Unit 4 - Week 2

Assignment 2

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

Due on 2019-08-21, 23:59 IST.

1) In which canonical form representation, the elements of the column vector **B** are all unity and the elements of the row vector **C** are the residues of the system poles **1 point**

- Controllable canonical form
- Observable canonical form
- Diagonal canonical form
- Jordan canonical form

No, the answer is incorrect.
Score: 0

Accepted Answers:
Diagonal canonical form

2) Consider a system with system matrices as A_{CC}, A_{OC}, and A_{DC} in controllable canonical, observable canonical, and diagonal canonical forms respectively. Choose the correct statement **1 point**

- The eigenvalues of the matrices A_{CC}, A_{OC}, and A_{DC} will be same.
- Only the eigenvalues of the matrices A_{CC} , and A_{OC} will be same.
- Only the eigenvalues of the matrices A_{CC}, and A_{DC} will be same.
- Only the eigenvalues of the matrices A_{OC} , and A_{DC} will be same.

No, the answer is incorrect.
Score: 0

Accepted Answers:
The eigenvalues of the matrices A_{CC}, A_{OC}, and A_{DC} will be same.

3) The Jordan canonical form of state model is applicable when **1 point**

- all poles are real and distinct
- some of the poles are real and some of the poles are repeated
- all poles are complex and distinct
- State model is non-square

No, the answer is incorrect.
Score: 0

Accepted Answers:
some of the poles are real and some of the poles are repeated

4) Which of the following statement is false regarding the state variable approach? **1 point**

- It is a time domain approach
- State variables need not be measurable
- State variables cannot be feedback
- Design by using this approach yields optimal solutions

No, the answer is incorrect.
Score: 0

Accepted Answers:
State variables cannot be feedback

5) Consider the system given by **1 point**
$\frac{Y(s)}{U(s)} = \frac{10(s+1)}{s^3+3s^2}$
The state-space representation of this system in Jordan canonical form is given by

- $\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [10/3 \quad 20/9 \quad -20/9]\, x$
- $\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [10/3 \quad -20/9 \quad 20/9]\, x$
- $\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [-10/3 \quad 20/9 \quad 20/9]\, x$
- $\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & -3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [10/3 \quad 20/9 \quad -20/9]\, x$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [10/3 \quad 20/9 \quad -20/9]\, x$

6) In which of the canonical form representations of the state model, the diagonal elements of the system matrix **A** are the eigen-values of the system **1 point**

- Controllable canonical form and observable canonical form
- Controllable canonical form and diagonal canonical form
- Diagonal canonical form and observable canonical form
- Diagonal canonical form and Jordan canonical form

No, the answer is incorrect.
Score: 0

Accepted Answers:
Diagonal canonical form and Jordan canonical form

7) In which of the canonical form representations of the state model, all elements except the last row elements and the super-diagonal elements are zeros **1 point**

- Controllable canonical form
- Observable canonical form
- Diagonal canonical form
- Jordan canonical form

No, the answer is incorrect.
Score: 0

Accepted Answers:
Controllable canonical form

8) A system is described by the differential equation $\ddot{y} + 3\dot{y} + 2y = \dot{u} + 3u$, all the initial conditions being zero. The diagonal canonical form representation of the system is given by **1 point**

- $\dot{x} = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u\ ;\ y = [-2 \quad 1]\, x$
- $\dot{x} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u\ ;\ y = [2 \quad -1]\, x$
- $\dot{x} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u\ ;\ y = [-2 \quad 1]\, x$
- $\dot{x} = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u\ ;\ y = [2 \quad -1]\, x$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\dot{x} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u\ ;\ y = [2 \quad -1]\, x$

9) Consider the following system **1 point**
$\frac{Y(s)}{U(s)} = \frac{3s+4}{(s+1)^3(s+2)^2(s+3)}$
The Jordan form representation of this system will have

- One (5×5) Jordan block in the system matrix and matrix $B = [0 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1]^T$.
- One (3×3) and one (2×2) Jordan blocks in the system matrix and matrix $B = [0 \quad 0 \quad 1 \quad 0 \quad 1 \quad 1]^T$.
- One (3×3) and one (2×2) Jordan blocks in the system matrix and matrix $B = [0 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1]^T$.
- One (5×5) Jordan block in the system matrix and matrix $B = [0 \quad 0 \quad 1 \quad 0 \quad 1 \quad 1]^T$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
One (3×3) and one (2×2) Jordan blocks in the system matrix and matrix $B = [0 \quad 0 \quad 1 \quad 0 \quad 1 \quad 1]^T$.

10)Consider the following system **1 point**
$\frac{Y(s)}{U(s)} = \frac{10(s+4)}{s^3+4s^2+3s}$
The state-space representation of this system in diagonal canonical form is given by

- $\dot{x} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [40/3 \quad 15 \quad 5/3]\, x$
- $\dot{x} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [40/3 \quad 15 \quad -5/3]\, x$
- $\dot{x} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [-40/3 \quad -15 \quad 5/3]\, x$
- $\dot{x} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [40/3 \quad -15 \quad 5/3]\, x$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\dot{x} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} u\ ;\ y = [40/3 \quad -15 \quad 5/3]\, x$