

RL 電路的正弦穩態響應 ( $v_s(t) = V_m \sin \omega t$ )

\* 電路(Fig 10.3-1)中  $R = 5\Omega$ ,  $L = 1H$ ,  $v_s(t) = 5 \sin 5t$ ,

求  $i(t)$ ,  $v_R(t)$ ,  $v_L(t)$  穩態解。

$$\rightarrow \frac{di(t)}{dt} + 5i(t) = 5 \sin 5t$$

$\rightarrow$  令  $i_f(t) = A \cos 5t + B \sin 5t$  代入 O.D.E

$$\rightarrow (5A + 5B) \cos 5t + (-5A + 5B) \sin 5t = 5 \sin 5t$$

$$\rightarrow \begin{cases} 5A + 5B = 0 \\ -5A + 5B = 5 \end{cases} \rightarrow A = -\frac{1}{2}, \quad B = \frac{1}{2}$$

$$\rightarrow i_f(t) = \frac{-1}{2} \cos 5t + \frac{1}{2} \sin 5t = \frac{\sqrt{2}}{2} \sin(5t - 45^\circ)$$

$$\rightarrow v_R(t) = 5i_f = \frac{5\sqrt{2}}{2} \sin(5t - 45^\circ)$$

$$\rightarrow v_L(t) = 1 \frac{di_f}{dt} = \frac{5\sqrt{2}}{2} \cos(5t - 45^\circ) = \frac{5\sqrt{2}}{2} \sin(5t + 45^\circ)$$

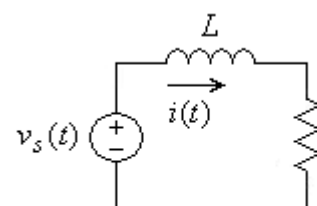


Fig 10.3-1

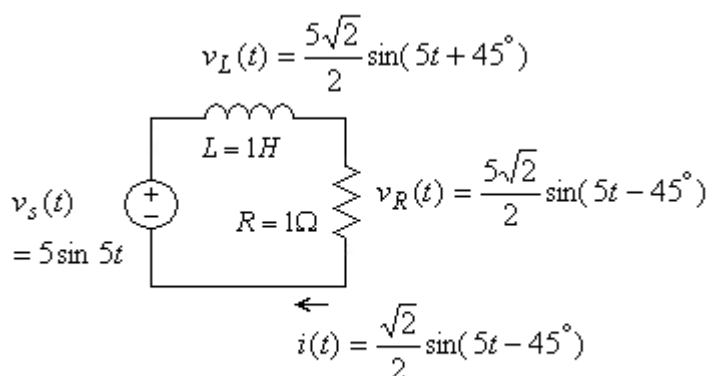


Fig 10.3-1a