

Task 2

$$H_{2|3} = \begin{bmatrix} H_2 & H_3 & H_4 & H_5 \\ H_3 & H_4 & H_5 & H_6 \\ H_4 & H_5 & H_6 & H_7 \end{bmatrix}, \quad H_{1|3} = \begin{bmatrix} H_1 & H_2 & H_3 & H_4 \\ H_2 & H_3 & H_4 & H_5 \\ H_3 & H_4 & H_5 & H_6 \end{bmatrix} \quad 4/12$$

a) Given $L=3$, $y=4$ and $H_k = DA^{k-1}B \quad \forall k=1, \dots, 7$, $N=L+y=7$

$$H_{2|4} = \begin{bmatrix} H_2 & H_3 & H_4 & H_5 & H_6 \\ H_3 & H_4 & H_5 & H_6 & H_7 \end{bmatrix}, \quad H_{1|4} = \begin{bmatrix} H_1 & H_2 & H_3 & H_4 & H_5 \\ H_2 & H_3 & H_4 & H_5 & H_6 \end{bmatrix}$$

$L=2$ number of ~~columns~~ ^{rows} in $H_{1|L}$ and $H_{2|L}$
 $y=4$ - - - of columns in - - -

$H_{1|L} = O_L C_y$ and $H_{2|L} = O_L A C_y$

where $O_L = \begin{bmatrix} D \\ DA \\ \vdots \\ DA^{L-1} \end{bmatrix}$ - the extended observability matrix.

$C_y = [B \quad AB \quad \dots \quad A^{y-1}B]$ - The extended controllability matrix

- Related to det. of L
 System order bounded by

$1 \leq n \leq L \cdot m$

where $\dim(y_n) = m$, $D \in \mathbb{R}^{m \times n}$