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NPTEL reviewer4@nptel.iitm.ac.in ▾

Courses » Nonlinear and Adaptive Control

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Unit 4 - Week 3

Assignment 3

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

(A) State whether the following set of dynamics is linearly-in-the-parameters (LIP). Write "TRUE" for LIP and "FALSE" otherwise.

1) $\dot{x} = e^{\alpha}x^2 + \ln(1+\beta^2)\sin(x)$, where $\alpha, \beta \in \mathbb{R}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) True

1 point

2) $\dot{x} = e^{\alpha}x^2 + \beta\sin(\gamma x)$, where $\alpha, \beta, \gamma \in \mathbb{R}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) False

1 point

3) $\dot{x}_1 = e^{\alpha x_1}x_2$, $\dot{x}_2 = \ln(1+\beta^4)x_1 + \gamma x_2$, where $\alpha, \beta, \gamma \in \mathbb{R}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) False

1 point

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) Yes

1 point

5) Consider the following dynamics ***1 point***

$$\dot{x} = ax + \tilde{k}x + d(t), \quad \dot{\hat{k}} = x^2 - \sigma \hat{k}$$

, where $a < 0, \sigma > 0$, $d(t) \le \bar{d}, \bar{d} > 0$ and $\tilde{k}(t) \triangleq k - \hat{k}(t)$, where $k \in \mathbb{R}$

and the following Lyapunov candidate function

$$V = \frac{1}{2}x^2 + \frac{1}{2}\tilde{k}^2$$

- The point (x, $\tilde{K}$) ≡ (0, 0) is Lyapunov stable.
- The point (x, $\tilde{K}$) ≡ (0, 0) is asymptotically stable.
- The solution of x(t) and $\tilde{K}$(t) is uniformly ultimately bounded.
- The solution of x(t) and $\tilde{K}$(t) grows unbounded

No, the answer is incorrect.
Score: 0

Accepted Answers:
The solution of x(t) and $\tilde{K}$(t) is uniformly ultimately bounded.

6) For the given Matrices $A \in \mathbb{R}^{nxn}$, $B \in \mathbb{R}^{nxm}$, $C \in \mathbb{R}^{pxn}$, $x \in \mathbb{R}^{px1}$, $y \in \mathbb{R}^{mx1}$, tr($CAByx^T$)is equal to which of the following ***1 point***

- x^TCABy
- yx^TCAB
- Byx^TCA
- $AByx^TC$

No, the answer is incorrect.
Score: 0

Accepted Answers:
x^TCABy

(C) Consider the following function

$$V(e,\tilde{\theta}) = \frac{1}{2}e^T Pe + \frac{1}{2}\tilde{\theta}^T \Gamma^{-1}\tilde{\theta}, \text{ where } e \in \mathbb{R}^n, \tilde{\theta} \in \mathbb{R}^m, \text{ and } P > 0, \Gamma > 0.$$

If $\lambda_{min/max}$ (•) denotes the minimum/maximum Eigen value of the argument matrix, then write "TRUE" or "FALSE" for the following statements.

7)

$$\frac{1}{2}\min(\lambda_{\min}(P), \lambda_{\max}^{-1}(\Gamma))(\|e\|^2 + \|\tilde{\theta}\|^2) \le V \le \frac{1}{2}\max(\lambda_{\max}(P), \lambda_{\min}^{-1}(\Gamma))(\|e\|^2 + \|\tilde{\theta}\|^2)$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) True

1 point

8)
$$\frac{1}{2}\min(\lambda_{\min}(P),\lambda_{\min}^{-1}(\Gamma))(\|e\|^2+\|\tilde{\theta}\|^2)\le V\le\frac{1}{2}\max(\lambda_{\max}(P),\lambda_{\max}^{-1}(\Gamma))(\|e\|^2+\|\tilde{\theta}\|^2)$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) False

1 point

9)
$$\frac{1}{2}\min(\lambda_{\min}(P),\lambda_{\min}(\Gamma))(\|e\|^2+\|\tilde{\theta}\|^2)\le V\le\frac{1}{2}\max(\lambda_{\max}(P),\lambda_{\max}(\Gamma))(\|e\|^2+\|\tilde{\theta}\|^2)$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) False

1 point

10)
$$\frac{1}{2}\min(\lambda_{\min}(P),\lambda_{\min}(\Gamma^{-1}))(\|e\|^2+\|\tilde{\theta}\|^2)\le V\le\frac{1}{2}\max(\lambda_{\max}(P),\lambda_{\max}(\Gamma^{-1}))(\|e\|^2+\|\tilde{\theta}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) True

1 point

(D) Given the following Plant:

Plant: $\dot{x} = Ax + Bu$ Reference model: $\dot{x}_m = A_m x_m + B_m r$

State "TRUE" for the case if MRAC design is possible and "FALSE" otherwise

11) $A = \begin{bmatrix} 0 & 2 \\ -3 & -4 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, A_m = \begin{bmatrix} 0 & 1 \\ -2 & -5 \end{bmatrix}, B_m = \begin{bmatrix} 0 \\ 1 \end{bmatrix};$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) False

1 point

12) $A = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, A_m = \begin{bmatrix} 0 & 1 \\ -2 & -5 \end{bmatrix}, B_m = \begin{bmatrix} 0 \\ 2 \end{bmatrix};$

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) True

1 point

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