ZADACI

XIII. 2-1.

$C = 100\mu F$, U, nabijen, $W_c = 5\,J$ $\quad W_c = \frac{C \cdot U^2}{2}$

$U^2 = \frac{10}{C} \Rightarrow U = 1000\,V$

XIII.2-2. $C = 100\mu F$; $U = 100\,V$ $R = 10k\Omega$

$t = ?$ $\quad 0{,}63\,U$ $\quad \tau = 1$

$U_c = U\left(1 - e^{-\frac{t}{\tau}}\right)$

$63 = 100\left(1 - e^{-t}\right)$

$0{,}37 = e^{-t}$

$1 = t$

XIII.2-3. Nenabijeni kondenzator $C = 5\,\mu F$ preko $R = 1000\,\Omega$

$s(t = 1{,}1\,s) = ?$ $\quad$ $\tau = R \cdot C = 11$

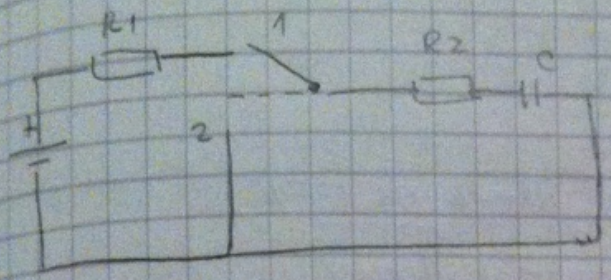
5τ ? Potrebno da se kondenzator nabije potpuno

$C = \frac{11}{5 \cdot R} = \frac{11}{5 \cdot 1000} = 2{,}2 \cdot 10^{-3}\,F$

XIII.2-4. $t=0 \to 1$ $U=10V$

$t=30ms \to 2$ $R_1=600\Omega$ $C=5\mu F$

$u_c(t=2ms)=?$ $R_2=2,4k\Omega$



(1) $R_{ok}=R_1+R_2=3k\Omega$

$\tau_1=R_{ok}\cdot C=3k\Omega\cdot 5\mu F=15ms$

$t_1=30-0=2\tau$

$u_c=U\left(1-e^{-\frac{t}{\tau}}\right)=12\left(1-e^{-2}\right)=10,3V=U_1$

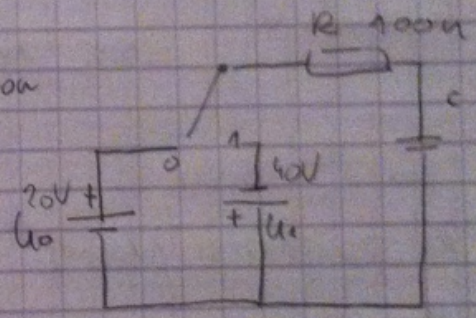
(2) $\tau_2=R_2\cdot C=12ms$

$u_c(\tau_2)=U\left(1-e^{-1}\right)=6,48$

$u=10,3-6,48=3,81V$

XIII.2-5. $u_c, u_R, I\ (t=0^+)$ $U_0=20V$

$u_c(konačno=?)$ $U_1=40V$



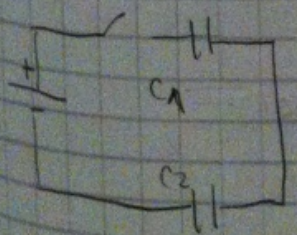
$u_c(t=0^-)=U_0=20V=u_c(t=0^+)$

$i(t=0^+)=\frac{60}{100}=0,6A$

$u_c(\infty)=40V$

XIII.2-6. $t=0$ - sklopka se zatvori, $u_{c2}(t_1=?)$, $U=10V$, $R_1=1k\Omega$, $t_1=20ms$,

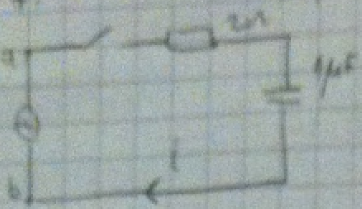
$C_1=30\mu F$, $C_2=60\mu F$ $C_{ek}=\frac{C_1C_2}{C_1+C_2}=20\mu F$ $\tau=R_1C_{ek}=0,02$



$u_{c1}=10\left(1-e^{-1}\right)=6,296V$

$u_{c2}=u_{c1}\cdot\frac{C_1}{C_1+C_2}=2,1V$

XIII.2-7. $U_{ab} = -5V$, i, U_R, U_C $(t=0^+)$



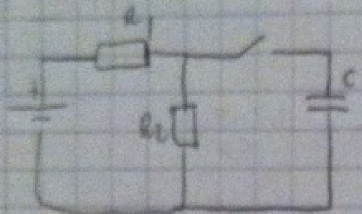
$I = \frac{U}{R} = \frac{-5}{2} = -2,5A$

$\tau = R \cdot C = 2 \cdot 10^{-6}$, $U_C = 0V$

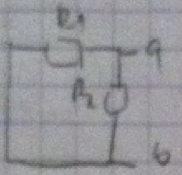
$U_R = \underline{\underline{5V}}$

XIII.2-8. kondenzator prazan, $t=0$ s sklopka se zatvara, $Q(150\mu s) = ?$

$I_{R_2}(150\mu s) = ?$, $R_1 = 4k\Omega$, $R_2 = 12k\Omega$, $C = 25nF$, $U = 120V$



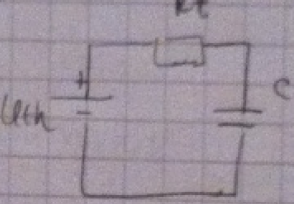
, KORISTITI THEVENINOV NADOMJESNI TAKO KAKO BI DOBILI SERIJU RC



$R_T = R_1 \| R_2 = \frac{12 \cdot 10^3 \cdot 4 \cdot 10^3}{16 \cdot 10^3} = \underline{\underline{3k\Omega}}$

$U_{th} = U_{R_2} = U \cdot \frac{R_2}{R_1 + R_2} = 90$

SADA IMAMO:



$\tau = R_t \cdot C = 7,5 \cdot 10^{-5}$

$U_C(150\mu s) = 90(1 - e^{-\frac{150 \cdot 10^{-6}}{7,5 \cdot 10^{-5}}})$

$U_C = \underline{\underline{77,65}}$

$C = \frac{Q}{U} \Rightarrow Q = C \cdot U = 1,94 \cdot 10^{-6} C$

(2) R_2 paralelan u početnoj shemi C, pa je u 150μs, napon na R_2 jednak naponu na C, pa je:

$I_{R_2} = \frac{U_C}{R_2} = \frac{77,65}{12k\Omega} = \underline{\underline{6,47 mA}}$

XIII.2-10. p_i (snaga izvora), p_R, p_L, serijski RL $t = 0^+$, $t = t_1 = 5\tau$

$p_i = \frac{U^2(1 - e^{-t/\tau})}{R}$, $p_R = \frac{U^2(1 - e^{-t/\tau})^2}{R}$, $p_L = \frac{U^2(1 - e^{-t/\tau})e^{-t/\tau}}{R}$

XIII.2-9. S. RL krug, $t=0$, τ, $U_R(t_1) = ?$ $R = 2\Omega$, $L = 0,01H$, $U = 10V$, $t_1 = 5ms$

$\tau = L/R = 0,01/2 = \underline{\underline{5ms}}$

$U_L(5ms) = U e^{-\frac{5ms}{5ms}} = 3,7V$

$U_R = U - U_L = 6,3V$

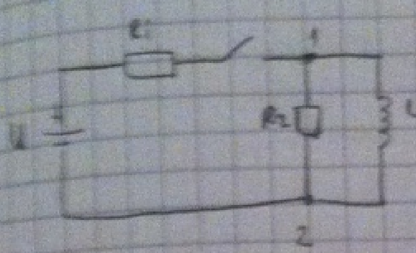
Zd. 2-11. $\rightarrow$ P_L ?, $U = 10\,V$, $R = 5\,\Omega$, $L = 1\,H$

$i_L(t) = \frac{U}{R}\left(1 - e^{-t/\tau}\right)$ $P_i = \frac{U^2}{R}\left(1 - e^{-t/\tau}\right)$ $\tau = \frac{L}{R} = 0,2$

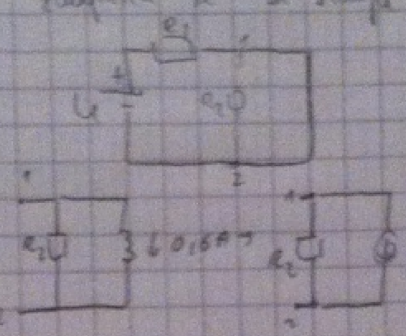
$P_i = \frac{10^2}{5}\left(1 - e^{-\frac{0,2}{0,2}}\right) = 12,6\,W$

Zd. 2-12. $t=0 \rightarrow$ dođe se sklopka

$U_{12}(t=0^+) = ?$ $U = 12\,V$, $R_1 = 20\,\Omega$, $R_2 = 20\,k\Omega$



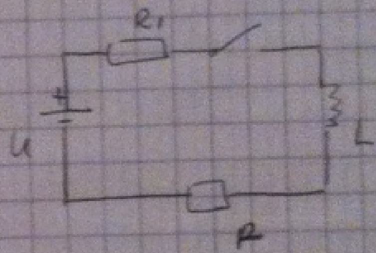
Zavojnica u 1. stanju predstavlja kratki spoj



$I_L = \frac{U}{R_1} = 0,6\,A$

ne prolazi kroz otpor

$U_{12} = -0,6 \cdot 20k = 12\,kV$



Zd. 2-13. $t_1 \rightarrow U_L$, $W_L = ?$

$U = 100\,V$, $R_1 = R = 10\,\Omega$, $t_1 = 40\,ms$, $U_L = 60\,V$

$W_L = \frac{LI^2}{2}$ $R_{uk} = R + R_1 = 20\,\Omega$

$u_L = U e^{-t/\tau}$

$\tau = \frac{L}{R}$

$\frac{60}{100} = e^{-\frac{0,4}{\tau}}$

$0,6 = e^{-0,4/\tau}$

$L = 0,78\,R_{uk} = 15,66$

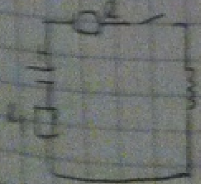
$I = \frac{U}{R_{uk}} = \frac{100}{20} = 5$

$\tau = 0,78$

$W_L = \frac{15,66 \cdot 25}{2} = 196\,Ws$

Zd. 2-14. R_S, R_1, $t_1 \rightarrow U_S$, $L_S = ?$

$U = 125\,V$, $R_1 = 2\,\Omega$, $R_S = 2\,\Omega$, $t_1 = 40\,ms$, $U_S = 85,5\,V$



$\tau = L/(R_1 + R_S)$

$t=0^+$ $I = \frac{U}{R_1 + R_S} = 31,25$

$U_L(0,4) = U e^{-\frac{0,4}{\tau}}$

$85,5 = 125\, e^{-0,4/\tau}$

$\tau = 1,05 = L/(R_1 + R_S)$

$L = 4$