Name: _____ (please print)

Signature: _____

ECE 2202 – Quiz 2

September 26, 2024

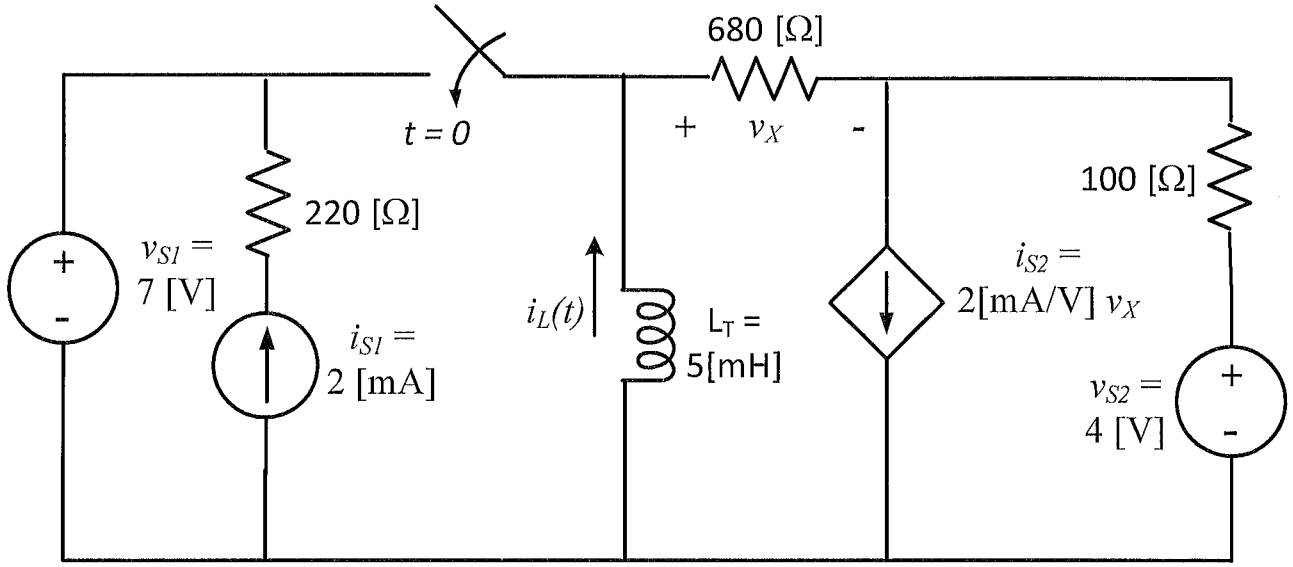
1. This quiz is closed book, closed notes. You may have one 8.5 x 11" crib sheet.
2. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. Show all units in solutions, 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 shown, the switch was open for a long time, and then closed at t = 0.

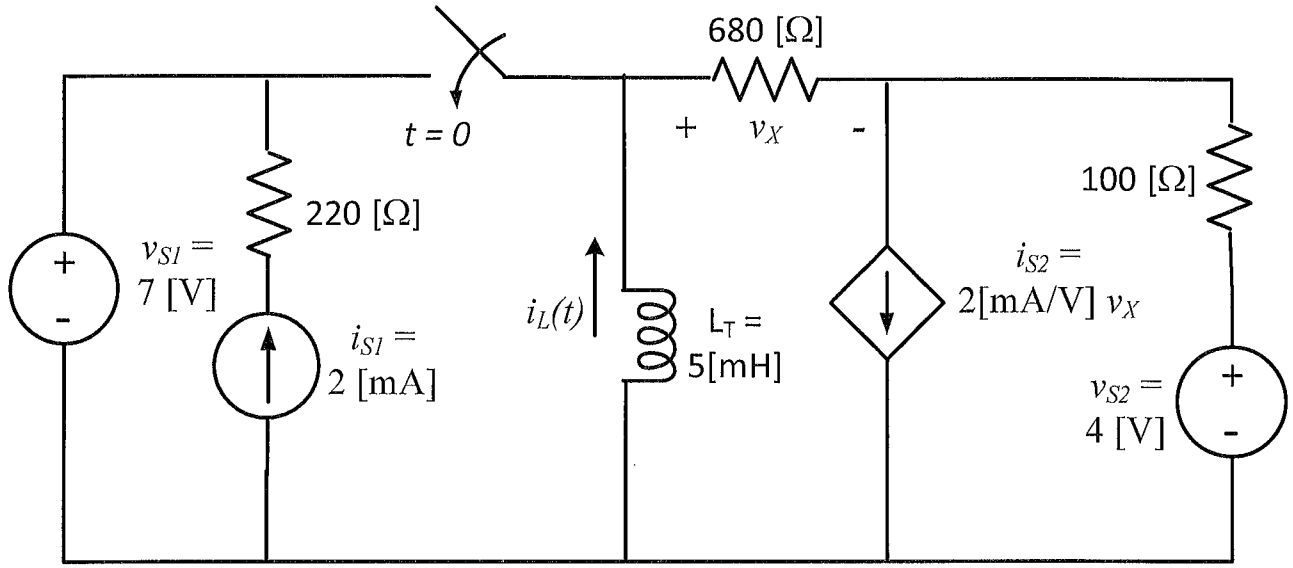
a) Find $i_L(0^-)$ and $i_L(0^+)$.
b) Find the power delivered by the source v_{S1} at 0.05 [ms].



Room for extra work

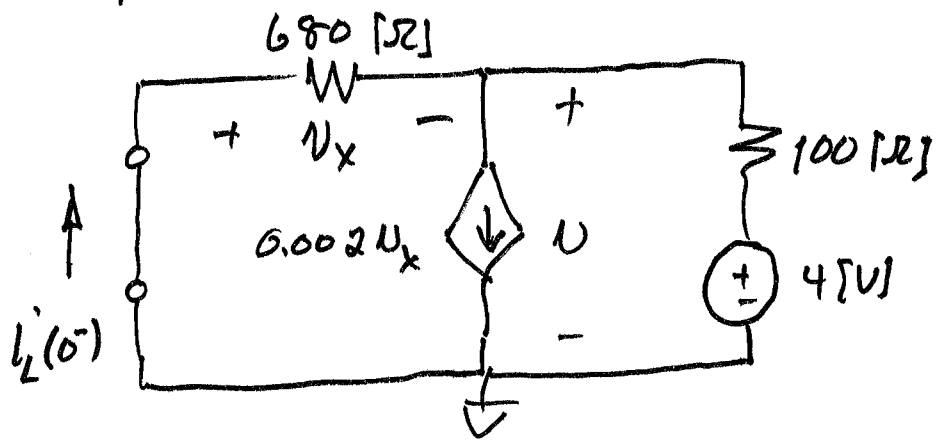
In the circuit shown, the switch was open for a long time, and then closed at t = 0.

a) Find $i_L(0^-)$ and $i_L(0^+)$.
b) Find the power delivered by the source v_{S1} at 0.05 [ms].



Draw for $t<0$. V_{s1} and i_{s1} are not needed.

$L_T \rightarrow$ short



$$\frac{V}{680} + 0.002\,V_x + \frac{V-4}{100} = 0$$

$$V_x = -V$$

$$V = 4.224\ [V]$$

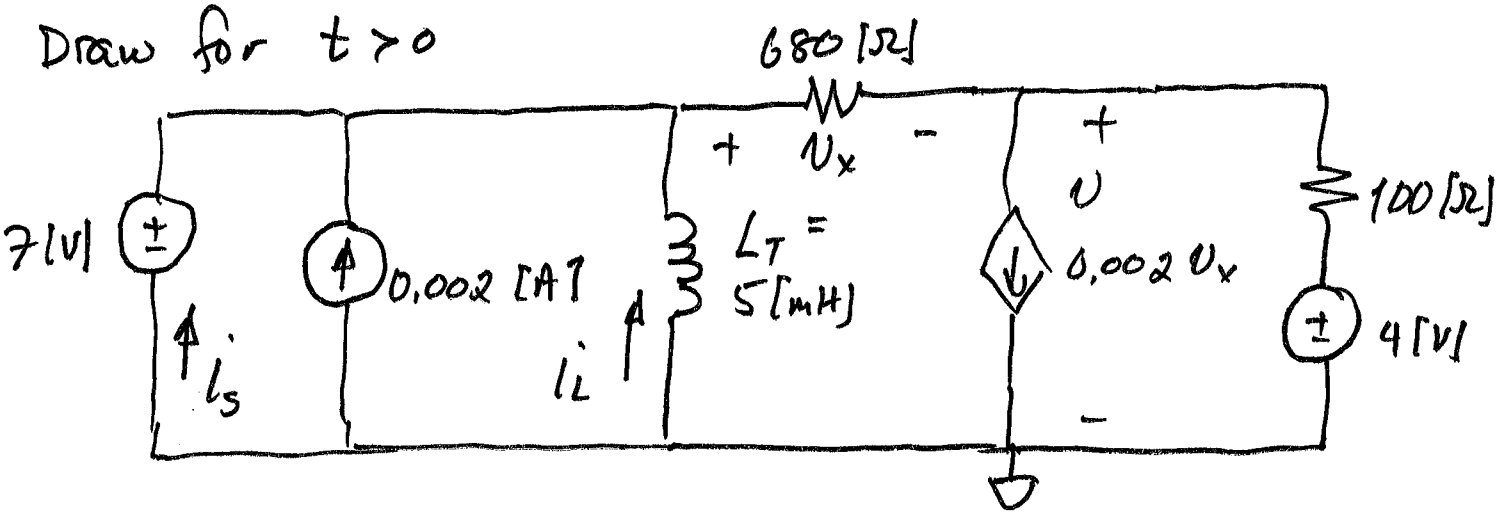
$$V_x = -4.224\ [V]$$

a)

$$i_L(0^-) = \frac{V_x}{680} = -0.006213\ [A] = i_L(0^+)$$

Room for extra work

Draw for $t > 0$



To find power delivered by v_{s1} we need i_s.

$$i_s = -0.002 - i_L + \frac{v_x}{680}$$

$$i_s(0.05\,[\text{ms}]) = -0.002 - i_L(0.05\,[\text{ms}]) + \frac{v_x}{680}$$

We have a voltage source in parallel with L_T so we need to integrate.

$$i_L(t) = -\frac{1}{L_T}\int_0^t 7\,dt + i_L(0) \qquad i_L(0) = i_L(0^+)$$

$$= -\frac{1}{0.005}\int_0^t 7\,dt - 0.00621$$

$$= -1400\left[\frac{A}{s}\right]t - 0.00621\,[A]$$

$$i_L(0.05\,[\text{ms}]) = -1400(0.05\times10^{-3}) - 0.00621 = -0.07621\,[A]$$

p. 2

Room for extra work

We also need v_x.

$$\frac{v-7}{680} + 0.002 v_x + \frac{v-4}{100} = 0$$

$$v_x + v - 7 = 0$$

$$\Rightarrow \begin{cases} v = 3.832 \text{ [V]} \\ v_x = 3.168 \text{ [V]} \end{cases}$$

$$i_s(0.05 \text{ [ms]}) = -0.002 - (-0.0762) + \frac{3.168}{680}$$

$$= 0.0789 \text{ [A]}$$

$$\therefore \boxed{\text{Pdel by } v_s, (0.05 \text{ [ms]}) = (0.0789)(7) = 0.5520 \text{ [W]}}$$