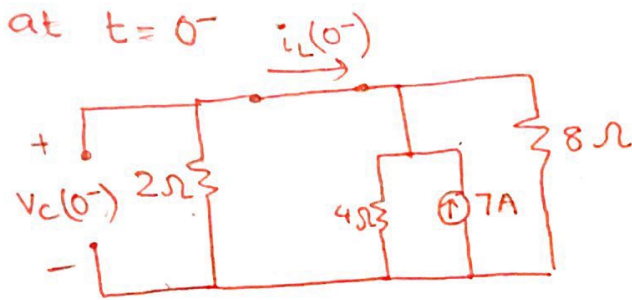
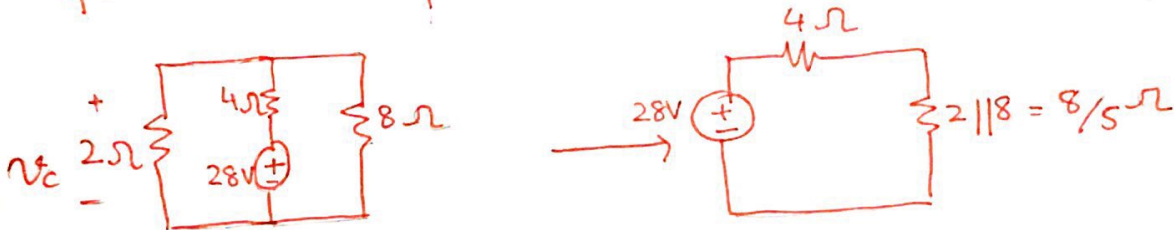


TAKE HOME QUIZ SOLUTION



Capacitor acts as open circuit when fully charged!
 Inductor acts as a short circuit when fully saturated!

After source transformation:



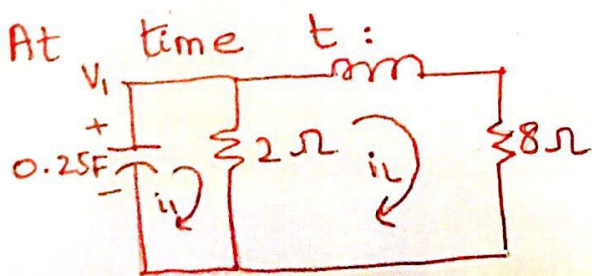
$$v_C(0^-) = 28 \left[\frac{8/5}{8/5 + 4} \right] = 8V \quad - (2) \text{ marks}$$

$i_L(0^-)$ = Current through 2Ω resistor

$$i_L(0^-) = \frac{8V}{2\Omega} = 4A$$

$$v_C(0^-) = v_C(0^+) = 8V$$

$$i_L(0^-) = i_L(0^+) = -4A \quad - (2) \text{ marks}$$



Loop equations:

For i_1 :

$$\frac{1}{C} \int i_1 dt + 2i_1 - 2i_L = 0 \quad - (1)$$

(1) mark

For i_L :

$$L \frac{di_L}{dt} + 8i_L + 2i_L - 2i_1 = 0$$

$$4 \frac{di_L}{dt} + 10i_L - 2i_1 = 0 \quad \text{--- (2)}$$

At $t = 0^+$:

$$i_L(0^+) = 4A$$

eq (2)

$$\Rightarrow 4 \frac{di_L}{dt} + 10(4) - 2i_1 = 0$$

$$\frac{di_L}{dt} = \frac{-10(4) - 2i_1}{4} \quad \text{--- (3)}$$

eq (1)

$$v_c(0^+) = 8V$$

$$8V + 2i_1 - 8 = 0$$

$$i_1 = 0A$$

eq (3) $\Rightarrow \frac{di_L}{dt} = -10 A/s$ --- (2) marks

Nodal at v_1 :

$$C \frac{dv_c}{dt} + \frac{v_c}{2} + i_L = 0 \quad \text{--- (4)}$$

at $t = 0^+$ $v_c(0^+) = 8V$

$$0.25 \frac{dv_c}{dt} + 4 - 4 = 0$$

$$\frac{dv_c}{dt} = 0 V/s \quad \text{--- (3) marks}$$