

✱ Pers. Diff. Order ke-n:
 $a_n \frac{d^n x(t)}{dt^n} + a_{n-1} \frac{d^{n-1} x(t)}{dt^{n-1}} + a_{n-2} \frac{d^{n-2} x(t)}{dt^{n-2}} + \dots + a_1 \frac{dx(t)}{dt} + a_0 x(t) = u(t)$ → sebuah pers. diff order ke-n

akan dipecahkan n buah pers. Diff. Order pertama:

Misalnya $x(t) = x_1 \rightarrow \frac{dx(t)}{dt} = \frac{dx_1}{dt} = x_2$

$\frac{dx(t)}{dt} = x_2 \rightarrow \frac{d^2 x(t)}{dt^2} = \frac{dx_2}{dt} = x_3$

$\frac{d^2 x(t)}{dt^2} = x_3 \rightarrow \frac{d^3 x(t)}{dt^3} = \frac{dx_3}{dt} = x_4$

$\vdots$
 $\frac{d^{n-1} x(t)}{dt^{n-1}} = x_n \rightarrow \frac{d^n x(t)}{dt^n} = \frac{dx_n}{dt}$

$\frac{d^n x(t)}{dt^n} = -\frac{a_0}{a_n} x_1 - \frac{a_1}{a_n} x_2 - \frac{a_2}{a_n} x_3 - \dots - \frac{a_{n-1}}{a_n} x_n + \frac{1}{a_n} u(t)$

n buah Pers. Diff. order pertama

↓ diselesaikan dengan METODE NUMERIK

n buah Pers. Diff order pertama

$\frac{dx_1}{dt} = x_2$

$\frac{dx_2}{dt} = x_3$

$\frac{dx_3}{dt} = x_4$

$\vdots$

$\vdots$

$\frac{dx_n}{dt} = -\frac{a_0}{a_n} x_1 - \frac{a_1}{a_n} x_2 - \frac{a_2}{a_n} x_3 - \dots - \frac{a_{n-1}}{a_n} x_n + \frac{1}{a_n} u(t)$

$x_1, x_2, x_3, \dots, x_n$

n buah peubah

n buah Pers. Diff. Order pertama

→ sebuah Pers. Diff order ke-n

✱ Fungsi Vander Pol:

$\frac{d^2 x(t)}{dt^2} + \mu([x(t)]^2 - 1) \left(\frac{dx(t)}{dt} \right) + x(t) = 0$

Misalkan: $x(t) = x_1 \rightarrow \frac{dx(t)}{dt} = \frac{dx_1}{dt} = x_2$

$\frac{d^2 x(t)}{dt^2} = -\mu([x(t)]^2 - 1) \left(\frac{dx(t)}{dt} \right) - x(t)$

$\frac{dx_2}{dt} = -\mu(x_1^2 - 1)(x_2) - x_1$

2 buah Pers. Diff. Order pertama