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EE3 Fall 2020
Homework Problem 3

The switch has been in position a for a long time. At t=0, it moves instantaneously to positon b. Find:

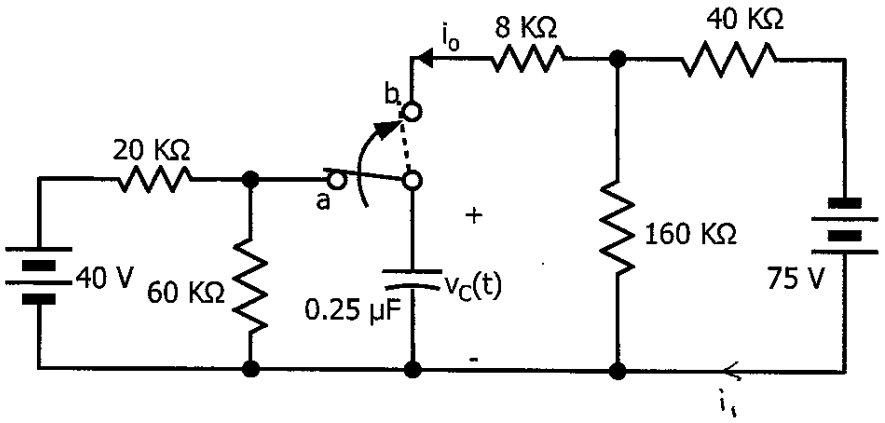
a. $v_c(0^-)$

b. $v_c(0^+)$

c. $i_o(0^-)$

d. $i_o(0^+)$

e. [EXTRA CREDIT] $v_c(t)$



(a) $40\,V \cdot \frac{60\,k\Omega}{60+20\,k\Omega} = \boxed{30\,V}$

(b) should be the same : $\boxed{30V}$

(c) $30 + 8k \cdot i_o - 40k \cdot i_1 + 75 = 0 \Rightarrow 8k(i_o - 5i_1) = -105$

$30 + 8k \cdot i_o + 160k(i_o + i_1) = 0 \Rightarrow 8k(21 i_o + 20 i_1) = -30$

$+\ 8k(4i_o - 20i_1) = -420$

$8k(25 i_o) = -450$

$i_o = \frac{-18}{8k} = \boxed{-2.25\,mA}$

SWAP ANSWERS

(d) 0 b/c discharging capacitor in left circuit, initial current = 0.

(e) $V_c(t) = V_c(\infty) + \left[V_c(0^+) - V_c(\infty)\right] e^{-t/\tau}$

$V_c(\infty) = 75 \cdot \frac{160}{200} = 60V$

$V_c(t) = 60 + \left[30 - 60\right] \cdot e^{-t/0.25mF \cdot 40k\Omega}$

$= \boxed{60 - 30\, e^{-100t}}$