

ECE 463/663 - Homework #9

LQG Control with Servo Compensators. Due Wednesday, April 15th

LQG Control

Cart and Pendulum (HW #5): Use LQG methods to design a full-state feedback control law of the form

$$U = -K_z Z - K_x X$$

$$\dot{Z} = (x - R)$$

for the cart and pendulum system from homework #5 using LQG control so that

- You track constant setpoints,
- You reject constant disturbances,
- The 2% settling time is 4 seconds, and
- There is no overshoot for a step input.

- 1) Give the control law (K_x and K_z) and explain how you chose Q and R
- 2) Plot the step response of the linear system
- 3) Check your design with the nonlinear simulation of the cart and pendulum system.

Ball and Beam (HW #6): Use LQG methods to design a full-state feedback control law of the form

$$U = -K_z Z - K_x X$$

$$\dot{Z} = (x - R)$$

for the ball and beam system from homework #5 using LQG control so that

- You track constant setpoints,
- You reject constant disturbances,
- The 2% settling time is 4 seconds, and
- There is no overshoot for a step input.

- 4) Give the control law (K_x and K_z) and explain how you chose Q and R
- 5) Plot the step response of the linear system
- 6) Check your design with the nonlinear simulation of the cart and pendulum system.