# Unit 8 - Week 6



## Assignment 6

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

**Due on 2019-09-11, 23:59 IST.**

1) The state transition matrix (STM) of any matrix $A$ using diagonalization (Canonical transformation) method is given by *1 point*

where, $M$ is the modal matrix of matrix $A$ and $\hat{A}$ is a diagonal matrix containing the distinct eigenvalues of matrix $A$.

- $e^{At} = M^{-1}e^{\hat{A}t}M$
- $e^{At} = Me^{\hat{A}t}M^{-1}$
- $e^{At} = e^{\hat{A}t}MM^{-1}$
- $e^{At} = MM^{-1}e^{\hat{A}t}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$e^{At} = Me^{\hat{A}t}M^{-1}$

2) Consider the following statements: *1 point*
1. Kalman's test is used to determine the controllability of a system
2. Gilbert's test is used to determine the controllability of a system
3. Stabilizability is a weaker notion of controllability
Choose the correct options:

- 1, 2, and 3
- 1 and 2 only
- 1 and 3 only
- 2 and 3 only

No, the answer is incorrect.
Score: 0

Accepted Answers:
*1, 2, and 3*

3) For the matrix $A = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix}$, the state transition matrix using the diagonalization method is given by *1 point*

- $e^{At} = \begin{bmatrix} (1-t)e^{-t} & te^{-t} \\ -te^{-t} & (1+t)e^{-t} \end{bmatrix}$
- $e^{At} = \begin{bmatrix} (1+t)e^{-t} & te^{-t} \\ -te^{-t} & (1-t)e^{-t} \end{bmatrix}$
- $e^{At} = \begin{bmatrix} -(1+t)e^{-t} & -te^{-t} \\ te^{-t} & (1-t)e^{-t} \end{bmatrix}$
- $e^{At} = \begin{bmatrix} -(1-t)e^{-t} & te^{-t} \\ te^{-t} & -(1+t)e^{-t} \end{bmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$e^{At} = \begin{bmatrix} (1+t)e^{-t} & te^{-t} \\ -te^{-t} & (1-t)e^{-t} \end{bmatrix}$

4) The system matrix $A$ is given by *1 point*
$A = \begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix}$
Using the Cayley-Hamilton theorem, the matrix $A^3$ will be given by (where $I$ be an identity matrix)

- $13A + 17I$
- $15A + 21I$
- $17A + 25I$
- $19A + 30I$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$19A + 30I$

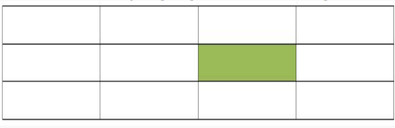
5) A transfer function $G(s) = \frac{s^2+5s+6}{s^3+3s^2+7s+12}$ is converted into a state space model $\dot{x} = Ax + Bu$ ; $y = Cx + Du$ by using the MATLAB. The appropriate MALAB command to do this conversion will be *1 point*

- $[A, B, C, D] = tf2ss([1 \quad 5 \quad 6], [1 \quad 3 \quad 7 \quad 12])$
- $[A, B, C, D] = ss2tf([1 \quad 5 \quad 6], [1 \quad 3 \quad 7 \quad 12])$
- $[A, B, C, D] = tftoss([1 \quad 5 \quad 6], [1 \quad 3 \quad 7 \quad 12])$
- $[A, B, C, D] = sstotf([1 \quad 5 \quad 6], [1 \quad 3 \quad 7 \quad 12])$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[A, B, C, D] = tf2ss([1 \quad 5 \quad 6], [1 \quad 3 \quad 7 \quad 12])$

6) The MATLAB command to plot a figure at green colored location shown in figure below will be *1 point*



- *figure*
  *subplot*(4, 3, 3)
- *figure*
  *subplot*(4, 3, 7)
- *figure*
  *subplot*(3, 4, 3)
- *figure*
  *subplot*(3, 4, 7)

No, the answer is incorrect.
Score: 0

Accepted Answers:
*figure*
*subplot*(3, 4, 7)

7) A SISO system is described by the following matrices *1 point*
$A = \begin{bmatrix} -5 & 1 & 0 \\ 0 & -2 & 1 \\ 20 & -10 & 1 \end{bmatrix}$ ; $B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ ; $C = [-1 \quad 1 \quad 0]$
The system will be

- State controllable and output controllable
- State controllable but not output controllable
- Output controllable but not state controllable
- Neither state controllable nor output controllable

No, the answer is incorrect.
Score: 0

Accepted Answers:
*State controllable and output controllable*

8) Which of the following statements is false regarding the Cayley-Hamilton theorem? *1 point*

- It is used to find the STM of a matrix
- It is used to find the inverse of a matrix
- Every matrix satisfies its own characteristic equation
- Every square matrix satisfies its own characteristic equation

No, the answer is incorrect.
Score: 0

Accepted Answers:
*Every matrix satisfies its own characteristic equation*

9) A system is described by the state equation $\dot{x} = \begin{bmatrix} 1 & 2 \\ 0 & p \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$, where $p$ is an constant. This system is *1 point*

- Uncontrollable for $p$=0
- Uncontrollable for $p$=1
- Controllable for all values of $p$
- Uncontrollable for all values of $p$

No, the answer is incorrect.
Score: 0

Accepted Answers:
*Controllable for all values of p*

10)A system will be stabilizable if *1 point*

- Uncontrollable modes are stable and unstable modes are controllable
- Uncontrollable modes are unstable and stable modes are controllable
- Stable and unstable both modes are controllable
- Stable and unstable both modes are uncontrollable

No, the answer is incorrect.
Score: 0

Accepted Answers:
*Uncontrollable modes are stable and unstable modes are controllable*