* Bagaimana solusi

$\dot{x} = Ax + Bu$, $x(0) = x_0$ $u = \begin{bmatrix} u_1(t) \\ u_2(t) \\ \vdots \\ u_m(t) \end{bmatrix}$

$\dot{x} = Ax(t) + Bu(t)$ $A\,[n \times n]$ $B = [n \times m]$

$c(t) = \begin{bmatrix} c_1(t) \\ c_2(t) \\ \vdots \\ c_n(t) \end{bmatrix}$

Misalkan $x(t) = e^{At}\,c(t)$

$$\dot{x} = \frac{dx(t)}{dt} = \frac{d[e^{At}]}{dt}\,c(t) + [e^{At}]\frac{dc(t)}{dt}$$

$$\dot{x} = A\underbrace{e^{At}\,c(t)} + [e^{At}]\frac{dc(t)}{dt}$$

$$\dot{x} = A\,x(t) + [e^{At}]\frac{dc(t)}{dt}$$

$$\dot{x} = A\,x(t) + Bu(t) \quad -$$

$$0 = [e^{At}]\frac{dc(t)}{dt} - Bu(t)$$

$$[e^{At}]\frac{dc(t)}{dt} = Bu(t)$$

$$\underbrace{[e^{At}]^{-1}[e^{At}]}_{I}\frac{dc(t)}{dt} = [e^{At}]^{-1}Bu(t)$$

$$\frac{dc(t)}{dt} = e^{-At}Bu(t)$$

$$c(t) = \int \underbrace{\underset{[n\times n]}{e^{-At}}\;\underset{[n\times m]}{B}\;\underset{[m\times 1]}{u(t)}}_{[n\times 1]}\,dt$$

solusi $\dot{x} = Ax + Bu$ adalah solusi $\dot{x} = Ax$ [umum] ditambah solusi $\dot{x} = Ax + Bu$

$$\boxed{x(t) = x_0 e^{At} + \int e^{-At}Bu(t)\,dt}$$

$y = Cx + Du$

Keluaran :

$$\boxed{y(t) = C\left[x_0 e^{At} + \int e^{-At}Bu(t)\,dt\right] + Du(t)}$$