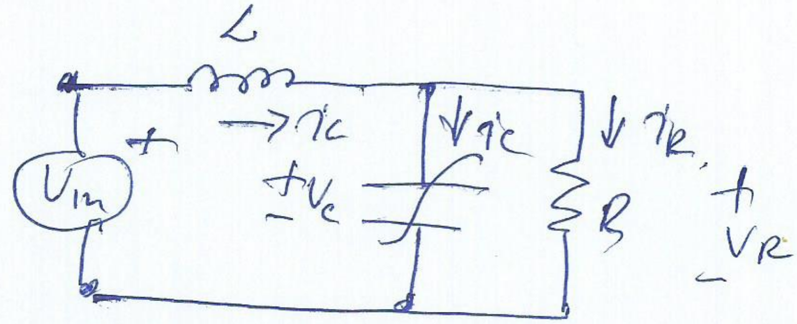

$$\begin{cases} L\frac{d}{dt}(i_C + i_R) + V_C = V_{in} \\ v_C = \cancel{v}_R = R i_R \Rightarrow \boxed{i_R = \frac{v_C}{R}} \end{cases}$$

(used: $i_L = i_C + i_R$)

$$i_C = \frac{dq_c}{dt}$$

$$v_c \doteq \Psi(q_c)$$

$$L\frac{d}{dt}\left(\frac{dq_c}{dt} + \frac{\Psi(q_c)}{R}\right) + V_c = v_{in}$$

$$\boxed{L\frac{d^2 q_c}{dt^2} + \frac{1}{R}\frac{d\Psi(q_c)}{R} + \Psi(q_c) = v_{in}(t)}$$

From here, $q_c(t)$ should be found, and then $v_c(t) = \Psi(q_c(t))$, which is $v_{out}(t)$.

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