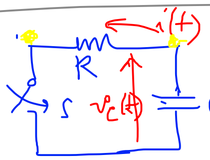
Project 1

Verifikasi SIMULINK

* Pelepasan Muatan Kapasitor



Pada $t=0$ kapasitor sudah bermuatan dengan tegangan $v_c(t) = 10$ Volt pada $t=0$, $v_c(0) = 10\,V$

Saklar S ditutup pada $t=0$, sehingga kapasitor C melepas muatan, dan mengalirlah arus $i(t)$ yang memanaskan resistor R, sehingga $v_c(t) \to 0$, $t \to \infty$.

Analisis. $i(t) = C\dfrac{dv_c(t)}{dt}$

pada R = 0 : $v_c(t) = R\,i(t)$

$$i(t) = -\frac{1}{R}v_c(t)$$

$$C\frac{dv_c(t)}{dt} = -\frac{1}{R}v_c(t)$$

$$\frac{dv_c(t)}{dt} = -\frac{1}{RC}v_c(t)$$

$$\int\frac{dv_c(t)}{v_c(t)} = \int -\frac{1}{RC}\,dt$$

$$\ln[v_c(t)] = -\frac{1}{RC}\int dt = -\frac{t}{RC}$$

$${}^{e}\log[v_c(t)] = -\frac{t}{RC} + K \leftarrow \text{konstanta}$$

$$v_c(t) = e^{\left(-\frac{t}{RC}+K\right)}$$

$$= e^{K}e^{-\frac{t}{RC}}$$

$$= Ae^{-\frac{t}{RC}}$$

Keadaan awal. $t=0 \to v_c(0) = Ae^{-0/RC} = A = 10$

$$\boxed{v_c(t) = 10e^{-t/RC}}$$

$\leftarrow$ ACUAN untuk verifikasi

$$\int\frac{dx}{x} = \int x^{-1}dx = \ln x = {}^{e}\log x$$

$$\int dx = x$$

$$\int x\,dx = \frac{1}{2}x^2$$

$$\int x^2\,dx = \frac{1}{3}x^3$$

$$\int x^{-1}\,dx =$$

$\log a = b$

$a = 10^b$

${}^{e}\log a = b$

$a = e^b$