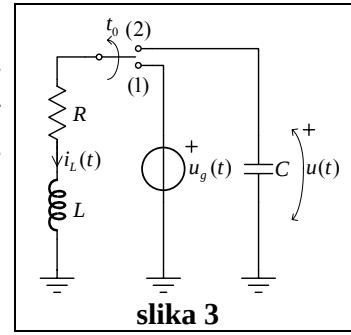


Zadatak 3

Parametri kola sa slike 3 su poznati i važi da je $L = R^2C$, $\omega = R/L$, $u_g(t) = U_m \sin(\omega t)$. Prekidač je u položaju (1) i kolo je u ustaljenom režimu rada. U trenutku t_0 , kada je struja kalema maksimalna, prekidač se prebacuje u položaj (2). Analizom u kompleksnom domenu Laplasove transformacije odrediti:

- a) napon na kondenzatoru $u(t)$ za $t \geq 0$,
b) rad koji se ulaže u otpornik u intervalu (t_0^+, ∞) .



Rešenje:

$$\text{a) } \underline{U}_g(\underline{s}) = \frac{U_m}{\sqrt{2}} e^{-j\frac{\pi}{2}}, \underline{I}_L = \frac{\underline{U}_g}{R + j\omega L} = \frac{\underline{U}_g}{R} \frac{1}{1 + j} = \frac{U_m}{2R} e^{-j\frac{3\pi}{4}}, i_L(t) = \frac{U_m}{\sqrt{2}R} \cos\left(\omega t - \frac{3\pi}{4}\right), i_L(t_0^-) = \frac{U_m}{\sqrt{2}R}, t_0^- = \frac{3\pi}{4\omega}.$$

$$\text{b) } \tau = t - t_0, \underline{U}(\underline{s}) = R\underline{I}_L + \underline{U}_L, \underline{U}_L = \underline{s}L\underline{I}_L - LI_{L0}, \underline{I}_L = -\underline{s}C\underline{U} + \underbrace{CU_0}_{=0}.$$

$$\underline{U}(\underline{s}) = \frac{-LI_{L0}}{1 + RC\underline{s} + (RC)^2 \underline{s}^2} = \frac{-I_{L0}}{C} \frac{1}{\underline{s}^2 + \frac{\underline{s}}{RC} + \frac{1}{(RC)^2}} = \frac{-I_{L0}}{C\omega_1} \frac{\omega_1}{(\underline{s} + \alpha)^2 + \omega_1^2},$$

$$\xrightarrow{\mathcal{L}^{-1}} u(t) = \frac{-I_{L0}}{C\omega_1} e^{-\alpha(t-t_0)} \cdot \sin[\omega_1(t-t_0)], t \geq t_0, \alpha = \frac{1}{2RC}, \omega_1 = \frac{\sqrt{3}}{2RC}.$$