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Courses » Nonlinear and Adaptive Control

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Unit 3 - Week 2

Course outline

How to access the portal

Week 1

Week 2

Model Reference Adaptive Control (Part -1)

Model Reference Adaptive Control (Part -2)

Quiz : Assignment 2

Week 3

Week 4

Assignment 2

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2018-09-05, 23:59 IST.**

(A)

1) Given the following the dynamics

$$\begin{aligned}\dot{x}_1 &= -x_1^3 + x_1 x_2 \\ \dot{x}_2 &= -x_1^2\end{aligned}$$

1 point

And the following Lyapunov candidate function

$$V(x_1, x_2) = \frac{1}{2}x_1^2 + \frac{1}{2}x_2^2$$

Which of the following is true? (Click on all the correct answers)

- The state $x_1 \rightarrow 0$ as $t \rightarrow \infty$
- The state $x_2 \rightarrow 0$ as $t \rightarrow \infty$
- Origin is asymptotically stable
- Origin is Lyapunov stable

No, the answer is incorrect.

Score: 0

Accepted Answers:

The state $x_1 \rightarrow 0$ as $t \rightarrow \infty$

Origin is Lyapunov stable

(B) For the following functions write "TRUE" if the function is positive definite and write "FALSE" otherwise

2) $V(x) = x^T (A^T A)x$, where $x \in \mathbb{R}^n$, $A \in \mathbb{R}^{n \times m}$, $n > m$

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3) $V(x) = x^T (A^T B A)x$, where $x \in \mathbb{R}^n$, $A \in \mathbb{R}^{2 \times 2}$, $B = \begin{bmatrix} 1 & 4 \\ 0.5 & 2 \end{bmatrix}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) FALSE

1 point

(C) With reference to the MRAC design method in lectures 3 and 4 answer the following.
Given the following

Plant: $\dot{x} = ax + bu$ Reference model: $\dot{x}_m = a_m x_m + b_m r$,

Where a,b are unknown scalars and a_m , b_m are known scalars. Write "TRUE" or "FALSE" for the following

4) Lower bound of |b| is required for designing indirect MRAC :

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) True

1 point

5) Lower bound of |b| is required for designing direct MRAC :

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) False

1 point

6) sign(b) is required for designing indirect MRAC :

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) TRUE

1 point

7) sign(b) is required for designing direct MRAC :

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) TRUE

1 point

(D) Consider the Lyapunov equation

$$A^T P + PA = -Q$$

Where $A \in \mathbb{R}^{n \times n}$, $P \in \mathbb{R}^{n \times n}$ and $P = P^T$. For $x \in \mathbb{R}^n$, write "TRUE" or "FALSE" for the following

8) $x^T PAx = -2x^T Qx$:

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) FALSE

1 point

9) $2x^T PAx = -x^T Qx$:

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) TRUE

1 point

10) $x^T PAx = -x^T Qx$:

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) FALSE

1 point

11) $1/2 x^T PAx = -x^T Qx$:

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) FALSE

1 point

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