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NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » Control systems (course)

Announcements (announcements) About the Course (preview) Ask a Question (forum) Progress (student/home) Mentor (student/mentor)

Unit 10 - Week 8

Course outline

How to access the portal

Pre-requisite Assignment

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Case Study - Control Design - Part 1 (unit?unit=71&lesson=72)

Case Study - Control Design- Part 2 (unit?unit=71&lesson=73)

State Space Representation - Part 1 (unit?unit=71&lesson=74)

State Space Representation- Part 2 (unit?unit=71&lesson=75)

Frequency Response - Part 1 (unit?unit=71&lesson=76)

Frequency Response- Part 2 (unit?unit=71&lesson=77)

WEEK 8 assignment solution (unit?unit=71&lesson=79)

Quiz : Assignment 8 (assessment?name=130)

Week 8 Feedback : Control systems (unit?unit=71&lesson=78)

Week 9

Week 10

Week 11

Week 12

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Assignment 8

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-09-25, 23:59 IST.

1) The open loop transfer function of a negative feedback closed loop system is $\frac{K}{(s^2 + 4s)}$ where K is a non-negative real valued parameter. The **1 point**

closed loop system is stable for only

- $K > 0$
- $K > 1$
- $K > 2$
- $K > 4$

No, the answer is incorrect. Score: 0

Accepted Answers: $K > 0$

2) It is desired that the closed loop system obtained in problem 1, be an underdamped second order system. This would be true for all **1 point**

- $K > 0$
- $K > 2$
- $K > 4$
- $K < 2$

No, the answer is incorrect. Score: 0

Accepted Answers: $K > 4$

3) What is TRUE about the underdamped second order closed loop system identified in problem 2? **1 point**

- It would have a settling time less than 1 s
- It would have a settling time less than 0.5 s
- It would have a settling time less than 4 s
- It would have a settling time less than 1.5 s

No, the answer is incorrect. Score: 0

Accepted Answers: It would have a settling time less than 4 s

4) It is desired that the underdamped second order closed loop system identified in problem 2 have a maximum peak overshoot less than 10 %. This **1 point** is true only when

- $11.4 > K > 4$
- $25 > K > 0$
- $25 > K > 4$
- $11.4 > K > 0$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$11.4 > K > 4$

5) Which ONE of the following statements is TRUE about the locus of the closed loop poles of problem 1? 1 point

The root locus always lies in the left half complex plane for $K > 0$

The root locus lies in both the left and right half complex planes for $K > 0$

The root locus lies always on the real axis for $K > 0$

The root locus lies always on the imaginary axis for $K > 0$

No, the answer is incorrect.

Score: 0

Accepted Answers:

The root locus always lies in the left half complex plane for $K > 0$

6) A second order system is governed by $\ddot{y} + 5\dot{y}(t) + 6y(t) = u(t)$ The number of state variables required for representing it in the state space representation is 1 point

 0

 1

 2

 3

No, the answer is incorrect.

Score: 0

Accepted Answers:

2

7) The state matrix for the system in problem 6) is 1 point

$\begin{pmatrix} 1 & 0 \\ -6 & -5 \end{pmatrix}$

$\begin{pmatrix} 0 & 1 \\ -6 & -5 \end{pmatrix}$

$\begin{pmatrix} -1 & 0 \\ -6 & -5 \end{pmatrix}$

$\begin{pmatrix} 0 & -1 \\ -6 & -5 \end{pmatrix}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$\begin{pmatrix} 0 & 1 \\ -6 & -5 \end{pmatrix}$

8) The eigenvalues of the state matrix obtained in problem 7 are 1 point

 -2 and -3

 -5 and -6

 5 and 6

 -1 and -6

No, the answer is incorrect.

Score: 0

Accepted Answers:

-2 and -3

9) The input vector of the state space realization of problem 6 corresponding to the state matrix obtained in problem 7 is 1 point

$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$

$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$

$\begin{pmatrix} -1 \\ 0 \end{pmatrix}$

$\begin{pmatrix} 0 \\ -1 \end{pmatrix}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

10) The output vector of the state space realization of problem 6 corresponding to the state matrix obtained in problem 7 is

1 point

$$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ -1 \end{pmatrix}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

11) Using the relationship between the transfer function and the state space realization, the transfer function of this system can be calculated as

1 point

$$\frac{1}{s^2 + 5s + 6}$$

$$\frac{1}{s^2 + 6s + 5}$$

$$\frac{1}{s^2 - 5s + 6}$$

$$\frac{1}{s^2 - 6s - 5}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\frac{1}{s^2 + 5s + 6}$$

12) Consider a stable LTI system that is provided with a sinusoidal input having a frequency of 12 Hz. Then, the corresponding steady state output would be a sinusoid having a frequency of

1 point

3 Hz

4 Hz

6 Hz

12 Hz

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$12 \text{ Hz}$$

13) The transfer function of a plant is $\frac{s+2}{s+4}$. The magnitude of the sinusoidal transfer function at an angular frequency of 1 rad/s is

1 point

0.5

0.6

0.54

0.707

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$0.54$$

14) In problem 13, the phase (in °) of the sinusoidal transfer function at an angular frequency of 1 rad/s is

1 point

45

26.57

14.03

12.53

No, the answer is incorrect.

Score: 0

Accepted Answers:

12.53

15) In problem 13, the ratio of the magnitude of the sinusoidal transfer function at an angular frequency of 10 rad/s to that at 1 rad/s is

1 point

- 0.4
- 0.707
- 1.36
- 1.75

No, the answer is incorrect.

Score: 0

Accepted Answers:

1.75