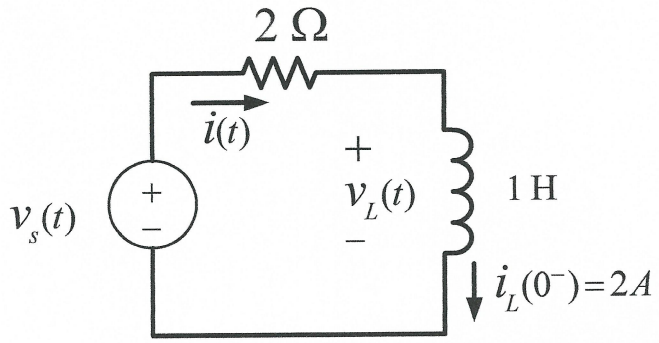
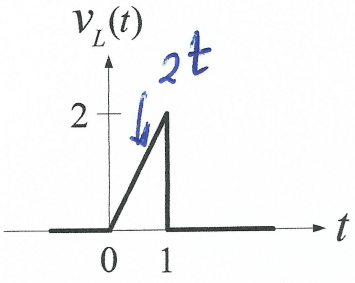
EE 202-02-Winter 2014(141)
QZ3

Sec	Ser	ID	Name KEY





For the circuit shown above , the inductor voltage $v_L(t)$ is as shown :

(*a*) Find $i(t)$ if the current through the inductor is $2\,A$?

(*b*) Find the energy stored at the inductor at t = 0, 0.5 and 1.5 seconds ?

(a) $i(t) = i_L(t) = \frac{1}{L}\int_{t_0}^{t} v_L(\tau)\,d\tau + i_L(t_0)$

$= \frac{1}{1}\int_{0}^{t} (2\tau)\,d\tau + 2 = t^2 + 2 \quad A \quad 0 \le t \le 1$

$i(t) = \frac{1}{1}\int_{1}^{t} (0)\,d\tau + i_L(1) = 0 + (1^2+2)$

$= 3 \quad A \quad t \ge 3$

$$i_L(t) = \begin{cases} t^2+2 & 0 \le t \le 1 \\ 3 & t \ge 3 \end{cases}$$

(b) $W_L(t) = \frac{1}{2} L\, i_L^2(t) \Rightarrow W_L(0) = \frac{1}{2}(1)(2)^2 = 2\ J$

$W_L(0.5) = \frac{1}{2}(1)(0.5^2+2) = 1.125\ J$

$W_L(1.5) = \frac{1}{2}(1)(1.5^2+2) = 2.125\ J$

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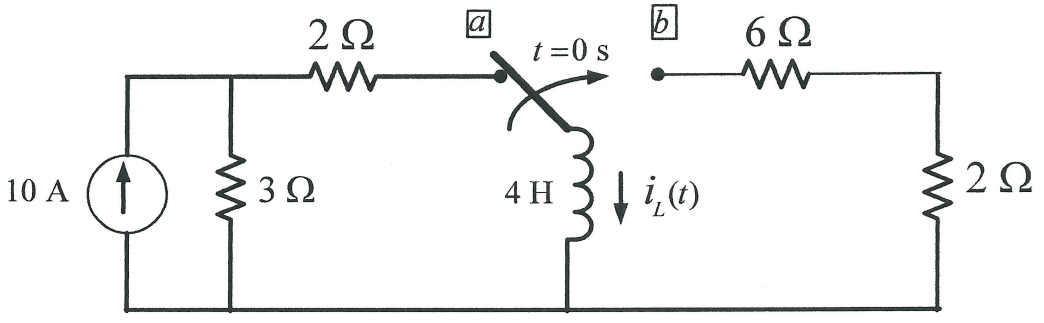
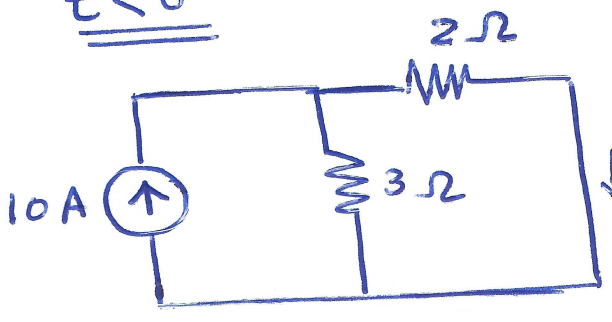


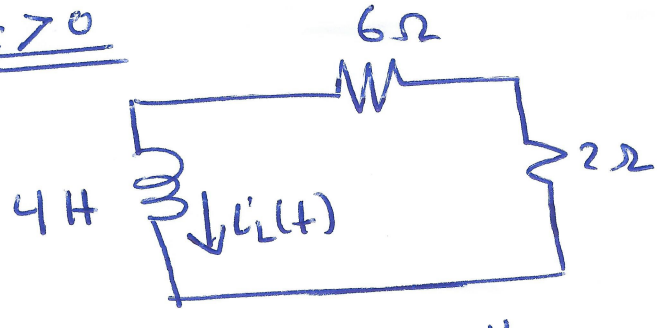
For the circuit shown above , the switch was in position ***a*** for long time and at t=0 the switch move to position ***b*** find $i_L(t)$ t > 0 ?

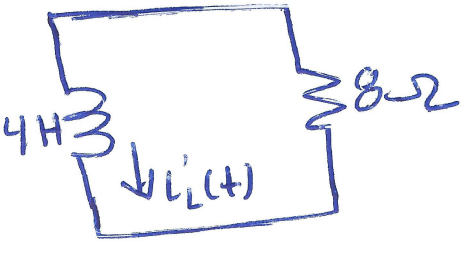
t<0



$i_L(0) = \frac{3}{3+2} 10 = 6A$

t>0





$\tau = \frac{L}{R} = \frac{4}{8} = \frac{1}{2}$ second

$i_L(t) = i_L(0)\, e^{-t/\tau}$

$i_L(t) = i_L(0)\, e^{-t/\frac{1}{2}}$

$= 6\, e^{-2t}$

$= 6\, e^{-2t}$