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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-2 Assessment
- ☐ Solutions to Assessment 2

Week-2 Assessment

The due date for submitting this assignment has passed. **Due on 2018-08-15, 23:59 IST.** 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 ω . The steady-state output of the system is zero at **0 points**

- ☐ $\omega = 1$ rad/sec
- ☐ $\omega = 2$ rad/sec
- ☐ $\omega = 3$ rad/sec
- ☐ $\omega = 4$ 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
- ☐ 1, 3, 4
- ☐ 1, 2
- ☐ 2, 4

No, the answer is incorrect.

Score: 0

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

Week 4: Bode-plot and root-locus based control design

Week 5: Control of systems with some known parameters, Introduction to 2-degree 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 $G(s)H(s) = \frac{2}{(s-1)}$. 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 **2 points**

☐
☐
☐
☐

No, the answer is incorrect.

Score: 0

Accepted Answers:

7) The Nyquist plot for the open loop transfer function $C(s)P(s) = \frac{\omega_n^2}{(s^2 + 2\zeta\omega_n s + \omega_n^2)}$ is as shown in the figure 2 (as ω varied from 0 to ∞). If the value of $C(s)P(s)$ at $\omega = 0.5 \text{ rad/s}$ 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

8)



1 point

1 point

1 point

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

1 point

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

1 point

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Funded by

Government of India
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