

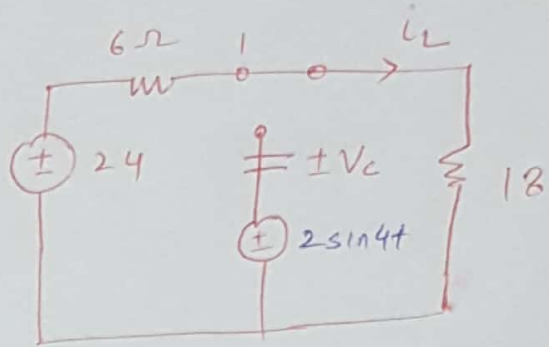
Solution

At $t=0^-$

Inductor; SC

$$i_L(0^-) = \frac{24}{24} = 1A = i_L(0^+)$$

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



At $t=0^+$

Series RLC circuit

Loop eq:

$$2 \frac{di}{dt} + 18i + \frac{1}{36} \int i dt = 2 \sin 4t \quad \text{--- (1)}$$

$$\Rightarrow \frac{d^2 i}{dt^2} + 9 \frac{di}{dt} + 18i = 4 \cos(4t) \quad \text{--- (2)}$$

$$i(t) = i_c(t) + i_p(t)$$

$i_c(t)$; characteristic eq: (From 2)

$$s^2 + 9s + 18 = 0$$

$$\Rightarrow s_1 = -3, s_2 = -6$$

$$\Rightarrow i_c(t) = K_1 e^{-3t} + K_2 e^{-6t}$$

$$i(t) = K_1 e^{-3t} + K_2 e^{-6t} + A \cos 4t + B \sin 4t$$

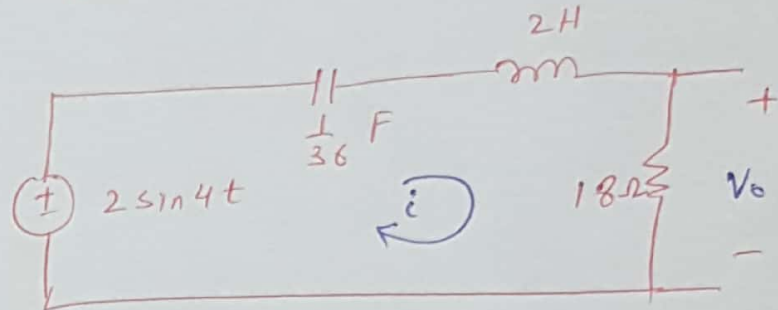
* To find K_1 and K_2 ; we use initial conditions

$$i(0) = i_L(0^+) = 1A$$

$$\frac{di(0^+)}{dt} = -9 i(0^+) = -9 A/sec \quad \text{(From 01)}$$

$$\Rightarrow \boxed{K_1 = -1.16 \quad ; \quad K_2 = 2.1538}$$

$$\boxed{V_o(t) = i(t) 18} \quad \text{Volts, } t \geq 0$$



$i_p(t)$:-

$$i_p(t) = A \cos 4t + B \sin 4t$$

Substitute

$$-16A \cos 4t - 16B \sin 4t - 36A \sin 4t + 36B \cos 4t + 18A \cos 4t + 18B \sin 4t = 4 \cos(4t)$$

$$\Rightarrow \begin{cases} 36B + 2A = 4 \\ 2B - 36A = 0 \end{cases}$$

| |
|----------------------|
| $A = \frac{2}{325}$ |
| $B = \frac{36}{325}$ |