Unit 5 - Week 4

Assignment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment. Due on 2018-09-12, 23:59 IST.

(A)

1) Consider the following dynamics

\[
\begin{align*}
    \dot{x}_1(t) &= -x_1^2(t) + x_1(t)x_2(t) + d_1(t) \\
    \dot{x}_2(t) &= -x_2^2(t)
\end{align*}
\]

Where \(|d_1(t)| < \frac{1}{a_1}, \frac{1}{a_1} > 0\). Given the following Lyapunov candidate function

\[
V(x_1, x_2) = \frac{1}{2} x_1^2(t) + \frac{1}{2} x_2^2(t)
\]

Which of the following is true?

- Origin is Lyapunov stable.
- Origin is asymptotically stable.
- The solution is uniformly ultimately bounded.
- None of the above.

No, the answer is incorrect.

Score: 0

Accepted Answers:
None of the above.

(B) State "TRUE" or "FALSE" for the following arguments

2) Knowledge of disturbance upper-bound is required in dead-zone based robust adaptive control

No, the answer is incorrect.

Score: 0
Nonlinear and Adaptive Control - - Unit 5 - Week 4

1) Knowledge of upper-bound of unknown parameters is required in dead-zone based robust adaptive control.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

2) Knowledge of disturbance upper-bound is required in projection based robust adaptive control.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

3) Knowledge of upper-bound of unknown parameters is required in e-mod based robust adaptive control.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

4) Knowledge of upper-bound of unknown parameters is required in dead-zone based robust adaptive control.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

5) Unlearning phenomenon of parameter estimates happens in dead-zone based robust adaptive control.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

6) Unlearning phenomenon of parameter estimates happens in projection based robust adaptive control.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

7) Knowledge of upper-bound of unknown parameters is required in e-mod based robust adaptive control.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: String) False

8) Knowledge of disturbance upper-bound is required in projection based robust adaptive control.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(C) State "TRUE" or "FALSE" for the following arguments

9) The function \( f(x) = e^{-x} + x^2 \) is a convex function of \( x \) where \( x \in \mathbb{R} \)

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

(Type: String) True

10) The function \( f(x) = e^{-x} - x^2 \) is a convex function of \( x \) where \( x \in \mathbb{R} \)

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

(Type: String) False

11) The set defined as \( \mathcal{S} = \{(x_1, x_2) \in \mathbb{R}^2 | x_1^2 + x_2^2 \leq 2 \} \) is a convex set

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

(Type: String) True

12) The set defined as \( \mathcal{S} = \{(x_1, x_2) \in \mathbb{R}^2 | |x_1| + |x_2| \leq 2 \} \) is a convex set

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

(Type: String) True

(D)

13) Consider the following system

\[
\begin{align*}
\dot{x}_1(t) &= -x_1(t) + x_1(t)x_2(t) + d_1(t) \\
\dot{x}_2(t) &= -x_2^2(t) - |x_1(t)|(x_2(t) - d_2)
\end{align*}
\]

Where \(|d_1(t)| < \frac{d_1}{2}\), \(|d_2| < \frac{d_2}{2}\) and \(d_1, d_2 > 0\). Given the following Lyapunov function candidate

\[ V(x_1, x_2) = \frac{1}{2} x_1^2(t) + \frac{1}{2} x_2^2(t) \]

Which of the following is true?
Origin is Lyapunov stable.
Origin is asymptotically stable.
The solution is uniformly ultimately bounded.
None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
The solution is uniformly ultimately bounded.