ID:	Name:

Brac University
Semester: Summer 2023
Course Code: CSE250
Circuits And Electronics
Section: 23
Faculty: PRM

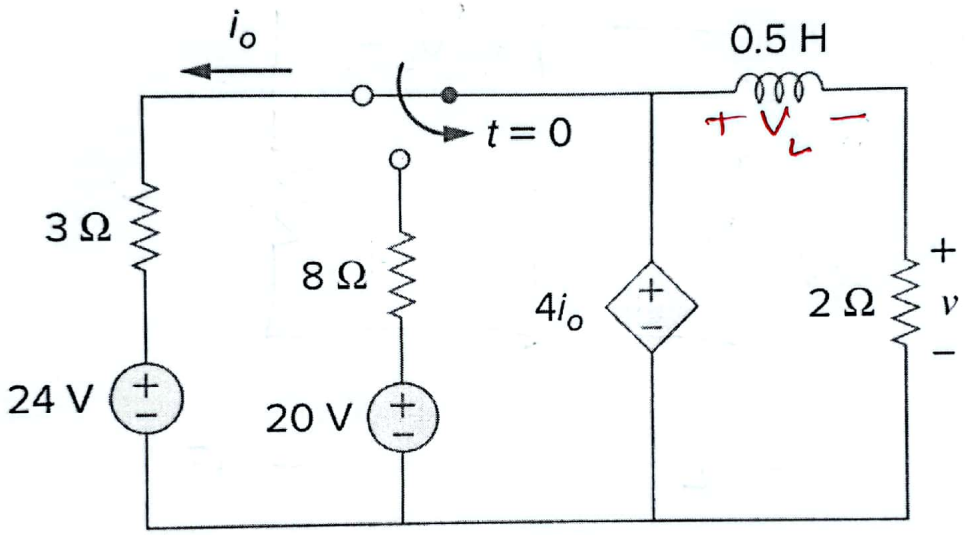
Set **B**

Assessment: *Quiz-4*
Full Marks: 20

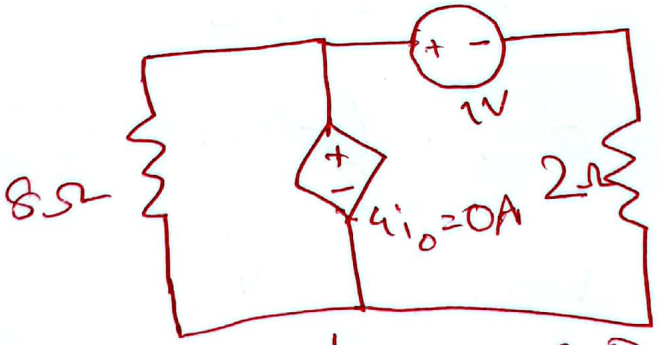
- ✓ No washroom breaks. Phones must be turned off. Using/carrying any notes during the exam is not allowed.
- ✓ At the end of the exam, the **answer script** must be returned to the invigilator.
- ✓ **All questions** are compulsory. Marks allotted for each question are mentioned beside each question.
- ✓ Symbols have their usual meanings.

■ Question 1 of 1 *[CO3] [20 marks]*

Calculate the time constant. **Calculate** $i_L(t)$ and $v_L(t)$ for t<0 and t>0 and the energy stored in the inductor at t=100ms.



For R,

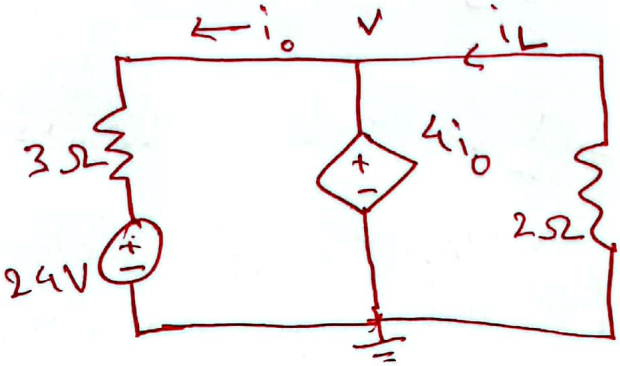


$i_o = 0$ A

Dependent source is short

$\therefore R = 2\,\Omega, \quad \tau = \frac{L}{R} = \frac{0.5}{2} = 0.25$s

For t < 0,



$i_o = \frac{v - 24}{3}$ — (1)

Again, $v = 4i_o$

or, $i_o = \frac{v}{4}$

~~Applying KCL we get,~~

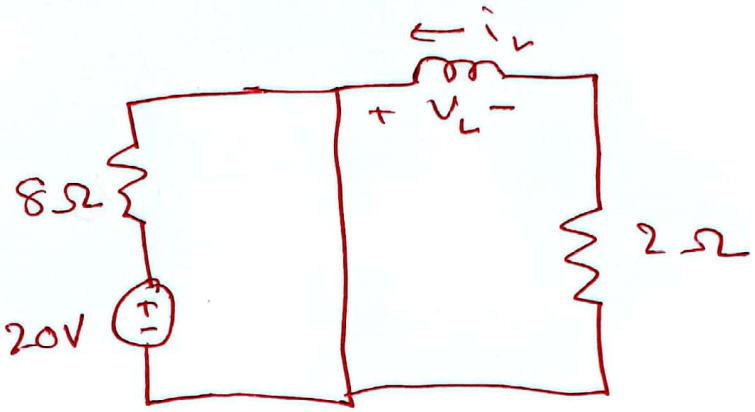
$\therefore \frac{v}{4} = \frac{v-24}{3}$

or, $v = 96\,V$

$\therefore i_L(0) = I_0 = \frac{0-v}{2} = -48\,A$

$v_L(0) = 0$, as inducter is short

For $t > 0$,



$I_S = 0$

$\therefore i_L(t) = I_0 e^{-\frac{t}{\tau}} = -48e^{-4t}\,A$

$v_L(t) = L\frac{di_L}{dt} = 0.5 \times (-48) \times (-4) e^{-4t}$

$= 96e^{-4t}\,V$

$i_L(t = 100ms) = -48e^{-4\times\frac{100}{1000}} = -32.18\,A$

$\therefore W = \frac{1}{2} L i_L^2 = \frac{1}{2} \times 0.5 \times (-32.18)^2$

$= ~~4035.55\,J~~$ $258.89\,J$

$v_L(t) = \begin{cases} 0V, & t \le 0 \\ 96e^{-4t}V, & t > 0 \end{cases}$

$i_L(t) = \begin{cases} -48A, & t \le 0 \\ -48e^{-4t}A, & t > 0 \end{cases}$