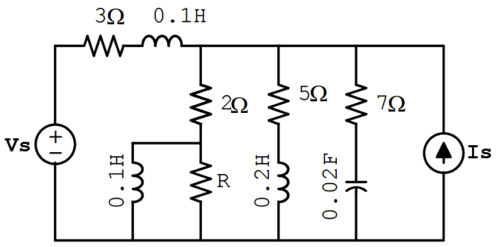
Somith Das
2019W1_ELEC_201_101102
Assignment ASN5a due 10/18/2019 at 11:59pm PDT

1. (10 points)

The circuit in the figure was connected a long time ago. Determine and report, in joules, the energy stored in each one of the three inductors and in the capacitor. L_1 is the top left inductor. L_2 is the bottom left inductor. L_3 is the bottom right inductor. The voltage source V_s = 15 volts, and the current source I_s = 8 amps.

Figure:



$E_{L\cdot1}$ = ___ J

$E_{L\cdot2}$ = ___ J

$E_{L\cdot3}$ = ___ J

E_C = ___ J

Correct Answers:

- 0.0325182
- 1.97841
- 0.633091
- 1.58273

2. (2 points)

We saw in class that the current in an inductor will not change instantaneously (abruptly), but is it possible for the voltage in an inductor to change abruptly?

- ?
- It can change abruptly
- It cannot change abruptly

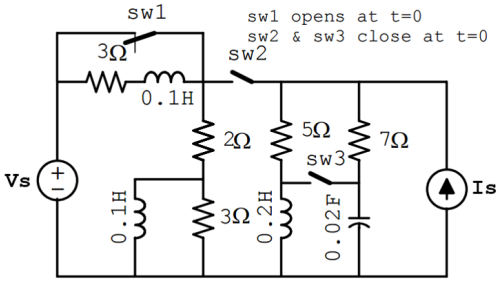
Correct Answers:

- It can change abruptly

3. (8 points)

L_1 is the inductor on the top left, L_2 is the inductor on the bottom left, L_3 is the inductor on the bottom right. The voltage source is V_s = 8 volts, and the current source is I_s = 9 amps. The switches have been as shown for a long time. At t = 0, sw_1 opens and sw_2 and sw_3 close. Determine the current and voltage in every inductor and in the capacitor right after t = 0, that is at $t = 0^+$. Currents are considered positive as follows: L_1, left to right, all other inductors, top to bottom. Voltage convention for the capacitor is positive at the top, and remember, in passive elements, "water falls from the sky".

Figure:



$I_{L\cdot1}$ = ___ A

$V_{L\cdot1}$ = ___ V

$I_{L\cdot2}$ = ___ A

$V_{L\cdot2}$ = ___ V

$I_{L\cdot3}$ = ___ A

$V_{L\cdot3}$ = ___ V

I_c = ___ A

V_c = ___ V

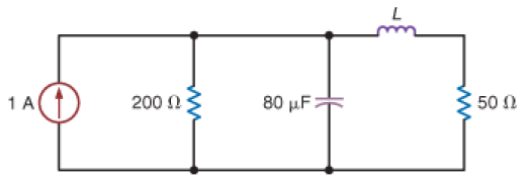
Correct Answers:

- 0
- -32.5789
- 4
- 19.5474
- 9
- 45
- -10.5158
- 45

4. (10 points)

If the total energy stored in the circuit is W = 110 mJ, what is the value of L?

Figure:



L = ___ mH

Correct Answers:

- 143.75

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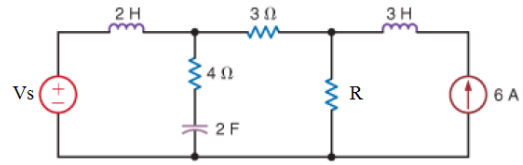
5. (10 points)

The circuit below has been like that for a long time, what is $P(3\Omega)$ and W_C? The voltage source V_S = 10 volts, and the resistance R = 8 Ω.

Figure:



$P(3\Omega)$ = ___ W

W_C = ___ J

Correct Answers:

- 35.8017
- 100

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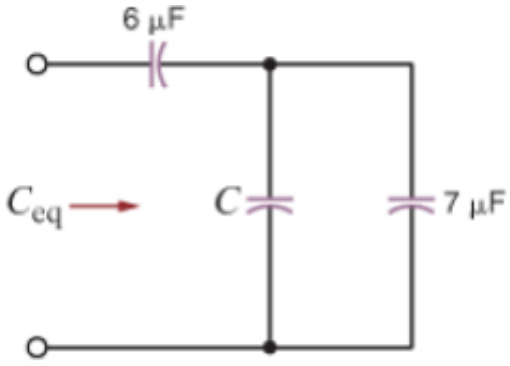
6. (10 points)

If, in the circuit below, C_{eq} = 4.28571 micro farads, what is the value of C in micro farads?

Figure:



C = ___

Correct Answers:

- 8

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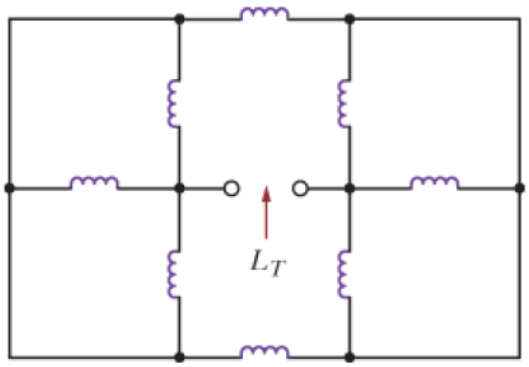
7. (10 points)

All inductors are L = 14 micro henrys, what is the value of the equivalent inductance L_T, also in micro henrys, at the port indicated? (In other words, find the equivalent inductance to the circuit shown at that port.

Find the equivalent inductance L_T



L_T = ___ μH

Correct Answers:

- 16.3333

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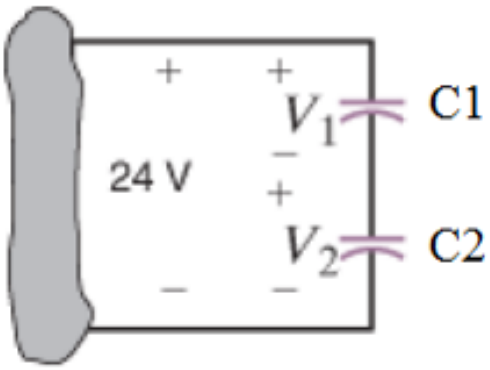
8. (10 points)

The capacitors have been connected as shown for a long time and are in DC-SS now, what are V_1, V_2, and also the total (including both capacitors) W_T?

C_1 = 18, C_2 = 5

Figure:



V_1 = ___ volts

V_2 = ___ volts

W_T = ___ joules

Correct Answers:

- 5.21739
- 18.7826
- 1126.96

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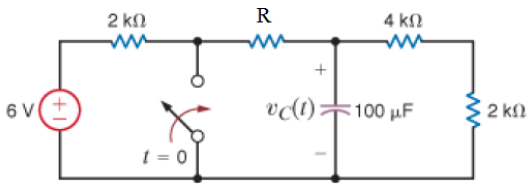
9. (10 points)

From the Irwin textbook, Ed. 10, solve Q7.6 and report for the voltage in the capacitor, the initial value, the final value, and the time constant (see picture below). The resistance $R = 6\ k\Omega$.

Figure:



$V_c(0)$ = ___ volts

$V_c(\infty)$ = ___ volts

τ = ___ sec

Correct Answers:

- 2.57143
- 0
- 0.3

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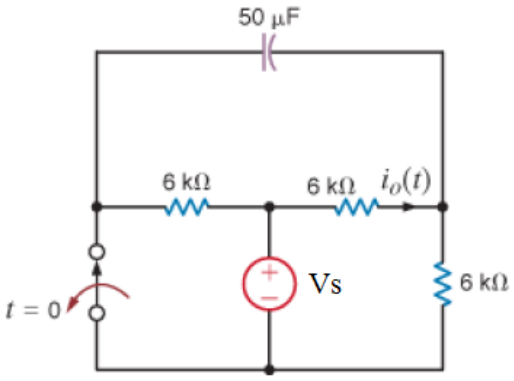
10. (10 points)

The switch in the circuit has been closed for a long time. It opens at t = 0. For the current $i_o(t)$, and for t > 0 (that is after the switch has opened), find its initial value (that is, the value right after the switch opens), the final value and the time constant. How long before the circuit reaches steady state after the switch opens? The voltage source V_S = 14 volts.

Figure:



$i_o(0)$ = ___ *mA*

$i_o(\infty)$ = ___ *mA*

τ = ___ *s*

T_{SS} = ___ *s*

Correct Answers:

- 0.388889
- 1.16667
- 0.45
- 2.25

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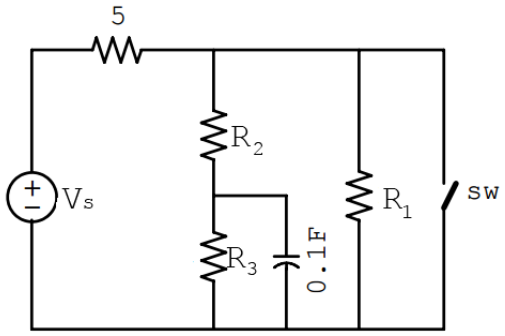
11. (10 points)

In this circuit, the switch has been open for a very long time. At t = 0 the switch closes. V_s = 17 volts, R_1 = 10 ohms, R_2 = 10 ohms, R_3 = 11 ohms. After the switch closes, (a) what is the initial voltage in the capacitor, in volts? (b) What is the final value of the voltage in the capacitor, in volts? (c) What is the time constant of the capacitor voltage decay, in seconds? (d) How long do you have to wait for the capacitor voltage to reach its final value on engineering standards, in seconds? (e) At what time, in seconds, has the voltage decayed to half its initial value? The polarity of reference for voltage in the capacitor is plus at the top, minus at the bottom.

Figure:



(a) V_{CO} = ___ volts

(b) V_{cf} = ___ volts

(c) τ = ___ sec

(d) T_{off} = ___ sec

(e) T_{half} = ___ sec

Correct Answers:

- 5.12329
- 0

- 0.52381
- 2.61905

- 0.363