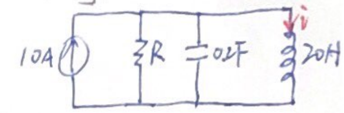
method 1 : 看作 step-response of parallel RLC, $R\to\infty$ 时的情况, 则:



$$\alpha = \frac{1}{2RC} = 0 \qquad \omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{20\times 0.2}} = 0.5$$

① 初始值: $i(0^+) = i(0^-) = 0$; $V(0^+) = V(0^-) = 0 \Rightarrow V_L(0^+) = V(0^+) = 0$

$$\Rightarrow \frac{di(0^+)}{dt} = 0$$

② 稳态值: $i(\infty) = 10$

③ 写出通解: $i(t) = 10 + (A_1\cos\omega_d t + A_2\sin\omega_d t)\cdot e^{-\alpha t}$, 其中 $\omega_d = \sqrt{\omega_0^2 - \alpha^2}$

$$= 10 + A_1\cos 0.5t + A_2\sin 0.5t$$

④ 应用初始值, 求待定系数

$$\begin{cases} 10 + A_1 = 0 \\ 0.5A_2 = 0 \end{cases} \Rightarrow A_2 = 0,\ A_1 = -10$$

$$\Rightarrow i(t) = 10 - 10\cos 0.5t$$

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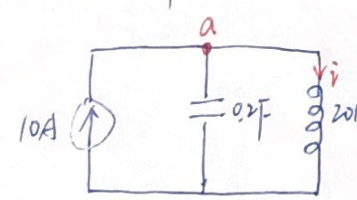
method 2: 因 0^+ 时刻是LC并联, 并非典型的RLC并联。直接对a节点写KCL方程



$$10 = 0.2\frac{dV_a}{dt} + i \quad \cdots ①$$

其中

$$V_a = 20\frac{di}{dt} \quad \cdots ②$$

把 ② 代入 ① 得到

$$4\frac{d^2 i}{dt^2} + i = 10$$

其特征方程为 $4s^2 + 1 = 0$

特征根为 $s_1 = 0.5j \quad s_2 = -0.5j$

特解为 $i = 10$

∴ 通解为 $i(t) = 10 + A_1 e^{0.5jt} + A_2 e^{-0.5jt}$

应用初始值, 求待定系数

$$\begin{cases} 10 + A_1 + A_2 = 0 \\ A_1 - A_2 = 0 \end{cases} \Rightarrow A_1 = A_2 = -5$$

$$\therefore i(t) = 10 - 5e^{0.5jt} - 5e^{-0.5jt}$$

$$= 10 - 10\cos 0.5t$$