Circuits II

Ch8 Additional Problems Solution

AP 8.1 **[a]** $\dfrac{1}{(2RC)^2} = \dfrac{1}{LC}, \qquad$ therefore $\quad C = 500\,\text{nF}$

[b] $\alpha = 5000 = \dfrac{1}{2RC}, \qquad$ therefore $\quad C = 1\,\mu\text{F}$

$$s_{1,2} = -5000 \pm \sqrt{25 \times 10^6 - \frac{(10^3)(10^6)}{20}} = (-5000 \pm j5000)\ \text{rad/s}$$

[c] $\dfrac{1}{\sqrt{LC}} = 20{,}000, \qquad$ therefore $\quad C = 125\,\text{nF}$

$$s_{1,2} = \left[-40 \pm \sqrt{(40)^2 - 20^2}\right] 10^3,$$

$$s_1 = -5.36\,\text{krad/s}, \qquad s_2 = -74.64\,\text{krad/s}$$

AP 8.2
$$\begin{aligned} i_\text{L} &= \frac{1}{50 \times 10^{-3}} \int_0^t [-14e^{-5000x} + 26e^{-20{,}000x}]\,dx + 30 \times 10^{-3} \\ &= 20\left\{ \frac{-14e^{-5000x}}{-5000}\bigg|_0^t + \frac{26e^{-20{,}000t}}{-20{,}000}\bigg|_0^t \right\} + 30 \times 10^{-3} \\ &= 56 \times 10^{-3}(e^{-5000t} - 1) - 26 \times 10^{-3}(e^{-20{,}000t} - 1) + 30 \times 10^{-3} \\ &= [56e^{-5000t} - 56 - 26e^{-20{,}000t} + 26 + 30]\,\text{mA} \\ &= 56e^{-5000t} - 26e^{-20{,}000t}\,\text{mA}, \qquad t \geq 0 \end{aligned}$$