+ time

SIMULINK
$v_c(t)$

spreadsheet

* Untuk SIMULINK, $\varepsilon = 10^{-3}$ → ERROR % → $\varepsilon = 10^{-4}$, $\varepsilon = 10^{-5}$, $\varepsilon = 10^{-6}$

t (sec)	$v_c(t)$ ANALITIK	$v_c(t)$ SIMULINK	ERROR %
0	10	10	0

MATLAB

MATLAB

$$\text{ERROR} = \left| \frac{v_{c\,ana} - v_{sim}}{v_{c\,ana}} \right| \times 100\%$$

Solusi analitik

~~EXACT~~

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

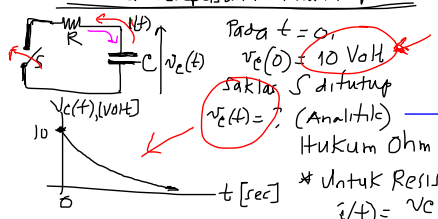
Referensi

TUGAS 1

Verifikasi SIMULINK

pengaruh nilai "Relative Tolerance" terhadap AKURASI Simulink

Model Pelepasan Muatan Kapasitor



(Analitik) → SOLUSI pers. differensial

Hukum Ohm:

* Untuk Resistor:

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

* Untuk Kapasitor:

$$i(t) = -C\frac{dv_c(t)}{dt} \quad (2)$$

(1) = (2)

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

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

$$\ln x = a$$
$$x = e^a$$

$$\int \frac{dx}{x} = \int \left(\frac{1}{x}\right) dx = \ln x$$

Analisis (dengan KALKULUS):

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

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

$$v_c(t) = e^{\left[-\frac{1}{RC}t + K\right]}$$

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

$$v_c(t) = Ae^{-t/RC}$$ solusi umum

$t = 0 \rightarrow v_c(0) = 10$ volt

$$10 = Ae^{-0/RC} = A$$