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FAKULTAS TEKNIK
UNIVERSITAS HASANUDDIN

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Mata Pelajaran : Sistem Kendali 1
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Strata : S1
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1. Transfer function $\Rightarrow$ State Space

a) $G(s) = \frac{s^2 + 1}{(2s + 1)^3}$

$$= \frac{s^2 + 1}{s^3 + 12s^2 + 25s + 1}$$

$$= \frac{s^2 + 1}{((2s + 1)(2s + 1)(2s + 1))}$$

$$= \frac{s^2 + 1}{8s^3 + 4s^2 + 8s^2 + 4s + 2s + 1}$$

$$= \frac{s^2 + 1}{(4s^2 + 2s + 2s + 1)(2s + 1)}$$

$$= \frac{s^2 + 1}{8s^3 + 12s^2 + 6s + 1} = G(s)$$

Jawab :

$m=3$ $n=4$ $\rightarrow$ kasus $m < n \rightarrow D = [0]$ $n=3$

$b_0 = 1$ $a_0 = 1$
 $b_1 = 0$ $a_1 = 6$
 $b_2 = 8$ $a_2 = 12$
 $a_3 = 8$

$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \\ \dot{x}_4 \end{bmatrix} = A \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} + B \begin{bmatrix} 0 \\ 0 \\ 0 \\ \frac{1}{8} \end{bmatrix} u$

$A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -\frac{1}{8} & -\frac{6}{8} & -\frac{12}{8} & \frac{8}{8} \end{bmatrix}$

$C = [1 \ 0 \ 0 \ 0]$

b. $\frac{s^2 + 1}{(2s + 1)^3} = \frac{s^2 + 1}{8s^3 + 12s^2 + 6s + 1}$

$m=4$ $n=4$ $\rightarrow$ kasus $m=n \rightarrow D \neq [0]$

$b_0 = 1$ $a_0 = 1$

$b_1 = 0$ $a_1 = 6$

$b_2 = 8$ $a_2 = 12$

$b_3 = 8$ $a_3 = 8$

$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \\ \dot{x}_4 \end{bmatrix} = A \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} + B \begin{bmatrix} 0 \\ 0 \\ 0 \\ \frac{1}{8} \end{bmatrix} u$

$A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -\frac{1}{8} & -\frac{6}{8} & -\frac{12}{8} & \frac{8}{8} \end{bmatrix}$

$C = [1 \ 0 \ 0 \ 0]$