

Name: _____ (please print)

Signature: _____

ECE 2202 – Quiz ~~4~~⁵
November 1, 2022

1. This quiz is closed book, closed notes. You may have one 8.5 x 11" crib sheet.
2. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
4. If the grader has difficulty following your work because it is messy or disorganized, you will lose credit.
5. Do not use red ink. Do not use red pencil.
6. You will have 30 minutes to work on this quiz.

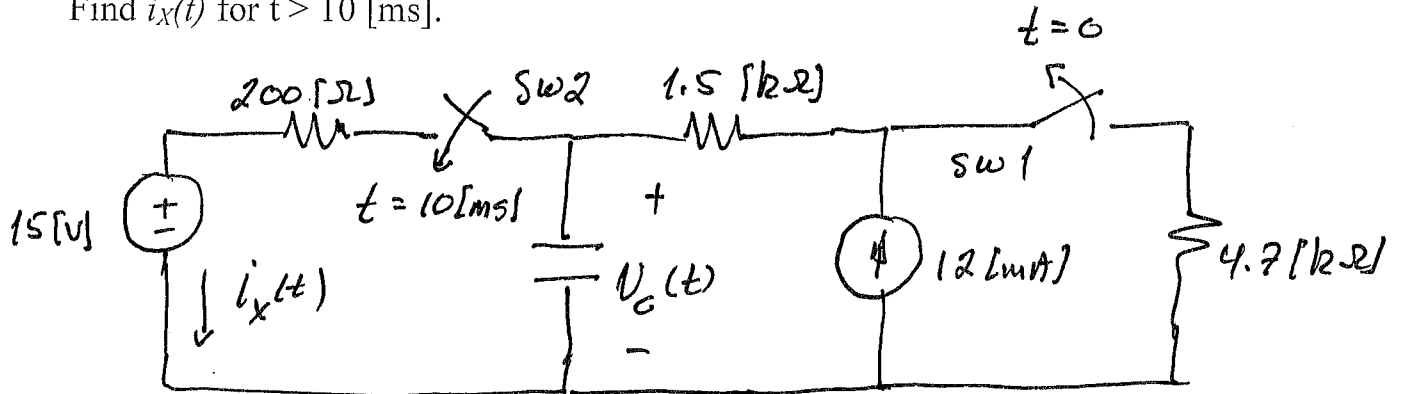
_____/20

Room for extra work

In the circuit below, switch 1 was closed for a long time, and switch 2 was open for a long time. At $t = 0$, switch 1 opened. At $t = 10$ [ms], switch 2 closed.

Find $v_C(t)$ for $t \geq 10$ [ms].

Find $i_X(t)$ for $t > 10$ [ms].

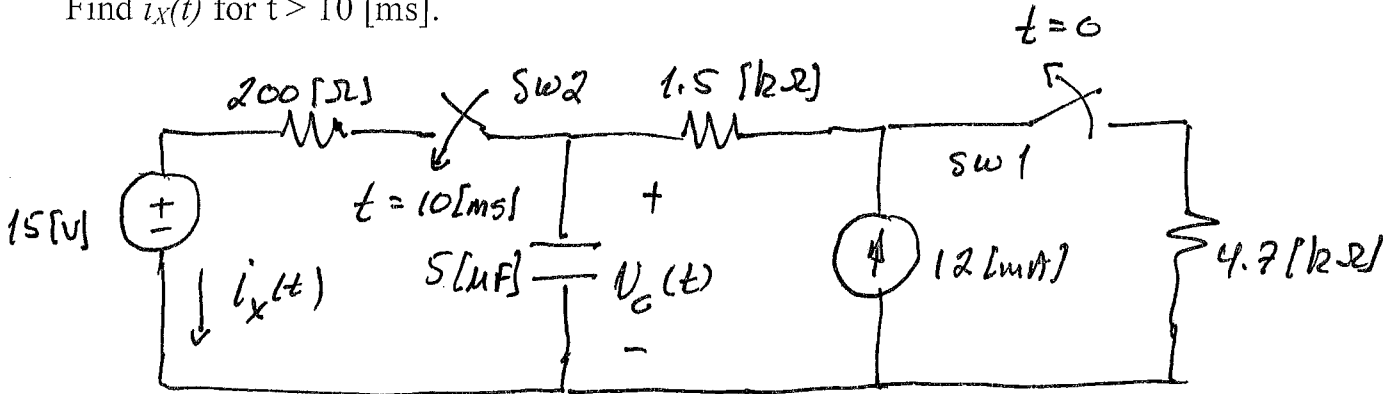


Room for extra work

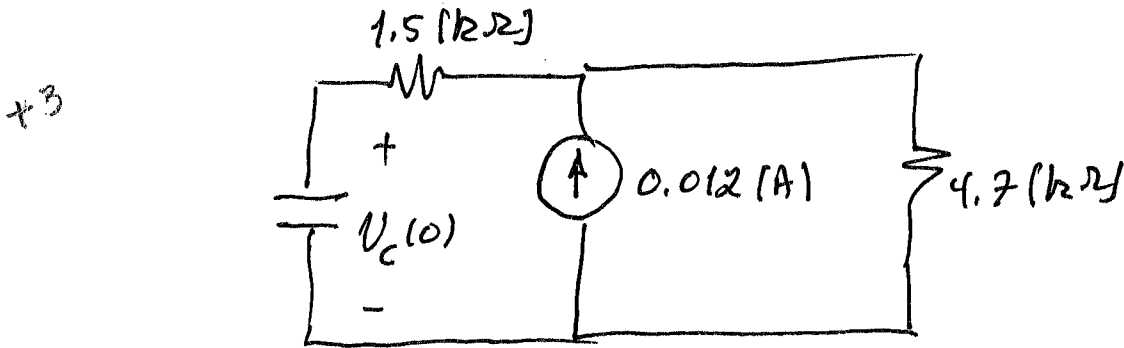
In the circuit below, switch 1 was closed for a long time, and switch 2 was open for a long time. At $t = 0$, switch 1 opened. At $t = 10$ [ms], switch 2 closed.

Find $v_C(t)$ for $t \geq 10$ [ms].

Find $i_X(t)$ for $t > 10$ [ms].

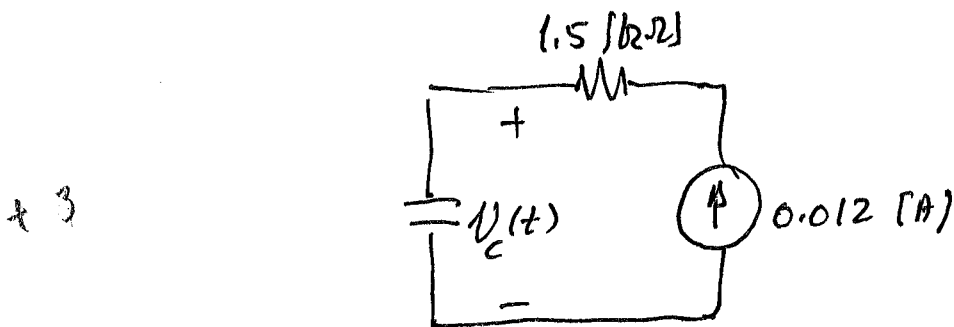


Re-draw for $t < 0$:



+4 $C \rightarrow$ open circuit so $v_C(0) = (0.012)(4700) = 56.4$ [V]

Re-draw for $0 < t < 0.01$ [s]:



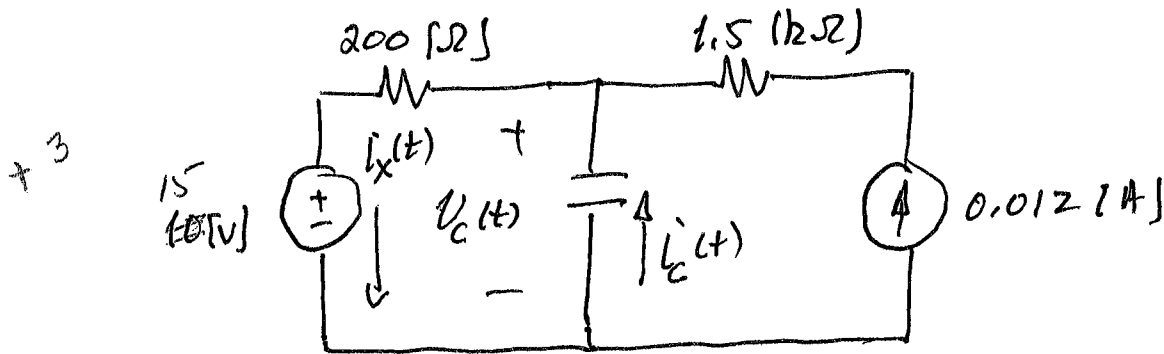
Room for extra work

$$V_c(t) = \frac{1}{C} \int_0^t 0.012 dt + V_c(0)$$

+6 $= 2 \cdot 10^5 \cdot 0.012 t + 56.4 \text{ [V]} \quad 0 \leq t \leq 10 \text{ [ms]}$

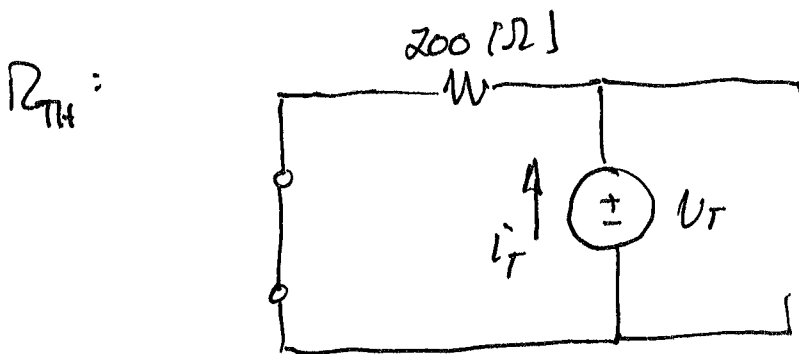
+2 $V(10 \text{ [ms]}) = 2 \cdot 10^5 \cdot 0.012 \cdot 10^{-2} + 56.4 \text{ [V]} = \overset{80.4}{\cancel{68.4}} \text{ [V]}$

Re-draw for $t > 10 \text{ [ms]}$



$V_{c,f} = V_c(t \rightarrow \infty)$ $C \rightarrow$ open circuit so...

+3 $V_{c,f} - 15 - 200(0.012) = 0 \Rightarrow V_{c,f} = \overset{12.4}{\cancel{12.4}} \text{ [V]}$



$R_{TH} = 200 \text{ [}\Omega\text{]}$

$\tau_c = R_{TH} \cdot C$
 $= 2 \text{ [ms]}$

Room for extra work

$$V_c(t) = 17.4 + (80.4 - 17.4) e^{-(t-0.01[s])/0.002[s]} \text{ [V]}$$

$$t \geq 0.01 \text{ [s]}$$

$$+5 \quad \left\{ \begin{array}{l} V_c(t) = 17.4 + 63 e^{-(t-0.01[s])/0.002[s]} \text{ [V]} \quad t \geq 0.01 \text{ [s]} \end{array} \right.$$

$$i_x(t) = i_c(t) + 0.012$$

$$i_c(t) = -C \frac{dV_c(t)}{dt} = -510^{-6} \cdot 63 \cdot \left(\frac{-1}{0.002}\right) e^{-(t-0.01)/0.002}$$

$$+6 \quad = 0.315 e^{-(t-0.01[s])/0.002[s]} \text{ [A]} \quad t > 0.01 \text{ [s]}$$

$$+3 \quad \left\{ \begin{array}{l} i_x(t) = 0.012 \text{ [A]} + 0.28 \text{ [A]} e^{-(t-0.01[s])/0.002[s]} \quad t > 0.01 \text{ [s]} \end{array} \right.$$

i_x sign -2

no $V_c(t)$ $0 \leq t \leq 10 \text{ [ms]}$ -2
but \int is good

to left out or unspecified -2

$\frac{V_c - 15}{200}$ done incorrectly -3

$i_x(10 \text{ [ms]})$ is wrong -4

$i_x(t)$ incomplete -1