Example Which controllers do I need for a given P???

TI, PTV, or PTV with switch box

(I) Let state model of P be

$$\left(\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & -3 \\ 0 & 0 & -2 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \right)$$

2 channel $\therefore$ $p_1 = 1$ $m_1 = 1$

$p_2 = 1$ $m_2 = 1$.

eigen values
1, -1, -2

P_{12} state model

$$\left(\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & -3 \\ 0 & 0 & -2 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 0 \end{bmatrix}, 0 \right)$$

find the transfer fn $P_{12}(z) \neq 0$

but P_{12} is not weakly complete

has DFM of 1.

So this does not satisfy TI lemma but it satisfies PTV lemma

$\therefore$ P is stabilizable using PTV controllers