Homework 1

ECE2004 CRN:12898

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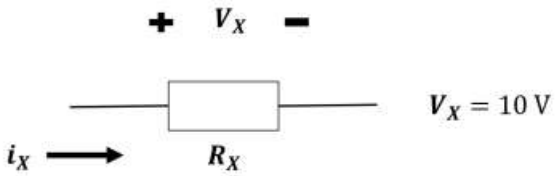
Question 1:



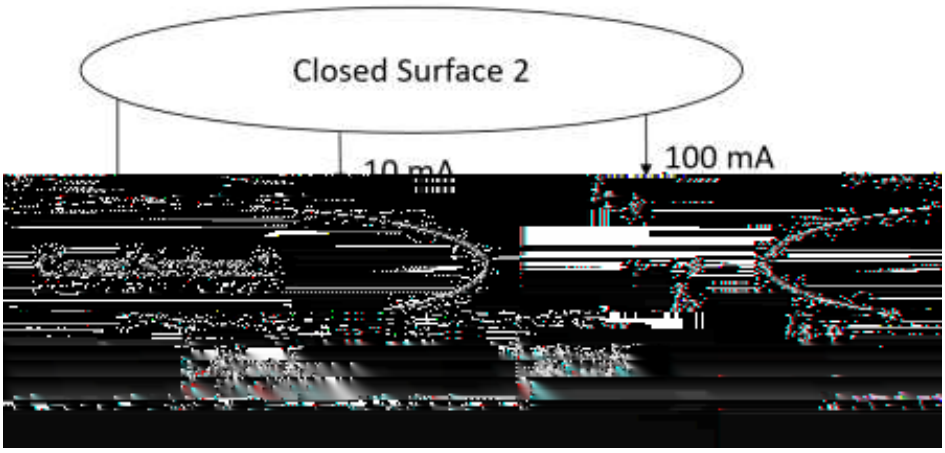
A. The power absorbed by this element is -100 mW. Find R_x and i_x.

$$i_x = \frac{P}{V} = \frac{-100mW}{10V} = -0{:}01A$$
$$R_x = \frac{V^2}{P} = \frac{(10V)^2}{-100mW} = -1000\Omega$$

B. Which direction is the current i_x flowing? From negative to positive.

C. Is this element producing or consuming power? It is producing power.

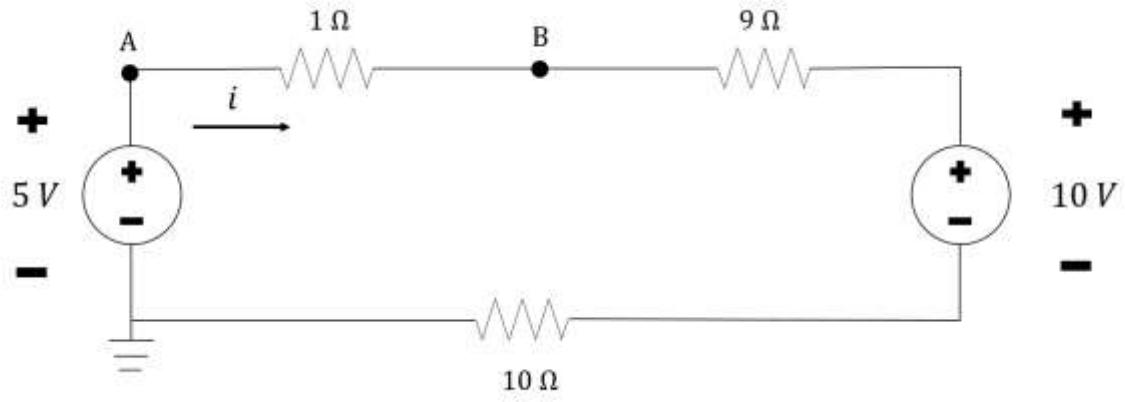
Question 2: KCL states current entering a node is equal to current leaving a node. There is, however, no reason to restrict ourselves to simply nodes. It may be restated as currents entering a closed surface have to equal currents leaving a closed surface. That being said, solve for the currents (I_1,I_2,I_3).



$$\begin{aligned}
\text{Closed Surface 1} &= -40mA + 30mA + 100mA + 10mA - I_2 \\
&= 0{:}1A - I_2 \\
I_2 &= 0{:}1A \\
\text{Closed Surface 2} &= -10mA - 100mA - I_1 \\
I_1 &= -0{:}11A \\
I_1 I_2 I_3 \text{Node} &= I_1 + I_2 + I_3 \\
I_3 &= -I_1 - I_2 \\
I_3 &= 0{:}11A - 0{:}1A \\
I_3 &= 0{:}01A
\end{aligned}$$

$$(I_1; I_2; I_3) = (-0{:}11A; 0{:}1A; 0{:}01A)$$

Question 3:

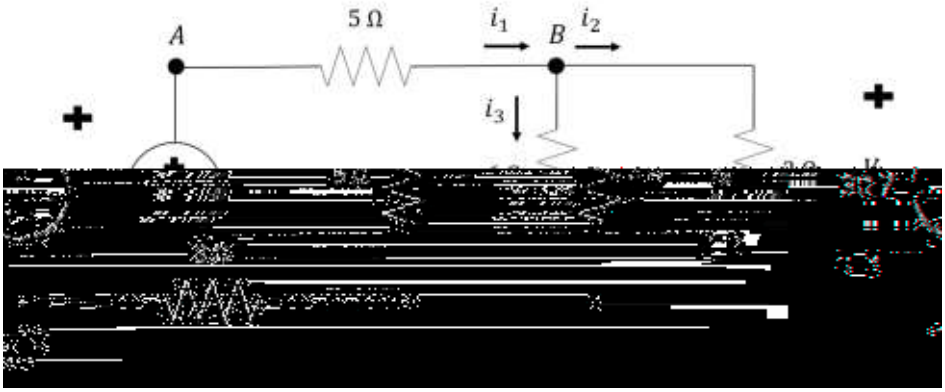


A. Find the current i.

B. Find V_{AB}, the voltage across the 1Ω resistor.

C. Is the voltage at node B higher or lower than the voltage at node A?

Question 4:



A. Solve for the current (i_1, i_2, i_3) as well as V_x.

B. What is the voltage across the 5Ω resistor (V_{AB})?