

Assignment 1 - Deadline 1 week

Problem 1

Consider the following MIMO system:

$$\mathbf{H}(s) = \begin{bmatrix} \frac{4s^2+7s+3}{s^3+4s^2+5s+2} & \frac{1}{s+1} \end{bmatrix}, \quad (1)$$

Find its minimal realization and comment on each step. Draw the step response of the original system and the step response of the minimal realization using MATLAB.

Problem 2

Consider the following MIMO system:

$$\mathbf{H}(s) = \begin{bmatrix} \frac{s+1}{s+2} & \frac{1}{s+1} \\ \frac{1}{s+1} & \frac{1}{s+1} \end{bmatrix} \quad (2)$$

Find its minimal realization and comment on each step. Draw the step response of the original system and the step response of the minimal realization using MATLAB.

Problem 3

Consider the following SISO system:

$$H(s) = \frac{5s^2 + 3s + 2}{s^3 + 11s^2 + 14s + 6} \quad (3)$$

Find its minimal realization and comment on each step. Draw the step response of the original system and the step response of the minimal realization using MATLAB.

Problem 4

Consider the following SISO system:

$$H(s) = \frac{4s^2 + 3s + 2}{2s^2 + 5s + 6} \quad (4)$$

Find its minimal realization and comment on each step. Draw the step response of the original system and the step response of the minimal realization using MATLAB.

Problem 5

Consider the following SISO system:

$$H(s) = \frac{s^4 + 2s^3 + 3s^2 + 4s + 5}{s^5 + 6s^4 + 7s^3 + 8s^2 + 9s + 10} \quad (5)$$

Find its minimal realization and comment on each step. Draw the step response of the original system and the step response of the minimal realization using MATLAB.