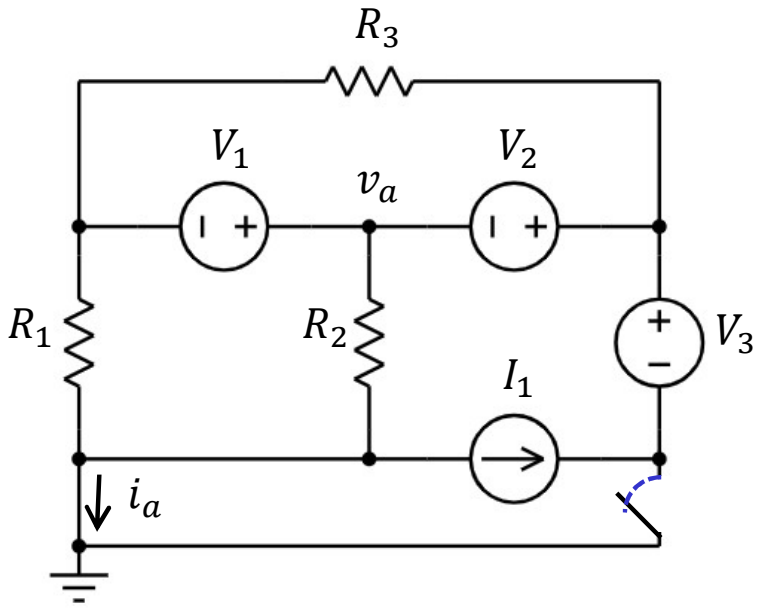
For $t < 1$ s, the switch is open. The switch closes at $t = 1$ s and remains closed.

(a) Find $v_a(0\text{ s})$

(b) Find $i_a(0\text{ s})$

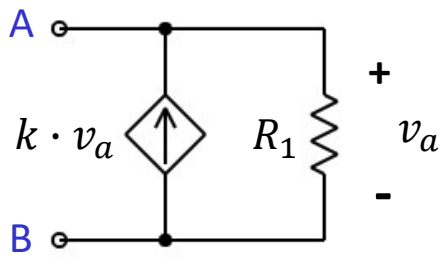
(c) Find $v_a(2\text{ s})$

(d) Find $i_a(2\text{ s})$



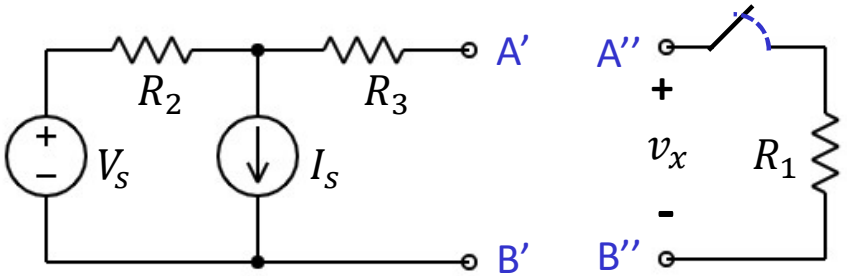

| | |
|---|---|
| R1: | 1 Ω |
| R2: | 1 Ω |
| R3: | 2 Ω |
| V1: | 1 V |
| V2: | 2 V |
| V3: | 0 V |
| I1: | 2 A |

(a) For the circuit on the right, find the Thevenin equivalent model between A and B. Draw the model and don't forget to label A and B.

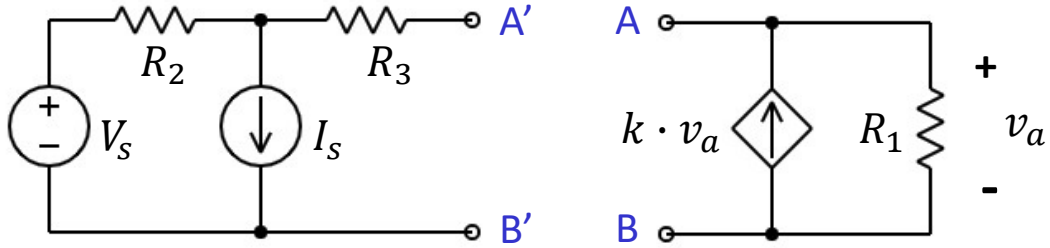



| | |
|---|---|
| R1: | 2 Ω |
| k: | 1 A/V |
| X: | 4 V |
| Y: | 1 V |

(b) Consider the two circuits on the right (you are not given the values of $R_2$, $R_3$, $V_s$ or $I_s$). We connect the two circuits together, A' to A'' and B' to B'' and do two measurements. When the switch is open, we measure $v_x = X$. When the switch is closed, we measure $v_x = Y$.




On the right, the circuit between A' and B' is the same as the one above and the circuit between A and B is the same as the one in part (a).
If we connect them together, A' to A and B' to B, what is value of $v_a$?



For $t < 0$ s, the switch is closed and you may assume the system has reached steady state. The switch opens at $t = 0$ s and remains open.

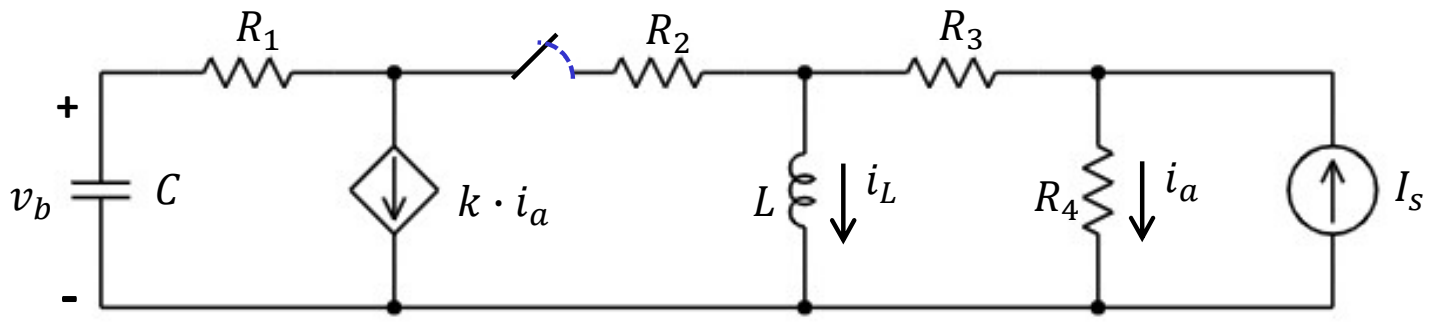
(a) Find $i_a(0^-\ \text{s})$ (i.e., just before the switch opens)

(b) Find $v_b(0^+\ \text{s})$ (i.e., right after the switch opens)

(c) Find $i_a(4\ \text{s})$

(d) Find $v_b(4\ \text{s})$

*Note: For any of the parts, you can leave your answers as a function of e.*




| | |
|---|---|
| R1: | 4 Ω |
| R2: | 1 Ω |
| R3: | 1 Ω |
| R4: | 3 Ω |
| Is: | 12 A |
| k: | 2 A/A |
| C: | 4 F |
| L: | 8 H |

The AC circuit below is in steady state.

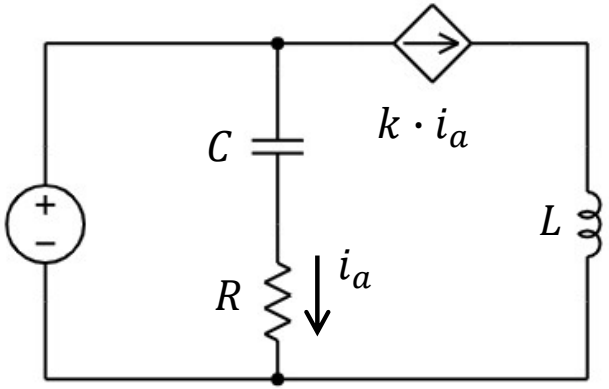
(a) What is the maximum value of the waveform $i_a(t)$?

(b) Find the complex power $S$ supplied by the voltage source $v_1$.

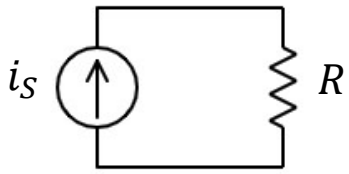
(c) Find the average power $P$ received by that same voltage source $v_1$.

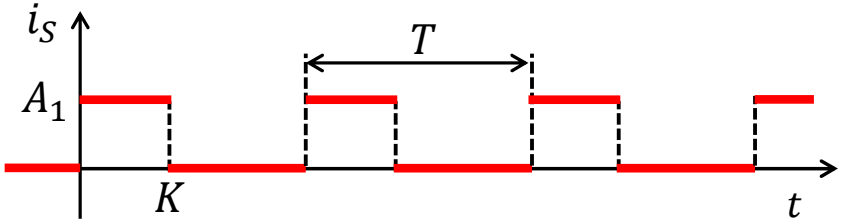
| | |
|---|---|
| R: | 2 Ω |
| C: | 100 mF |
| L: | 100 mH |
| k: | 3 A/A |
| A1: | 10 V |
| B1: | -15 degrees |
| T: | 4 s |

$$v_1(t) = A_1 \cos(10t + B_1)$$




(d) In the circuit below, the waveform $i_S(t)$ is periodic with period $T$. The resistor $R$ is the same as in the circuit above. Find the value of $K$ such that the average power received by the resistor in the circuit below is the same as by the resistor in the circuit above.



In the circuit, $v_1$ and $v_2$ are AC sources with ω = 100 rad/s . The phasor diagram shows the phasors of $v_1$ and $v_2$. It is not drawn to scale. You may assume the system is in steady state.

$V_3$ is a DC source.

(a) What is $v_2\left(\frac{T}{4}\right)$ where $T$ is the period of the waveform ?

(b) What is the waveform $i_a(t)$?

(c) What is the maximum value of the waveform $v_a(t)$?

| | |
|---|---|
| \|V1\|: | 2 V |
| \|V2\|: | 3 V |
| alpha: | 30 degrees |
| V3: | 3 V |
| C: | 10 mF |
| L: | 25 mH |