (b) Find the energy transferred between  $t = 0$  and  $t = \infty$ .
- (c) Is this energy absorbed or supplied by the element?

## 4. (Hambley P1.26)

The current and voltage of an electrical device are  $i_{ab}(t) = 5$  A, and  $v_{ab} = 10 \sin(200\pi t)$  V in which the angle is in radians.

- (a) Find the power delivered to the device and sketch it to scale vs. time for  $t \in [0, 15]$  ms.
- (b) Determine the energy delivered to the device for the interval  $0 \leq t \leq 2.5$  ms.
- (c) Repeat for the interval  $0 \leq t \leq 10$  ms.

## 5. (Hambley P1.66)

Consider the circuit shown in Figure P1.66

- (a) Find the current  $i_R$  flowing through the resistor.

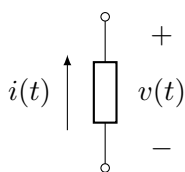


Figure P1.25

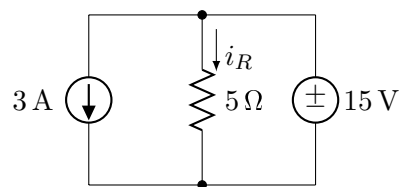


Figure P1.66

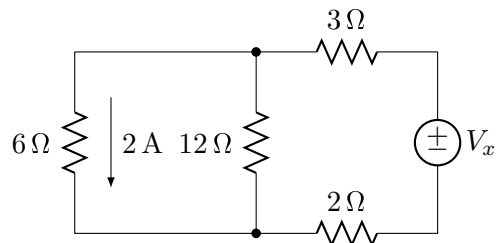


Figure P1.68

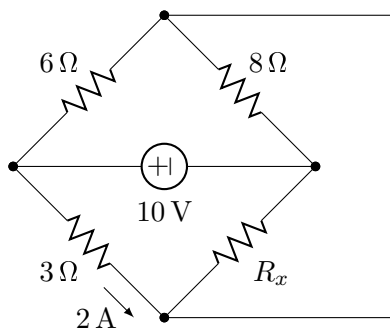


Figure P1.72

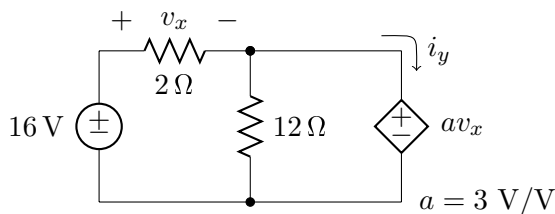


Figure P1.74

- (b) Find the power for each element in the circuit.  
 (c) Which elements are absorbing energy?
6. (Hambley P1.68)  
 Consider the circuit shown in Figure P1.68
- (a) Which elements are in series?  
 (b) Which elements are in parallel?  
 (c) Apply Ohm's and Kirchoff's laws to solve for  $V_x$ .
7. (Hambley P1.72)  
 Consider the circuit shown in Figure P1.72
- (a) Which elements are in series?  
 (b) Which elements are in parallel?  
 (c) Apply Ohm's and Kirchoff's laws to solve for  $R_x$ .
8. (Hambley P1.74)  
 What type of controlled source appears in the circuit of Figure P1.74? Determine the values of  $v_x$  and  $i_y$ .
9. (Hambley T1.3)  
 The circuit of Figure T1.3 has  $I_1 = 3\text{A}$ ,  $I_2 = 1\text{A}$ ,  $R_1 = 12\Omega$ , and  $R_2 = 6\Omega$ .
- (a) Determine the value of  $v_{ab}$ .  
 (b) Determine the power for each current source and state whether it is absorbing energy or delivering it?  
 (c) Compute the power absorbed by  $R_1$  and by  $R_2$ .

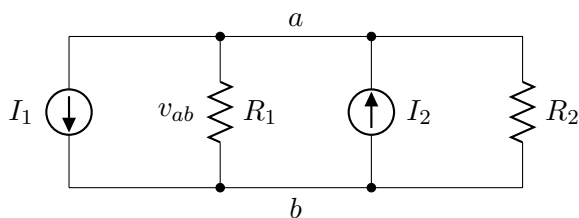


Figure T1.3

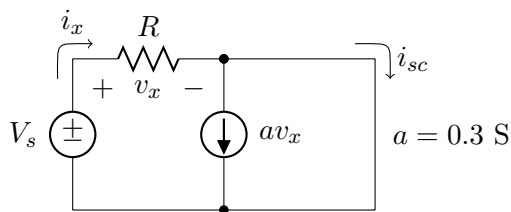


Figure T1.5

10. (Hambley T1.5)

We are given  $V_s = 15\text{V}$ ,  $R = 10\Omega$ , and  $a = 0.3\text{S} = 0.3\Omega^{-1}$  for the circuit of Figure T1.5. Find the value of the current  $i_{sc}$  flowing through the short circuit.