Assignment 8

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

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 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

- \( K > 0 \)
- \( K > 2 \)
- \( K > 4 \)
- \( K < 2 \)

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?

- 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 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:
- \( 1.4 \times K > 4 \)

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

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

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

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

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

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
- -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

\[
\begin{pmatrix}
0 \\
1
\end{pmatrix}
\]

\[
\begin{pmatrix}
1 \\
0
\end{pmatrix}
\]

\[
\begin{pmatrix}
-1 \\
0
\end{pmatrix}
\]

\[
\begin{pmatrix}
0 \\
-1
\end{pmatrix}
\]
10) The output vector of the state space realization of problem 6 corresponding to the state matrix obtained in problem 7 is

- \[
\begin{pmatrix}
0 \\
1
\end{pmatrix}
\]

No, the answer is incorrect.
Score: 0
Accepted Answers:

- \[
\begin{pmatrix}
0 \\
1
\end{pmatrix}
\]

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

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

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

- 3 Hz
- 4 Hz
- 6 Hz
- 12 Hz

No, the answer is incorrect.
Score: 0
Accepted Answers:

- 12 Hz

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

- 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

- 45°
- 26.57°
- 14.03°
- 12.53°

No, the answer is incorrect.
Score: 0
Accepted Answers:

- 45°
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

- 0.4
- 0.707
- 1.36
- 1.75

No, the answer is incorrect.
Score: 0
Accepted Answers:
1.75