

NPTEL

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Courses » Control System Design

Announcements

Course

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Unit 6 - Week 2: Introduction to feedback control, Nyquist stability theory





Course outline

How to access the portal

Prerequisite Assignment

MATLAB
Download and
Introduction

MATLAB Learning Modules

Week 1: Linear System Theory, Fourier and Laplace Transforms

Week 2: Introduction to feedback control, Nyquist stability theory

- Introduction to feedback control (Part 1/2)
- Introduction to feedback control (Part 2/2)
- Nyquist stability theory (Part 1/3)
- Nyquist stability theory (Part 2/3)
- Nyquist stability theory (Part 3/3)
- Quiz : Week-2Assessment
- Solutions to Assessment 2

Week-2 Assessment

The due date for submitting this assignment has passed. Due on 2018-08-15, 23:59 IS As per our records you have not submitted this assignment.

Week-2 Assessment

- 1) A plant with transfer function P(s) = $\frac{(s^3+9)(s+2)}{(s+1)(s+2)(s+4)}$ is excited by sine wave of frequency 0 *points*
- $\boldsymbol{\omega}\text{'}.$ The steady-state output of the system is zero at
 - $\omega = 1 \text{ rad/sec}$
 - $\omega = 2 \text{ rad/sec}$
 - ω = 3 rad/sec
 - $\omega = 4 \text{ rad/sec}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

 $\omega = 3 \, rad/sec$

2) For what value of the controller gain 'K', the time constant of the closed loop system is reduced to 10% of the time constant of open loop system. (up to 2 decimal places)

No, the answer is incorrect. Score: 0

Accepted Answers:

(Type: Range) 8.99,9.01

1 point

- 3) Identify the correct statements about feedback systems. Feedback systems are:
- 1 point

- 1. Very sensitive to variation in sensor parameters
- 2. Sensitive to variation in plant parameters
- 3. Prone to sensor noise
- 4. Used to stabilize unstable plants
 - 1, 2, 3
 - 0 1, 3, 4
 - 0 1, 2
 - 2, 4

No, the answer is incorrect.

Score: 0

Control System Design - - Unit 6 - Week 2: Introduction to feedback control, Nyquist stability theory

Week 3: Bode plots, Steps for performing control design, General controllers

Week 4: Bodeplot and rootlocus based control design

Week 5: Control of systems with some known parameters, Introduction to 2degree of freedom control

Week 6: 2-Degree of freedom control design for robustness

Week 7: Quantitative feedback theory (Part 1/2)

Week 8: Quantitative feedback theory (Part 2/2)

Lecture Notes(Week 1 -8)

Week 9: **Fundamental** properties of feedback systems

Week 10 :Nonminimum phase system

Week 11: Unstable systems

Week 12 Describing functions

Assignment solutions

Accepted Answers:

1, 3, 4

4) Find the difference between the maximum and minimum value of the steady state response of the system to the step input. (up to 3 decimal places)

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 0.001,0.003





5) For what value of the controller gain 'K' will the sinusoidal noise component of frequency 1 rad/sec be rejected by at least 90% at the output





K > 1



 $K = \infty$



K > 0.15



K < 0.15

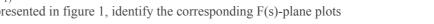
No, the answer is incorrect.

Score: 0

Accepted Answers:

K < 0.15

6) The characteristic equation of a system is given by F(s) = 1 + G(s)H(s), where 2 points $G(s)H(s) = \frac{2}{(s-1)}$. For the given equation of lines: $\sigma = 0$, $\omega = 0$. in the s-plane (where $s = \sigma + j\omega$) represented in figure 1, identify the corresponding F(s)-plane plots



No, the answer is incorrect.

Score: 0

Accepted Answers:

7) The Nyquist plot for the open loop transfer function $C(s)P(s) = \frac{1}{2}$ is as shown in the figure 2 (as ω varied from 0 to ∞). If the value of C(s)P(s) at $\omega = 0.5 rad/s$ is $1.109 \angle -33.69^{\circ}$, then find the value of ζ (upto 2 decimal places).

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 0.49,0.51

1 point

8)

In the above problem 7, find the value of ω_n (upto 2 decimal places).

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Range) 0.99,1.01



9) For a stable closed loop system, determine the total number of clock-wise encirclements in the Nyquist plot. Given the open loop transfer function $C(s)P(s)=\frac{10}{(s^2+s-2)}$



No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: Numeric) -1



g+

1 point

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