Second order circuits 001

Problem has been graded.

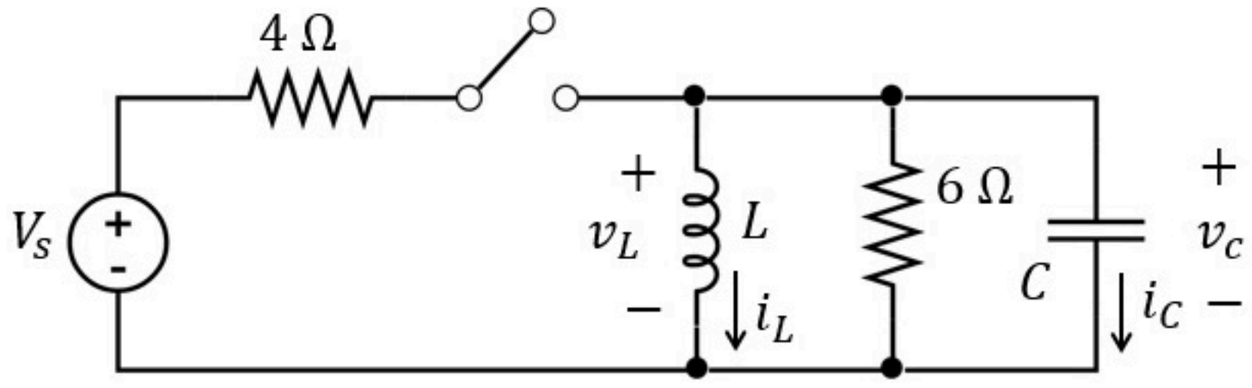
The switch opens at time t = 2 s. Before the switch opens, the system has reached steady state.

Find these voltages and currents (i.e., just before the switch opens):

$$i_{L1} = i_L(2^-) \quad v_{L1} = v_L(2^-) \quad i_{C1} = i_C(2^-) \quad v_{C1} = v_C(2^-)$$

Find these voltages and currents (i.e., just after the switch opens):

$$i_{L2} = i_L(2^+) \quad v_{L2} = v_L(2^+) \quad i_{C2} = i_C(2^+) \quad v_{C2} = v_C(2^+)$$



Given Variables:

Vs : 8 V

C : 2 nF

L : 2 mH

Calculate the following:

iL1 (A) :

2 ✓

vL1 (V) :

0 ✓

iC1 (A) :

0 ✓

vC1 (V) :

0 ✓

iL2 (A) :

2 ✓

vL2 (V) :

0 ✓

iC2 (A) :

-2 ✓

vC2 (V) :

0 ✓

Hint: In steady state, the capacitor and inductor behave as an open and short respectively.

The switch opens at time t = 2 s. Before the switch opens, the system has reached steady state.

Vs : 20 V

C : 2 nF

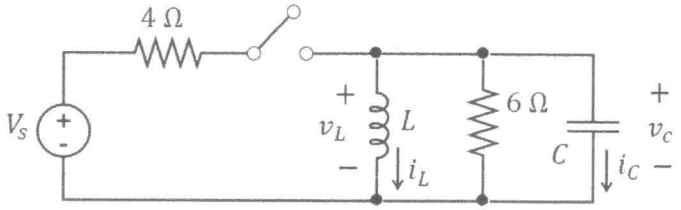
L : 1 mH

Find these voltages and currents (i.e., just before the switch opens):

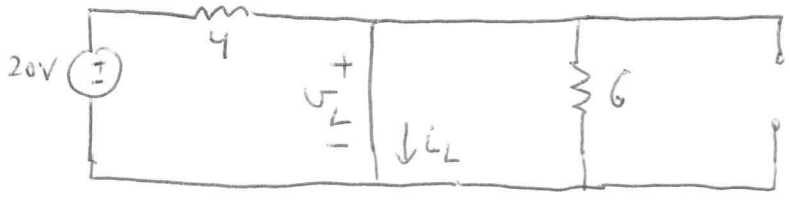
$i_{L1} = i_L(2^-)$ $v_{L1} = v_L(2^-)$ $i_{C1} = i_C(2^-)$ $v_{C1} = v_C(2^-)$

Find these voltages and currents (i.e., just after the switch opens):

$i_{L2} = i_L(2^+)$ $v_{L2} = v_L(2^+)$ $i_{C2} = i_C(2^+)$ $v_{C2} = v_C(2^+)$



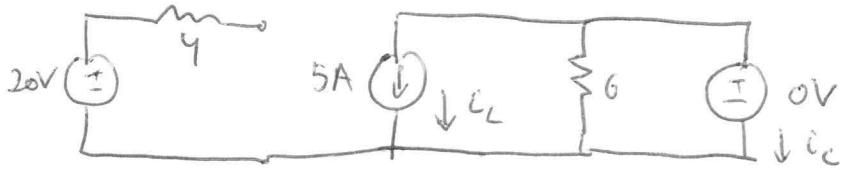
(a) $t = 2^-$: SWITCH IS CLOSED



$i_L = \frac{20}{4} = 5$

$v_L(2^-) = 0V$ $i_C(2^-) = 0A$ $v_C(2^-) = 0V$ $i_L(0^-) = 5A$

(b) $t = 2^+$



$i_L(2^+) = 5A$ $v_C(2^+) = 0V$ $v_L(2^+) = 0V$ $i_C(2^+) = -5A$