

$$c) s = -\alpha + \sqrt{\alpha^2 - \omega_0^2} = -10^5$$

$$v_{c,n} = A_1 e^{-10^5 t} + A_2 t \cdot e^{-10^5 t}$$

$$\text{Guess } v_{c,f} = A_3 \cdot \Rightarrow v_{c,f}' = v_{c,f}'' = 0.$$

$$\Rightarrow 10^{10} \cdot A_3 = 10^{11} \Rightarrow A_3 = 10$$

$$v_c(t) = v_{c,n} + v_{c,f} = A_1 e^{-10^5 t} + A_2 t e^{-10^5 t} + 10.$$

$$v_c(0^-) = v_c(0^+) = v_c(0) = A_1 + 10 = 0 \Rightarrow A_1 = -10$$

$\hookrightarrow$  continuous

$$i_L = C \frac{dv_c}{dt} = 5 \cdot 10^{-7} \cdot \left( 10^6 e^{-10^5 t} + A_2 (e^{-10^5 t} - 10^5 t e^{-10^5 t}) \right)$$

$$i_L(0^-) = i_L(0^+) = i_L(0) = 5 \cdot 10^{-7} (10^6 + A_2) = 5$$

$\hookrightarrow$  continuous

$$\Rightarrow 10^6 + A_2 = 10^7 \Rightarrow A_2 = 9 \cdot 10^6$$

$$\Rightarrow v_c(t) = -10 e^{-10^5 t} + 9 \cdot 10^6 t e^{-10^5 t} + 10 \text{ V.}$$

$$i_L(t) = 0.5 e^{-10^5 t} + 4.5 \cdot e^{-10^5 t} - 4.5 \cdot 10^5 t e^{-10^5 t}$$

$$i_L(t) = 5 e^{-10^5 t} - 4.5 \cdot 10^5 t e^{-10^5 t} \text{ A.}$$

$$d) \alpha = \omega_0 = 10^5 \Rightarrow \text{critically damped.}$$