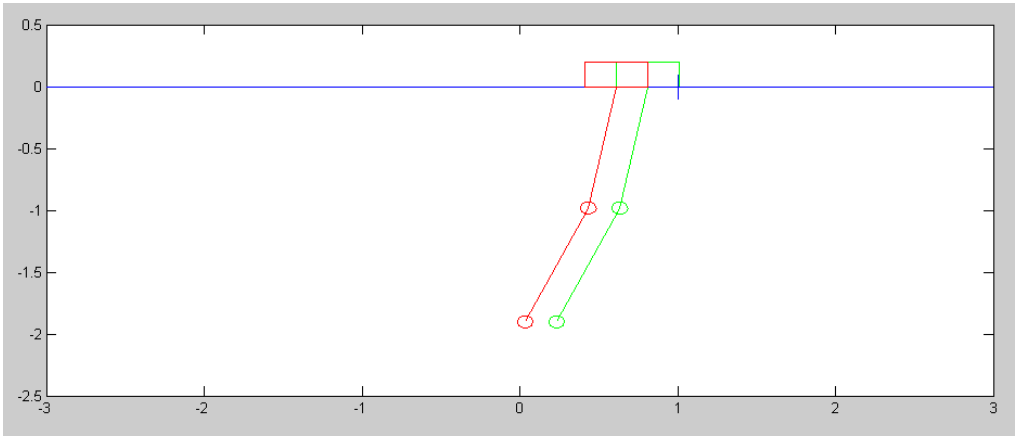
ECE 463/663 - Test #2: Name _____

Due midnight Sunday, March 27th. Individual Effort Only (no working in groups)



The linearized dynamics for a double gantry system are:

$$s\begin{bmatrix} x \\ \theta_1 \\ \theta_2 \\ \dot{x} \\ \dot{\theta}_1 \\ \dot{\theta}_2 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 2g & 0 & 0 & 0 & 0 \\ 0 & -3g & g & 0 & 0 & 0 \\ 0 & 3g & -3g & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} x \\ \theta_1 \\ \theta_2 \\ \dot{x} \\ \dot{\theta}_1 \\ \dot{\theta}_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ -1 \\ 1 \end{bmatrix} F + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ -1 \\ 1 \end{bmatrix} d$$

C Level (max 80 points)

Design a feedback control law for the double pendulum assuming

- All states are measured (no observer is needed)
- A sinusoidal set point (R(t) = sin(0.5t)), and
- A constant disturbance (d(t) = 5)

Validate your feedback control law on the linear system

Validate your feedback control law on the nonlinear system (Gantry2)

B Level (max 90 points)

Design a feedback control law for the double pendulum assuming

- Only position and angles are measured, (observer is required)
- A sinusoidal set point (R(t) = sin(0.5t)), and
- No disturbance (d(t) = 0)

Validate your feedback control law on the linear system

Validate your feedback control law on the nonlinear system (Gantry2)

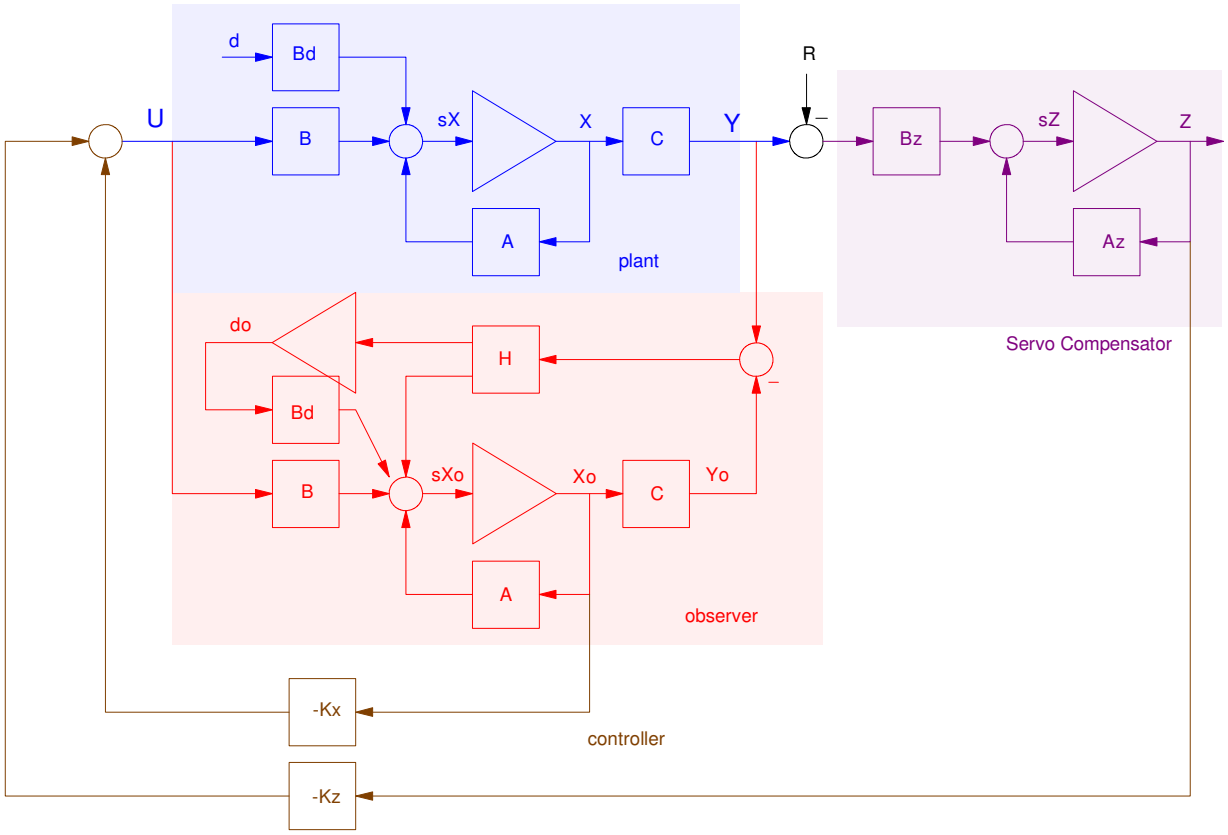
A Level (max 100 points)

Design a feedback control law for the double pendulum assuming

- Only position and angles are measured, (observer is requried)
- A sinusoidal set point (R(t) = sin(0.5t)), and
- A constant disturbance (d(t) = 5)

Validate your feedback control law on the linear system

Validate your feedback control law on the nonlinear system (Gantry2)



Block diagram for the Plant, Servo Compensator, Disturbance, Observer, and Full-State Feedback