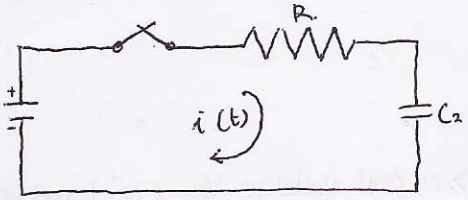

Consider the RC circuit in that figure the switch Is closed at t=
Before the switch closing, the capasitor C is charged to V_0 volt
and the capacitor C_2 is not charged.

a). Assuming $C_1 = C_2 = C$, find the current $i(t)$ for $t \geq 0$

Dari loop $i(t)$ didapat :

$$-V_{C1} + V_R + V_{C2} = 0$$

$$V_R + V_{C2} = V_{C1}$$

$$R \cdot i(t) + \frac{1}{C_2}\int_{-\infty}^{t} i(t)\,dt = V_0 - \frac{1}{C_1}\int_{0}^{t} i(t)\,dt$$

$$R \cdot i(t) + \frac{1}{C}\int_{\infty}^{t} i(t)\,dt = V_0 - \frac{1}{C}\int_{0}^{t} i(t)\,dt$$

$$R \cdot i(s) + \frac{1}{C}\left[\frac{I(s)}{s} + \frac{1}{s}\int_{-\infty}^{0} i(t)\,dt\right] = \frac{V_0}{s} - \frac{1}{C}\cdot\frac{I_s}{s}$$

dengan $V_{C2}(0^-) = \frac{1}{C}\int_{-\infty}^{0^-} i(t)\,dt = 0$

Kapasitor 2 kosong selama saklar belum close $(t<0)$

$$R\,I(s) + \frac{1}{Cs} + I(s) = \frac{V_0}{s} - \frac{1}{Cs}\,I(s)$$

$$R\,I(s) = \frac{2}{Cs}\,I(s) = \frac{V_0}{s}$$

$$\left(R + \frac{2}{Cs}\right) I(s) = \frac{V_0}{s}$$

$$I(s) = \frac{V_0}{s} \cdot \frac{1}{R + 2/Cs} \longrightarrow \text{dikali } \frac{S/R}{S/R}$$

$$I(s) = \frac{V_0}{R} \cdot \frac{1}{S + 2/RC}$$

$$I(t) = \frac{V_0}{R} \cdot e^{-2t/RC}$$

b). Find the total energy E dissipated by the resistor and show that E is independent of R is equal to half of the initial energy

Energi rangkaian $= \frac{1}{2}CV^2 \longrightarrow$ energi tersebut tidak tergantung oleh R

C pengganti $= C = C_1 + C_2 = 2C$

V_1 dan V_2 besarnya sama saat rangkaian tertutup yaitu $\frac{V_1}{2}$

$$E = \frac{1}{2}CV^2$$

$$= \frac{1}{2}\,2C\left(\frac{V_1}{2}\right)^2$$

$$= C\,\frac{V_1^2}{4}$$

$$= \frac{1}{4}CV_1^2 \longrightarrow V_1 = V_0$$

$$= \frac{1}{4}CV_0^2$$

Besar energi di $C_1 = \frac{1}{2}CV_0^2$

Besar energi disipasi $= \frac{1}{4}CV_0^2$

$\frac{1}{4} CV_0^2 = n \left[\frac{1}{2} CV_0^2 \right]$

$n = \frac{1}{2}$

besar energi disipasi $= \frac{1}{2}$ energi pada C_1

C. Assume that $R = 0$ and $C_1 = C_2 = C$. Find the current $i(t)$ for $t \geq 0$ and voltage $V_{C1}(0^+)$ and $V_{C2}(0^+)$

$R = 0$

$C_1 = C_2 = C$

Dari loop didapatkan :

$-V_C + V_R + V_{C2} = 0$

$V_R + V_{C2} = V_{C1}$

$V_{C2} = V_{C1}$

$$\frac{1}{C_2} \int_{-\infty}^{t} i(t)\, dt = V_0 - \frac{1}{C_1} \int_0^t i(t)\, dt$$

$$\frac{1}{C} \int_{-\infty}^{t} i(t)\, dt = V_0 - \frac{1}{C} \int_0^t i(t)\, dt$$

$$\frac{1}{C} \left[\frac{I(s)}{s} + \frac{1}{s} \int_{-\infty}^{0} i(t)\, dt \right] = \frac{V_0}{s} - \frac{1}{C} \frac{I(s)}{s}$$

$$\frac{1}{Cs} \cdot I(s) + 0 = \frac{V_0}{s} - \frac{1}{Cs} \cdot I(s)$$

$$\frac{2}{Cs} \cdot I(s) = \frac{V_0}{s}$$

$$I(s) = \frac{V_0}{2} \cdot \frac{Cs}{s}$$

$$I(s) = \frac{V_0 \cdot C}{2}$$

$I(s) \longrightarrow i(t)$

$1 \longrightarrow \delta(t)$

$i(t) = \frac{1}{2} V_0 C\, \delta(t)$

$V_C = \frac{1}{C} \int i(t)\, dt$

$C_1 = C_2 \cdot C$

$V_{C1} = V_{C2} = V_C$

$$V_C = \frac{1}{C} \int i(t)\, dt$$

$$= \frac{1}{C} \int C \frac{1}{2} V_0 \cdot C\, \delta(t)\, dt$$

$$= \frac{1}{C} \cdot \frac{1}{2} \cdot V_0 \cdot C$$

$$V_C = \frac{V_0}{2}$$

$$V_{C1}(0^+) = \frac{V_0}{2}$$

$$V_{C2}(0^+) = \frac{V_0}{2}$$