ECE2150J 2025FA Assignment 3

GLOBAL COLLEGE
SHANGHAI JIAO TONG UNIVERSITY

Due time: 23:59, Nov. 18th, 2025

In order to get full marks, you shall write all the intermediate steps of calculation or proof unless otherwise indicated. This assignment covers content from chapters 6 to 8.

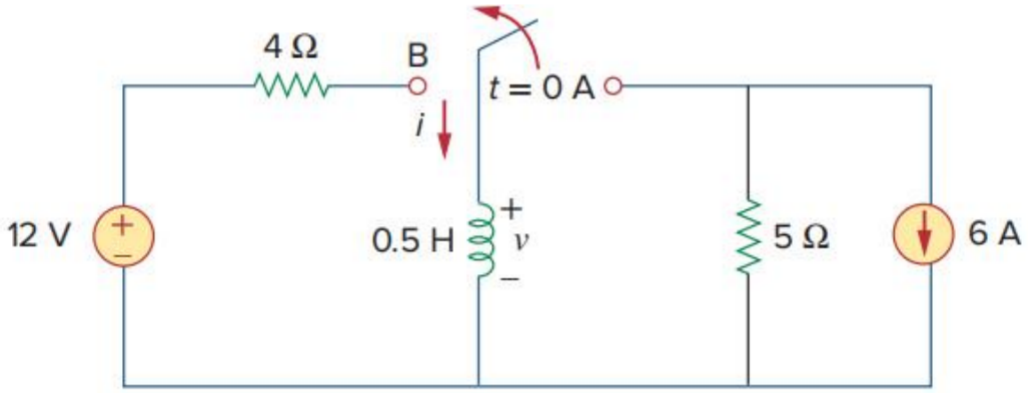
Exercise 3.1

The switch in the picture has been in position A for a long time. At $t = 0$, the switch moves from position A to B. The switch is a make-before-break type so that there is no interruption in the inductor current. Find:

(a) $i(t)$ for $t > 0$,

(b) v just after the switch has been moved to position B,

(c) $v(t)$ long after the switch is in position B.



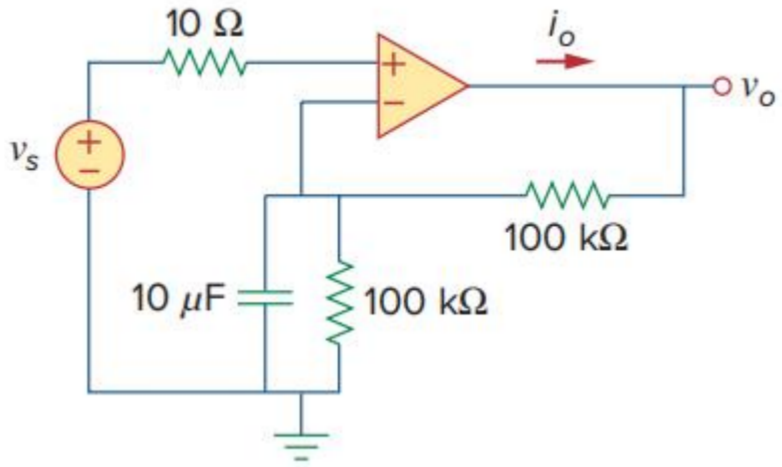
(a) $i(t) = i(\infty) + [i(0) - i(\infty)]e^{-t/\tau}$

(b) $v = 12 - 4i(0) = \mathbf{36\ V}$

(c) $v = \mathbf{0\ V}$

Exercise 3.2

Given $V_s = 10[1 - e^{-t}]u(t)\,V$, find V_o and i_o.



$V_o = (20 - 10e^{-t})u(t)\ V$

$i_o = 0.1u(t)\ mA$

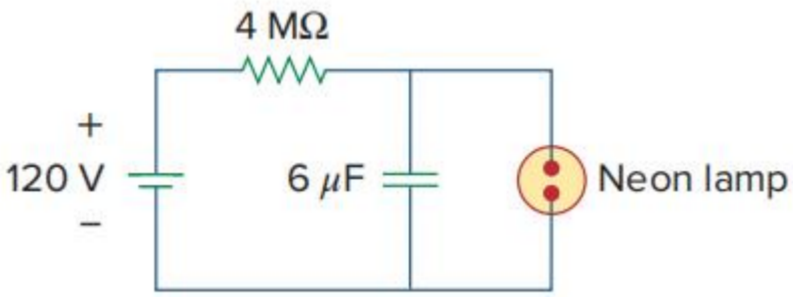
Exercise 3.3

The neon lamp fires when its voltage reaches 75 V and turns off when its voltage drops to 30 V. Its resistance is 120 Ω when on and infinitely high when off.

(a) For how long is the lamp on each time the capacitor discharges?

(b) What is the time interval between light flashes?

Hint: 4M >> 120, when the capacitor discharges, you can consider it as charging the lamp only. And the same as charging process.

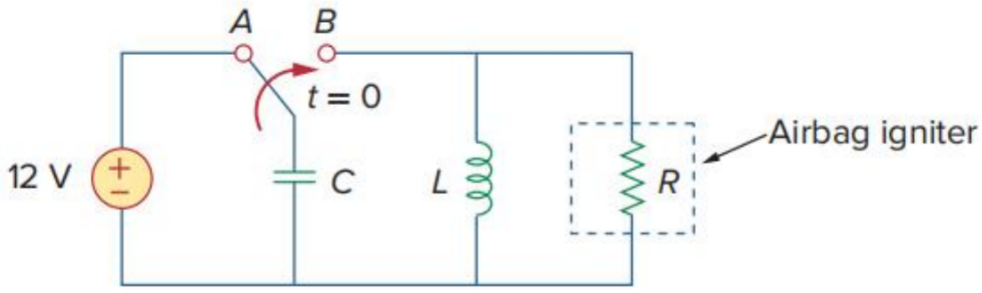


(a) 659.7 μs

(b) 16.636 s

Exercise 3.4

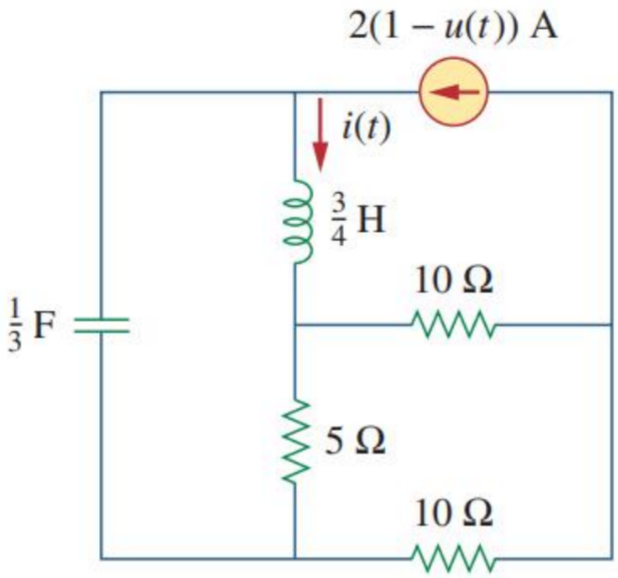
Determine the time it takes the voltage across the igniter to reach its first peak after switching from A to B. Let $R = 3\Omega$, $C = \frac{1}{30}$F, and $L = 60$mH.



Exercise 3.5

(a) When t = 0, what's the energy stored in the capacitor?

(b) Calculate i(t) for t > 0.



(a) W = 8/3 J

(b) i(t) = $[e^{-4.431t} + e^{-0.903t}]$ A