13.47 In the network in Fig. P13.47, the switch opens at $t = 0$. Use Laplace transforms to find $i_L(t)$ for $t > 0$.

PSV

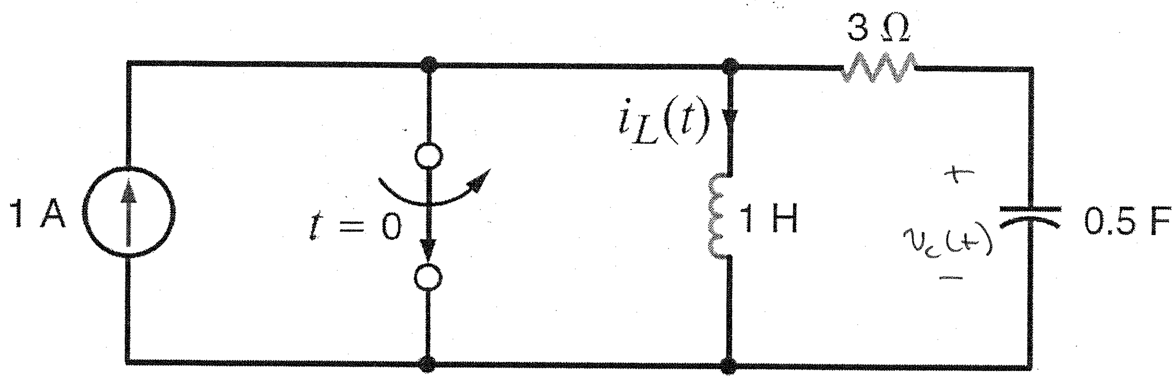


Figure P13.47

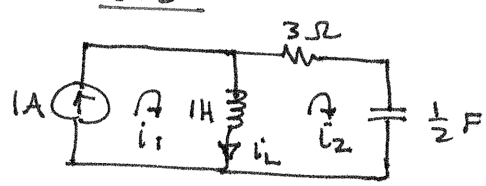
SOLUTION:

$\underline{t=0^-}$

$i_L(0^-)=0$

$v_c(0^-)=0$

$\underline{t=0^+}$



$i_L = i_1 - i_2$

$i_2 = 1 - i_L$

$$3i_2 + 2\int i_2\,dt - \frac{di_L}{dt} = 0 \Rightarrow 3(1-i_L) + 2\int dt - 2\int i_L\,dt - \frac{di_L}{dt} = 0$$

$$3 - 3I_L(s) + \frac{2}{s} - \frac{2I_L(s)}{s} - sI_L(s) = 0$$

$$I_L(s)\left[s^2+3s+2\right] = 3s+2 \Rightarrow I_L(s) = \frac{3s+2}{(s+1)(s+2)} = \frac{K_1}{s+1} + \frac{K_2}{s+2}$$

$K_1 = -1$ $\quad K_2 = 4$

$$\boxed{i_L(t) = \left[4e^{-2t} - e^{-t}\right]u(t)}$$