Hukum Newton :

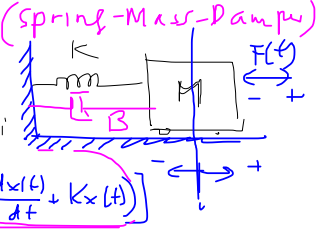
$$F(t) = M\frac{d^2x(t)}{dt^2} + B\frac{dx(t)}{dt} + Kx(t)$$

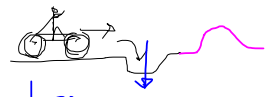
percepatan, kecepatan, posisi

$$\frac{d^2x(t)}{dt^2} = \frac{1}{M}\left[F(t) - \left(B\frac{dx(t)}{dt} + Kx(t)\right)\right]$$

perubahan kecepatan → 0

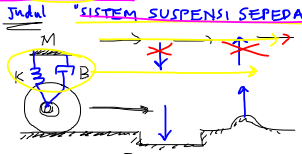
(Spring-Mass-Damper)

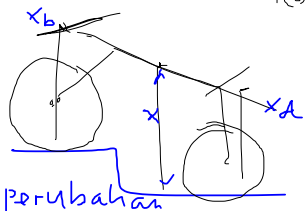


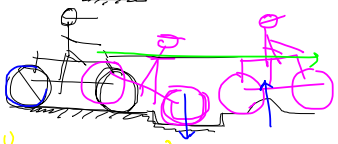


* PROJECT 2

Judul "SISTEM SUSPENSI SEPEDA MOTOR"





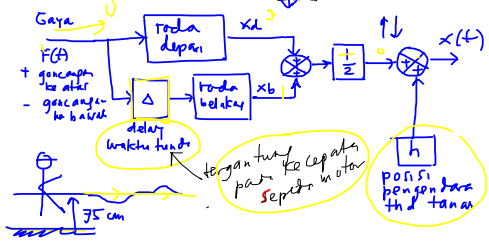


perubahan

x_b posisi roda belakang terhadap tanah — + ke atas, − ke bawah

x_d : posisi roda belakang depan terhadap tanah

$x = \frac{1}{2}(x_b + x_d)$ = posisi pengendara terhadap tanah



MODEL
- STATIC
  - FISIK
  - MATEMATIK
    - ANALITIK
    - NUMERIK
- DINAMIK
  - FISIK
  - MATEMATIK
    - ANALITIK
    - NUMERIK
    - SIMULASI

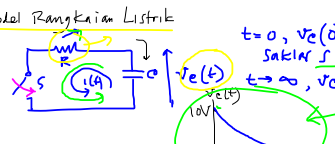
Bisa diunduh di
http://www.unhas.ac.id/thiza/arsip/kuliah/
→ Pemodelan dan Simulasi
↳ Dokumentasi 2015 – Kelas C

Project 1

"VERIFIKASI SIMULINK"

Kasus : [Pelepasan muatan Kapasitor melalui Resistor]

Model Rangkaian Listrik



$t = 0$, $v_c(0) = 10$ Volt
Saklar S ditutup
$t \to \infty$, $v_c(t) \to 0$

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

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

$\int x^{-2} dx = -x^{-1}$

Analisis (Hukum Ohm)

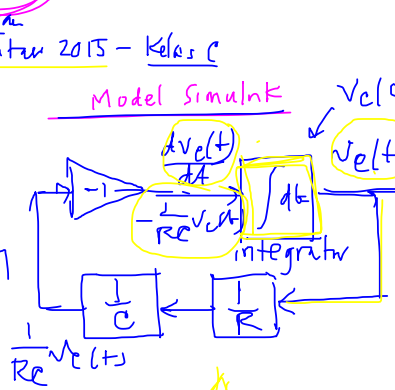
(1) $i(t) = -C\frac{dv_c(t)}{dt}$

(2) $v_c(t) = R\,i(t) \rightarrow i(t) = \frac{v_c(t)}{R}$

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

Pers. Diff $\boxed{\frac{dv_c(t)}{dt} = -\frac{1}{RC}v_c(t)}$, $v_c(0) = 10$ Volt

Model Simulink



+error

$\int \frac{dx}{x} = \ln x$

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

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

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

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

$x = e^a$

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

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

$t = 0 \rightarrow v_c(0) = Ae^0 = A = 10$

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

check : (1) $t = 0 \rightarrow v_c(0) = 10e^0 = 10$ ✓

$t = \infty \rightarrow v_c(\infty) = 10e^{-\infty} = 0$ ✓

(2) $\frac{dv_c(t)}{dt} = (-10)\left(\frac{1}{RC}\right)e^{-t/RC}$

$= -\frac{1}{RC}\,10e^{-t/RC}$

$= -\frac{1}{RC}\,v_c(t)$ ✓

relative tolerance 10^{-3}

$v_c(t)$

t	ANA	SIM	Error
0	$10e^{-t/RC}$		

referen