Name: _____ (please print)

Signature: _____

ECE 2202 – Quiz 3

September 25, 2023

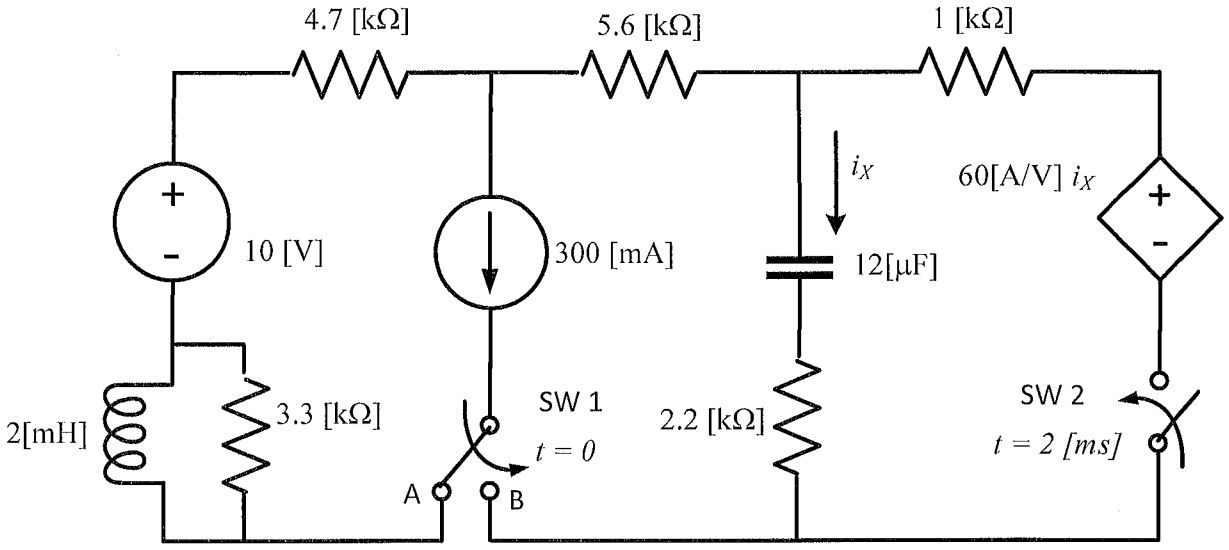
1. This quiz is closed book, closed notes. You may have one 8.5 x 11" crib sheet.
2. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. Show all units in solutions, 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 SW 1 was at position A for a long time. There was no energy in the capacitor during that time. SW1 moved instantaneously to position B at t = 0. Switch SW 2 was open for a long time, and then closed at t = 2 [ms]. Find the following.

i) $i_X(2[ms]^-)$
ii) $i_X(2[ms]^+)$
iii) power delivered by the independent current source at $t = 2\ [ms]^+$.



Room for extra work

In the circuit below, switch SW 1 was at position A for a long time. There was no energy in the capacitor during that time. SW1 moved instantaneously to position B at t = 0. Switch SW 2 was open for a long time, and then closed at t = 2 [ms]. Find the following.

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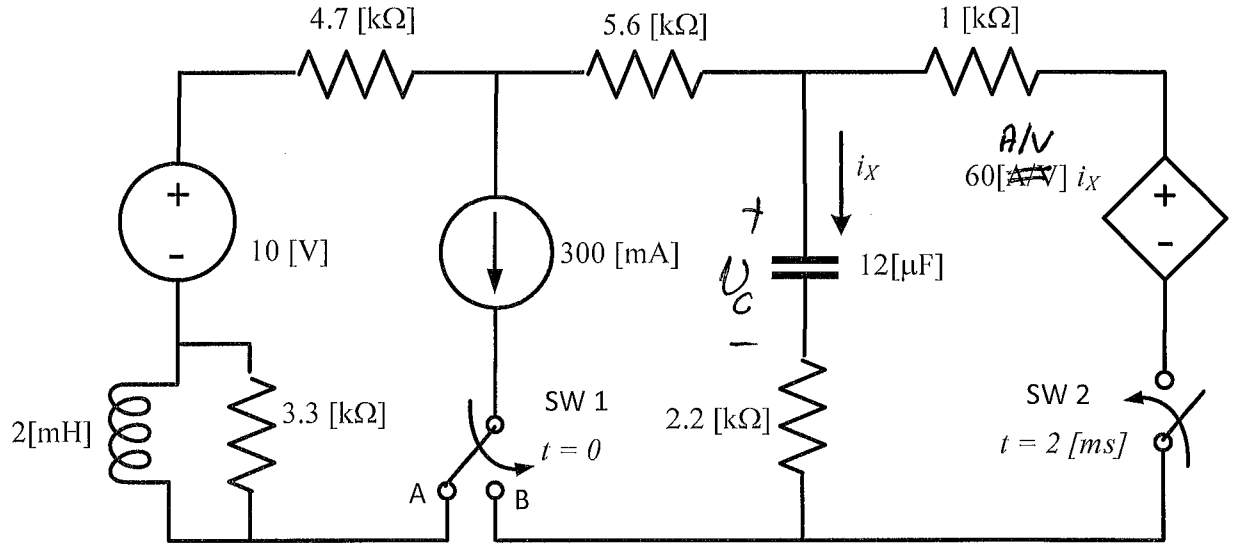
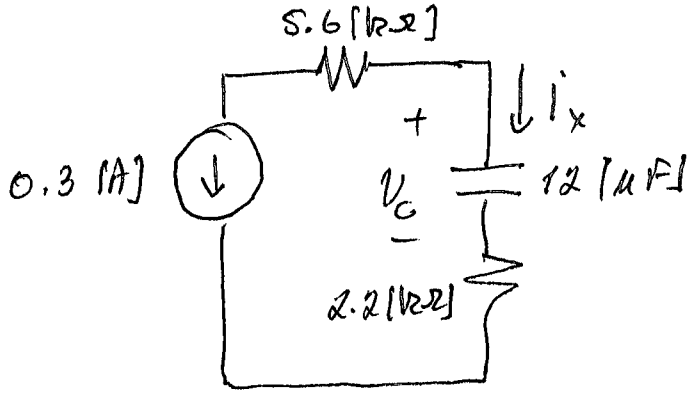
ii) $i_X(2[ms]^+)$
iii) power delivered by the independent current source at $t = 2\ [ms]^+$.



At $t<0$, and as far as the capacitor is concerned, nothing is happening: $v_c = 0$, $i_x = 0$.

$0<t<2$ [ms] SW 2 is still open, so...



.. So we have a current source in series with the capacitor:

$$v_c = \frac{-1}{C}\int_0^t i_x\,dt + v_c(0)$$

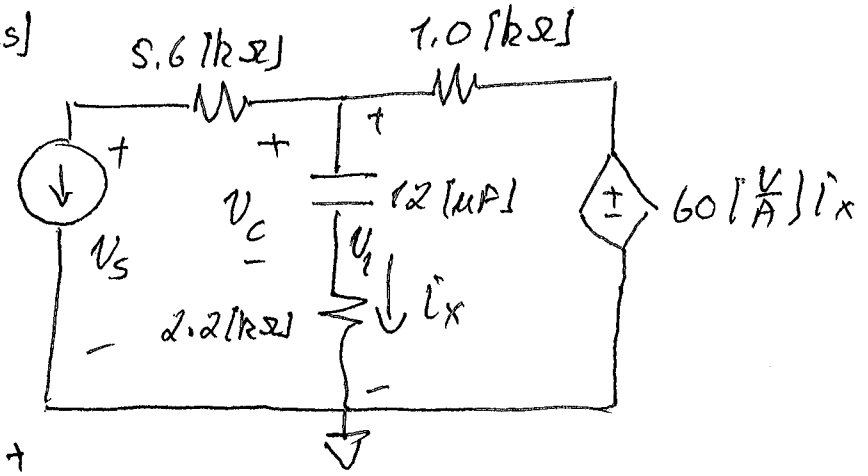
Room for extra work

$$v_c(t) = \frac{-1}{12\times10^{-6}} \int_0^t 0.3\,dt + 0 = -0.25\times10^5 t \qquad t \geq 0$$

$$v_c(t = 2[\text{ms}]) = -50\,[\text{V}]$$

$$\boxed{i_x(2\,[\text{ms}]^-) = -0.3\,[\text{A}]}$$

$t > 2\,[\text{ms}]$



$t = 2\,[\text{ms}]^+$

$$\frac{v_1 - (-50)}{2200} + \frac{v_1 - 60 i_x}{1000} + 0.3 = 0$$

$$i_x = \frac{v_1 - (-50)}{2200}$$

$$v_1 = -225.16\,[\text{V}]$$

$$i_x = -79.62\,[\text{mA}]$$

So $\boxed{i_x(2[\text{ms}]^+) = -79.62\,[\text{mA}]}$

$$v_s - 2200\, i_x - v_c + 0.3(5600) = 0$$

$$v_s = -1905.2\,[\text{V}]$$

$$\boxed{P_{\text{del by } i_s}(2[\text{ms}]^+) = -v_s(0.3) = 571.55\,[\text{W}]}$$