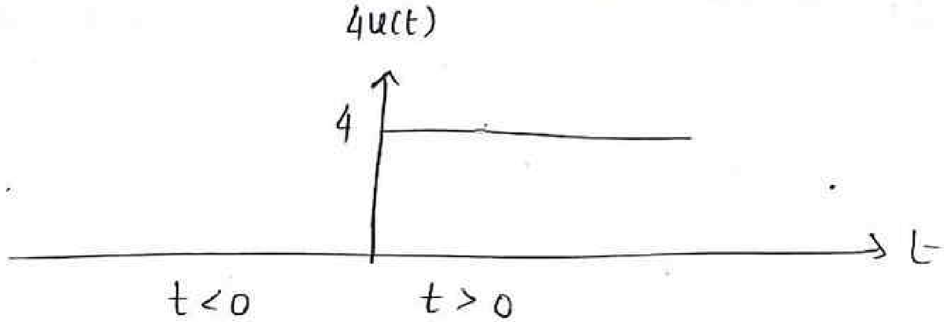
Answer

(1)



↓

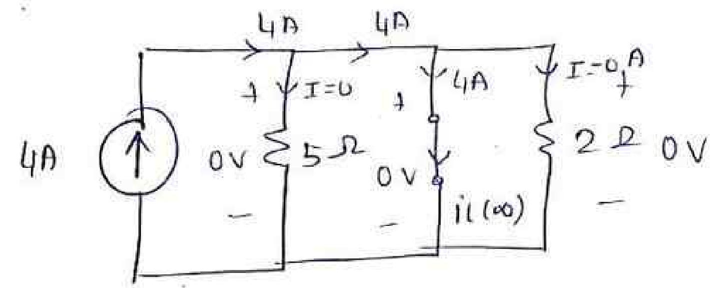
It gives initial condition.

=> Initial current

$$\boxed{i_L(0^-) = 0 \text{ Amps}}$$

t>0

(*) Current source is connected, therefore inductor is short circuited.

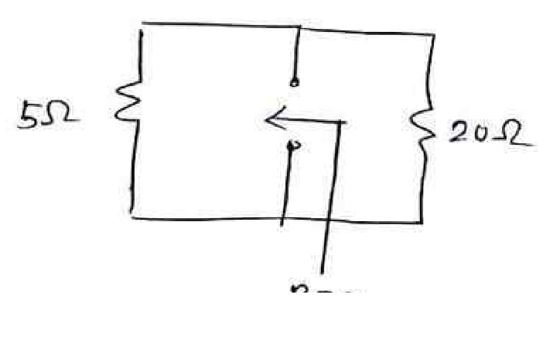


$$\therefore \boxed{i_L(\infty) = 4A}$$

(*) It gives steady state condition.

Time constant

=> while finding Req across inductor, the current source become open circuited



KOQ

Both 5Ω & 20Ω resistors are parallel.

$$R_{eq} = (5 \| 20)$$

$$= \frac{5 \times 20}{25}$$

$$R_{eq} = 4\Omega$$

Time constant

$$\tau = L/R_{eq}$$

$$= 8/4$$

$$\boxed{\tau = 2 \text{ seconds}}$$

Inductor current

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

$$i_L(t) = 4 + (0-4)\, e^{-t/2} \text{ Amps}$$

$$\boxed{i_L(t) = 4 - 4e^{-t/2} \text{ Amps}}$$

voltage across inductor = voltage across 20Ω

$$V_L(t) = V(t)$$

$$V(t) = L\frac{di_L(t)}{dt}$$

$$V(t) = 8\frac{d}{dt}\left[4 - 4e^{-t/2}\right]$$

$$V(t) = 8\left[-4 \times (-1/2)\, e^{-t/2}\right]$$

$$\boxed{V(t) = 16e^{-t/2} \text{ volts}} \quad t > 0$$

Likes: 0 **Dislikes: 0**