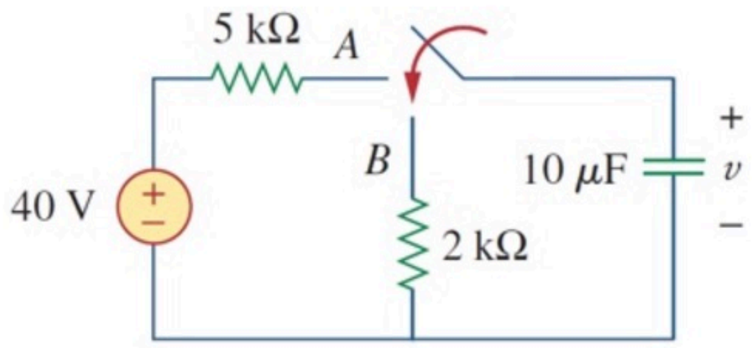
PP First order circuits 001

Unlimited Attempts.

The switch has been in position A for a long time.
At time $t = 0$, the switch moves to position B.

Find $v(t) = D$ for $t = 0^-$

$= A \cdot e^{-t/tau} + B$ for $t > 0$



Given Variables:

. . . .

Calculate the following:

D (V) :

40 ✓

A (V) :

40 ✓

B (V) :

0 ✓

tau (s) :

0.02 ✓

Hint: At steady state, the capacitor is an open circuit

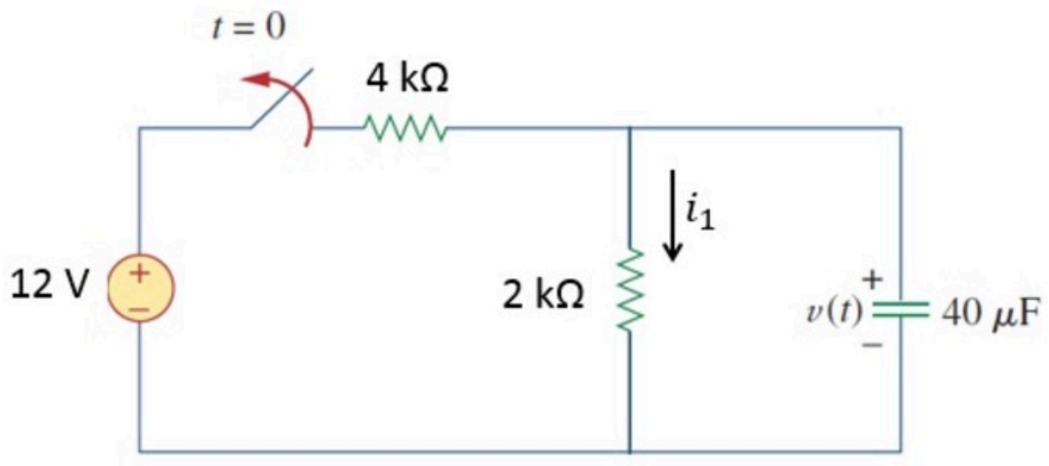
PP First order circuits 002

Unlimited Attempts.

The switch has been closed for a long time.
At time $t = 0$, the switch is opened.

Find $i_1(t) = D$ for $t = 0^-$

$= A \cdot e^{-t/tau} + B$ for $t > 0$



Given Variables:

. : . .

Calculate the following:

D (mA) :

2 ✓

A (mA) :

2 ✓

B (mA) :

0 ✓

tau (ms) :

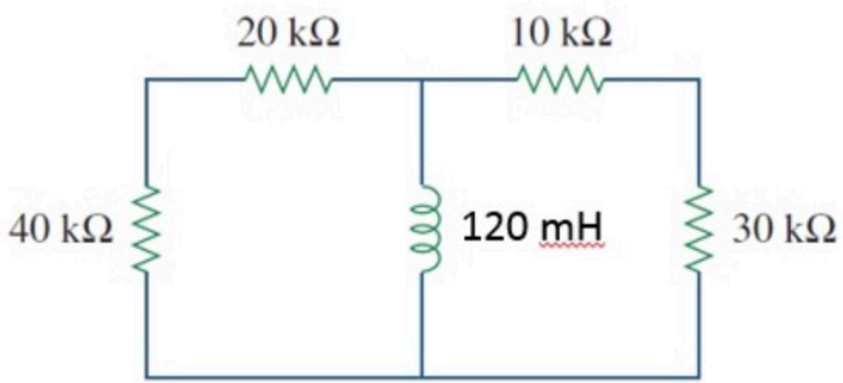
80 ✓

Hint: The capacitor voltage does not change instantaneously

PP First order circuits 003

Unlimited Attempts.

What is the time constant tau in this circuit?



Given Variables:

. : . .

Calculate the following:

tau (us) :

5 ✓

Hint: Find Req

PP First order circuits 004

Unlimited Attempts.

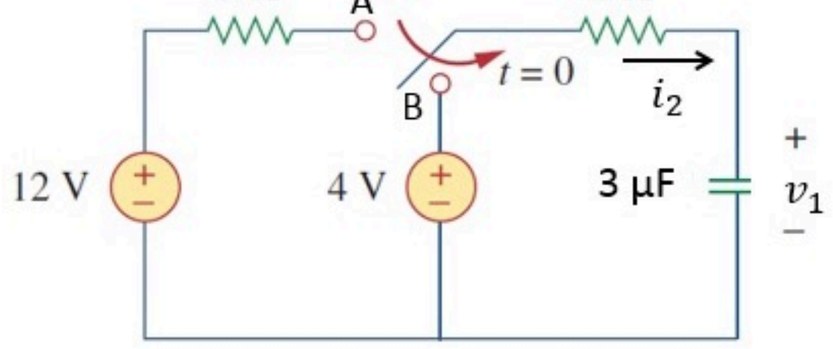
The switch has been in position A for a long time. At time $t = 0$, the switch moves to position B.

Find $v_1(t) = D1$ for $t = 0^-$

$= A1 \cdot e^{-t/tau1} + B1$ for $t > 0$

Find $i_2(t) = D2$ for $t = 0^-$

$= A2 \cdot e^{-t/tau2} + B2$ for $t > 0$



Given Variables:

. : . .

Calculate the following:

D1 (V) :

12 ✓

A1 (V) :

8 ✓

B1 (V) :

4 ✓

tau1 (us) :

6 ✓

D2 (A) :

0 ✓

A2 (A) :

-4 ✓

B2 (A) :

0 ✓

tau2 (us) :

6 ✓

Hint: Find the capacitor voltage before and after the switch

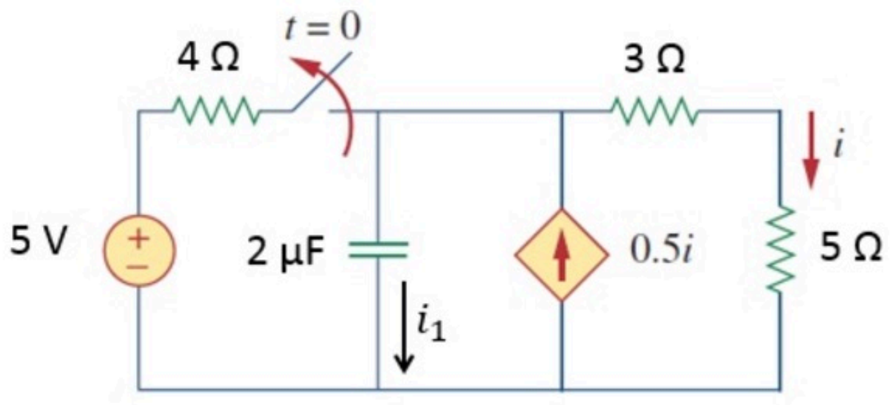
PP First order circuits 005

Unlimited Attempts.

The switch has been closed for a long time.
At time $t = 0$, the switch is opened.

Find $i_1(t) = D$ for $t = 0^-$

$= A \cdot e^{-t/tau} + B$ for $t > 0$



Given Variables:

. : . .

Calculate the following:

D (A) :

0 ✓

A (A) :

-0.25 ✓

B (A) :

0 ✓

tau (us) :

32 ✓

Hint: Use a test source to find Req.

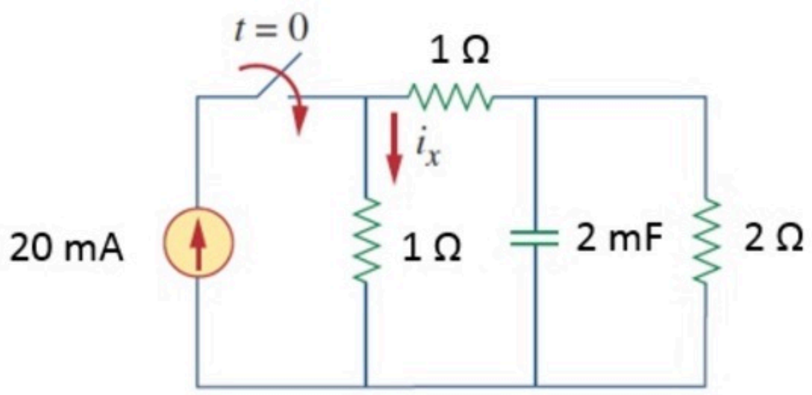
PP First order circuits 006

Unlimited Attempts.

The switch has been open for a long time.
At time $t = 0$, the switch is closed.

Find $i_x(t) = D$ for $t = 0^-$

$= A \cdot e^{-t/tau} + B$ for $t > 0$



Given Variables:

. : . .

Calculate the following:

D (mA) :

0 ✓

A (mA) :

-5 ✓

B (mA) :

15 ✓

tau (ms) :

2 ✓

Hint: What is the capacitor voltage right after the transition?

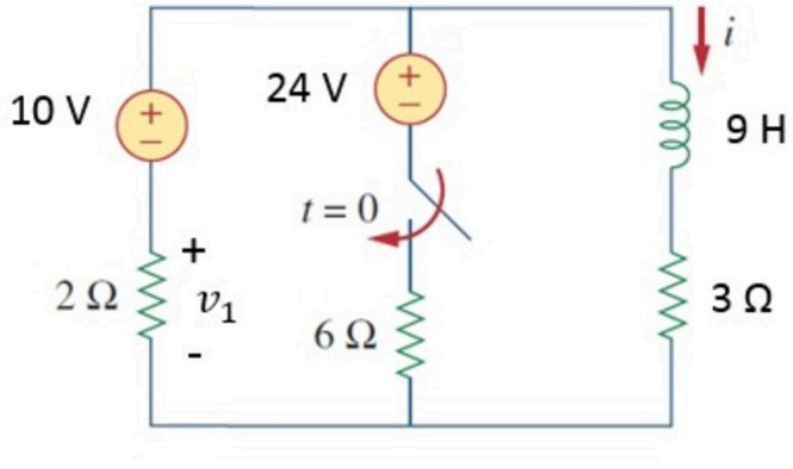
PP First order circuits 007

Unlimited Attempts.

The switch has been open for a long time.
At time $t = 0$, the switch is closed.

Find $v_1(t) = D$ for $t = 0^-$

$= A \cdot e^{-t/tau} + B$ for $t > 0$



Given Variables:

. : . .

Calculate the following:

D (V) :

-4 ✓

A (V) :

1.5 ✓

B (V) :

-1 ✓

tau (s) :

2 ✓

Hint: First find the inductor current just before the switch opens.

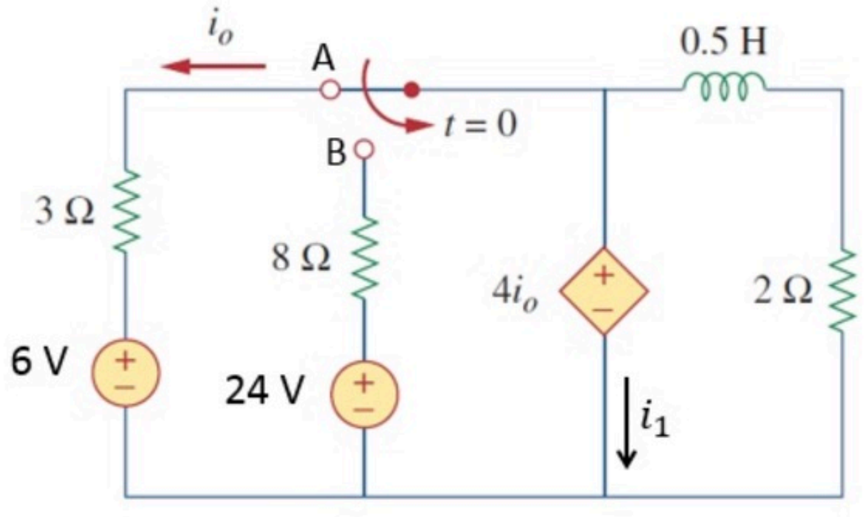
PP First order circuits 008

Unlimited Attempts.

The switch has been in position A for a long time.
At time $t = 0$, the switch moves to position B.

Find $i_1(t) = D$ for $t = 0^-$

$= A \cdot e^{-t/tau} + B$ for $t > 0$



Given Variables:

. : . .

Calculate the following:

D (A) :

-18 ✓

A (A) :

-12 ✓

B (A) :

3 ✓

tau (s) :

0.25 ✓

Hint: What is io after the switch opens?

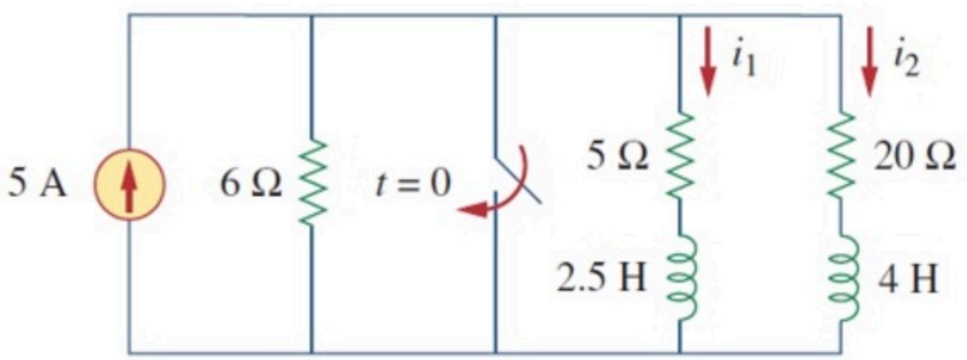
PP First order circuits 009

Unlimited Attempts.

The switch has been open for a long time.
At time $t = 0$, the switch is closed.

Find $i_1(t) = D$ for $t = 0^-$

$= A \cdot e^{-t/tau} + B$ for $t > 0$



Given Variables:

. : . .

Calculate the following:

D (A) :

2.4 ✓

A (A) :

2.4 ✓

B (A) :

0 ✓

tau (s) :

0.5 ✓

Hint: After the switch closes, do the two inductors influence each other?

PP First order circuits 010

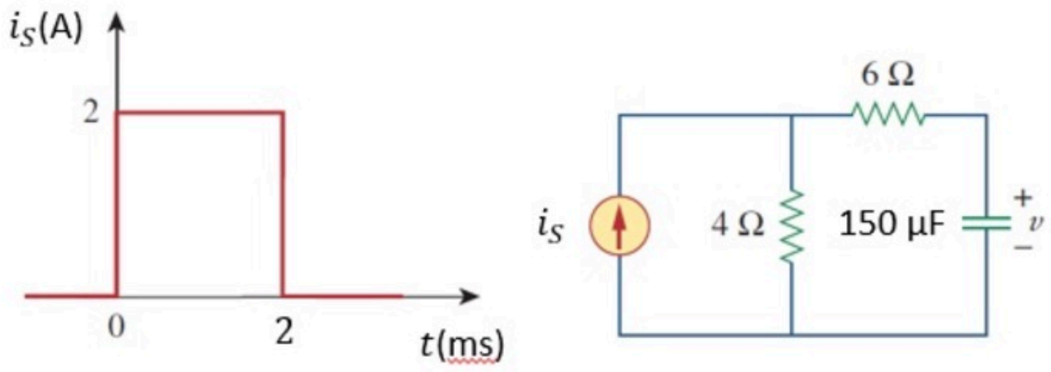
Unlimited Attempts.

The current source behaves as shown (and assume it has been zero for a long time for $t < 0$).

Find $v(t) = D$ for $t = 2^-$ ms

$= A \cdot e^{-(t-2\,ms)/tau} + B$ for $t > 2$ ms

Note, for your calculations, use: $e^{-1/1.5} \approx 0.5$



Given Variables:

. : . .

Calculate the following:

D (V) :

6 ✓

A (V) :

6 ✓

B (V) :

0 ✓

tau (ms) :

1.5 ✓

Hint: Find the result of the first transition first.

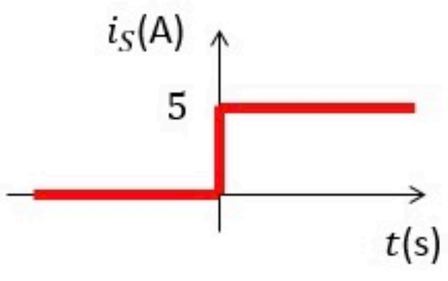
PP Second order circuits 001

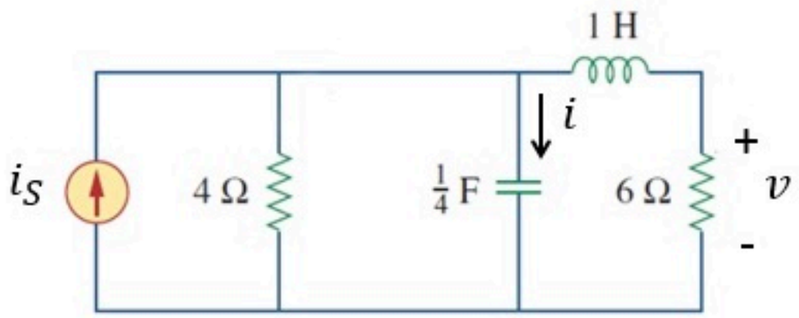
Unlimited Attempts.

Find $i_1 = i(0^-)$ and $v_1 = v(0^-)$

Find $i_2 = i(0^+)$ and $v_2 = v(0^+)$

Find $i_3 = i(\infty)$ and $v_3 = v(\infty)$





Given Variables:

. : . .

Calculate the following:

i1 (A) :

0 ✓

v1 (V) :

0 ✓

i2 (A) :

5 ✓

v2 (V) :

0 ✓

i3 (A) :

0 ✓

v3 (V) :

12 ✓

Hint: Capacitors and inductors in steady state behave as opens and shorts.

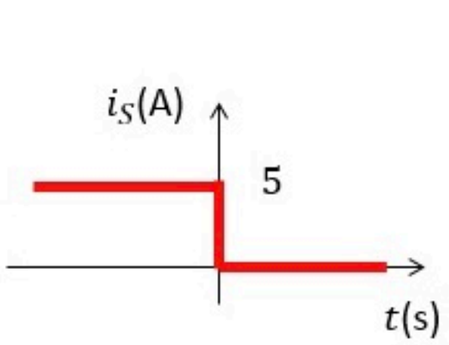
PP Second order circuits 002

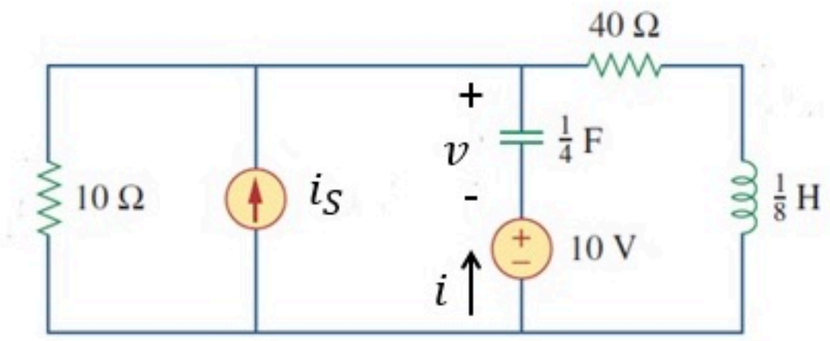
Unlimited Attempts.

Find $i_1 = i(0^-)$ and $v_1 = v(0^-)$

Find $i_2 = i(0^+)$ and $v_2 = v(0^+)$

Find $i_3 = i(\infty)$ and $v_3 = v(\infty)$





Given Variables:

. : . .

Calculate the following:

i1 (A) :

0 ✓

v1 (V) :

30 ✓

i2 (A) :

5 ✓

v2 (V) :

30 ✓

i3 (A) :

0 ✓

v3 (V) :

-10 ✓

Hint: Capacitors and inductors in steady state behave as opens and shorts.