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Unit 2 - Week 1

Assignment 1

The due date for submitting this assignment has passed. **Due on 2018-09-05, 23:59 IST.**
As per our records you have not submitted this assignment.

(A) Which of the following functions are positive definite? (Write "TRUE" for positive-definite, otherwise "FALSE")

1) $V(x_1, x_2) = 2x_1^2 + x_2^2 + 2x_1x_2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) True

1 point

2) $V(x_1, x_2) = x_1^2 + (x_1 - x_2)^2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) True

1 point

3) $V(x_1, x_2) = x_1^2 + x_2^4$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) True

1 point

4) $V(x_1, x_2) = x_1^2 + e^{-t}x_2^2$

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(B) Mention whether the following statements are "TRUE" or "FALSE".

5) A differentiable function $f(t)$ is bounded $(\mathcal{L}_\infty)$ implies that its derivative $\dot{f}(t)$ is also bounded $(\mathcal{L}_\infty)$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) False

1 point

6) A function $f(t)$ is square-integrable $(\mathcal{L}_2)$ implies that $f(t) \to 0$ as $t \to \infty$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) False

1 point

7) There exists functions such that $f(t) \to 0$ as $t \to \infty$, but its derivative $\dot{f}(t) \to \infty$ as $t \to \infty$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) True

1 point

(C) Given a system $\dot{x}$(t) = f(x(t)) where f(0) = 0, which of the following statements true.(State "TRUE" or "FALSE".)

8) The equilibrium point $x = 0$ is stable if $\forall \delta > 0, \exists \varepsilon(\delta) > 0$ s.t. $\|x(0)\| \leq \delta \Rightarrow \|x(t)\| \leq \varepsilon, \forall\, t > 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) False

1 point

9) The equilibrium point $x = 0$ is stable if $\forall \varepsilon > 0\,, \exists \delta(\varepsilon) > 0$ s.t. $\|x(0)\| \leq \delta \Rightarrow \|x(t)\| \leq \varepsilon, \forall\, t > 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) True

1 point

10) The state $x(t)$ is bounded if $\forall \delta > 0\,, \exists \varepsilon(\delta) > 0$ s.t. $\|x(0)\| \leq \delta \Rightarrow \|x(t)\| \leq \varepsilon, \forall\, t > 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:

(Type: String) True

1 point

11) The state $x(t)$ is bounded if $\forall \varepsilon > 0, \exists \delta(\varepsilon) > 0$ s.t. $\|x(0)\| \leq \delta \Rightarrow \|x(t)\| \leq \varepsilon, \forall\, t > 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) True

1 point

(D) Choose the Correct Options

12) Consider the following dynamics. *1 point*

$\dot{x}(t) = -x^3(t) + d(t)$, where $|d(t)| < \bar{d},\ \bar{d} > 0$

Choose the correct option from below.

- The origin is Lyapunov stable.
- The origin is asymptotically stable.
- The solution x(t) is uniformly ultimately bounded.
- None of the above.

No, the answer is incorrect.
Score: 0

Accepted Answers:
The solution x(t) is uniformly ultimately bounded.

13) Within which of the following regions, the origin of the system given below, is stable? *1 point*

$\dot{x} = x^3 - x$

- x ∈ [-1,1]
- x ∈ (-1,1)
- x ∈(-∞,∞)
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
x ∈ [-1,1]

14) Within which of the following regions, the origin of the following system is asymptotically stable? *1 point*

$\dot{x} = x^3 - x$

- x ∈ [-1,1]
- x ∈ (-1,1)
- x ∈ (-∞,∞)
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
x ∈ (-1,1)

15) For the system given below, which of the following natures of stability are true for the origin of the system given as *1 point*

$\dot{x}(t) = \frac{-x(t)}{1+t}, t \geq 0$

- Globally uniformly stable
- Globally Stable
- Globally asymptotically stable
- Globally uniformly asymptotically stable

No, the answer is incorrect.
Score: 0

Accepted Answers:
Globally asymptotically stable

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