Digital Control System Fall-2019: Homework

HW #1

Chapter 3 Problems 1, 13, 14b, 20

Read Chapter 3 of the Textbook up to section 3.7

Topic

modeling systems in time domain .

Objective

1. Model systems in state-space representation
2. Converting a transfer function to state space
3. Converting from a state space to a transfer function

HW #2

Chapter 4: problems 38,42, 68 a,b,c

Read Chapter 4 sections 4.10 and 4.11

Topic

calculate zero-input and zero-state responses of a system given the model.

Objective

1. Find the time response from state-space representation

HW #3

Chapter 5 Problems 23a, 24, 31a, 45, and 57

Read Chapter 5 of the Textbook sections 5.6-5.8

Topic

represent multiple subsystems in different state space forms

Objective

1. Represent state equations as signal-flow graphs
2. Represent multiple subsystems in state space in cascade , parallel, controller canonical, and observer canonical forms
3. Perform transformations between similar systems using transformation matrices; and diagonalize a system matrix

HW #4

Chapter 6 problems 50 and 52, Chapter 7 problems 55a, and 57

Read Chapter 6 of the Textbook section 6.5 and Chapter 7 section 7.8

Topic

determine the stability of the state space system using Routh table and calculate steady state errors.

Objective

1. Use a Routh table to determine the stability of a system represented in state space
2. Find steady-state error for systems represented in state space

HW #5, 6, 7

No. 5: Chapter 12: Problems 5, 6, 10, 14, 15

No. 6: Chapter 12: Problems 20, 23, 26, 27, and 34

No. 7: Chapter 12: Problems 31, 32, and 45

Read Chapter 12 of the Textbook

Topic

design controllers via state space.

Objective

1. Design a state-feedback controller using pole placement
2. Determine if a system is controllable
3. Design a state-feedback controller using pole placement for the system not represented in phase-variable form

4. Design a state-feedback observer using pole placement for systems represented in observer canonical form
5. Determine if the system is observable
6. Design a state-feedback observer using pole placement for systems not represented in observer canonical form
7. Design steady-state error characteristics for systems represented in state space

HW #8, 9

No. 8: Chapter 13: Problems 1 (a,b), 2 (a,b), 3 (a,b), 4 (a,b), and 6 (a,b)

No. 9: Chapter 13: Problems 10, 14, 15, and 17

Topic

model and design digital control systems.

Objective

1. Find z- and inverse z- transforms of time and Laplace functions
2. Find sampled-data transfer functions
3. Determine digital system stability
4. Design digital systems to meet steady-state error specification
5. Design digital systems to meet transient response specification
6. Design cascade compensation for digital systems