EE-792 **Quiz-1** **Summer-18**

10/10

Last Name: Sama **First Name** Rishika Reddy

1. What is the determinant of the following matrix $A = \begin{bmatrix} 3 & 2 & 1 \\ 5 & 6 & 0 \\ 4 & 3 & 0 \end{bmatrix}$

   a. -9
   b. 9
   c. 21
   d. -15

2/2

15 - 24

2. What is the cofactor of '5' the following matrix $A = \begin{bmatrix} 3 & 2 & 1 \\ 5 & 6 & 0 \\ 4 & 3 & 0 \end{bmatrix}$

2/2

   a. -3
   b. 3
   c. -15
   d. 15

3. What is the trace of the following matrix $A = \begin{bmatrix} 3 & 2 & 1 \\ 5 & 6 & 0 \\ 4 & 3 & 0 \end{bmatrix}$

   a. 0
   b. 2
   c. 1
   d. 3

2/2

trace(A) = sum of diagonal elements
= 3+6+0 = 9

4. Find the inverse of A if $A = \begin{bmatrix} 2 & 0 \\ 4 & 1 \end{bmatrix}$

   a. $A^{-1} = \begin{bmatrix} 2 & 0 \\ 4 & 1 \end{bmatrix}$
   b. $A^{-1} = \begin{bmatrix} 0 & 2 \\ 1 & 4 \end{bmatrix}$
   c. $A^{-1} = \begin{bmatrix} 0.5 & 0 \\ -2 & 1 \end{bmatrix}$
   d. $A^{-1} = \begin{bmatrix} 1 & 0 \\ -4 & 2 \end{bmatrix}$

2/2

$\frac{1}{2}\begin{bmatrix} 1 & -0 \\ -4 & 2 \end{bmatrix}$

$\begin{bmatrix} \frac{1}{2} & 0 \\ -2 & 1 \end{bmatrix}$

5. Find the Transpose of matrix $A = \begin{bmatrix} 3 & 2 & 1 \\ 5 & 6 & 0 \\ 4 & 3 & 0 \end{bmatrix}$

2/2

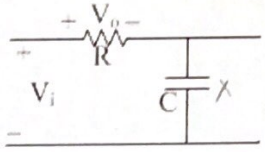
a. $A^T = \begin{bmatrix} 3 & 2 & 1 \\ 5 & 6 & 0 \\ 4 & 3 & 0 \end{bmatrix}$ b. $A^T = \begin{bmatrix} 3 & 5 & 4 \\ 2 & 6 & 3 \\ 1 & 0 & 0 \end{bmatrix}$ c. $A^T = \begin{bmatrix} 5 & 6 & 0 \\ 3 & 2 & 1 \\ 4 & 3 & 0 \end{bmatrix}$ d. $A^T = \begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 6 \\ 0 & 4 & 3 \end{bmatrix}$

Please show your work for partial credit.
Each question worth 4 points; this quiz worth 1 % of your final grade.

EE-792 8/10 **Quiz-2** **FALL-17**

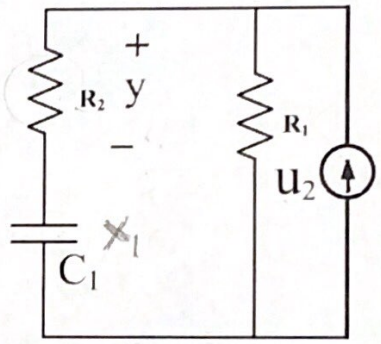
Last Name: Sama **First Name** Rishika Reddy

1. Write the state equation for the given circuit



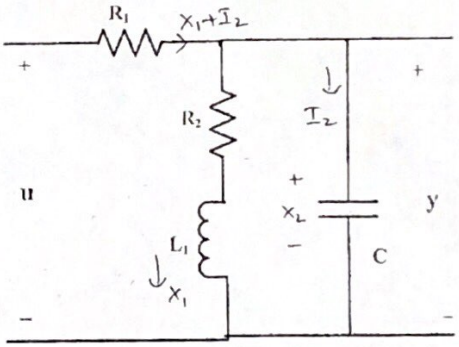
   a. $\dot{X} = \frac{1}{RC}V_i - \frac{1}{RC}X$
   b. $\dot{X} = \frac{1}{R}V_i - \frac{1}{R}X$
   c. $V_0 = V_i - X_1$
   d. $\dot{X} = V_i - X$

2. Which of the following statement is **FALSE**
   a. Number of state variables depends upon the number of energy storage elements
   b. Single input and single output system will have only one state variable
   c. State variable is nothing but current and voltage across any element
   d. Input of the circuit can be either voltage or current



3. Write the output equation for the circuit in fig-2

   a. $Y = \frac{R_1R_2U_2}{R_1+1} - \frac{X_1}{R_1+1}$
   b. $Y = \frac{R_1R_2U_2}{R_1+R_2} - \frac{R_2X_1}{R_1+R_2}$
   c. $Y = \frac{R_1R_2U_2}{R_1+1} + \frac{X_1}{R_1+1}$
   d. $Y = \frac{R_1R_2U_2}{R_1+R_2} + \frac{R_2X_1}{R_1+R_2}$



4. write the first loop equation for given circuit

   a. $U = R_1(X_1 + I_2) + R_2X_1 + L_1\dot{X}_1$
   b. $U = R_1(X_1) + R_2X_1 + L_1\dot{X}_1$
   c. $U = R_1(X_1) + R_2X_1 + \dot{X}_1$
   d. $U = R_1(X_1 + I_2) + X_1$

$Y = X_2$

5. Write the output equation for the given circuit

   a. $y = X_2$
   b. $y = R_2X_1 + L_1\dot{X}_1$
   c. $y = R_2X_1 + L_1X_1$
   d. $y = R_2X_1 + L_1\dot{X}_1 + X_2$

Please show your work for partial credit.
Each question worth 2 points; this quiz worth 1 % of your final grade.

EE-792 8/10 **Quiz-3** **Summer-18**

Last Name: Sama **First Name** Rishitha Reddy

1. In controllable canonical form which of the following statement is **TRUE**
   - (a.) All state variables depends upon the input
   - b. All state variables depends upon the output
   - (c.) Only one state variable depends upon the input
   - d. Only one state variable depends upon the output

2. $\ddot{y} + 3\dot{y} + 2y = u$; write the state equation by using observer canonical form
   - a. $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u$
   - b. $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-3 & -2\\ 1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u$
   - c. $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-3 & 1\\ -2 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}1\\ 0\end{bmatrix}u$
   - (d.) $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-3 & 1\\ -2 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u$

2/2

$\ddot{y} = u - 3\dot{y} + 2y$

$\dot{y} = \int u - 3y + 2\int y$

$y = \iint u - 3\int y + 2\iint y$

$y = x_1$

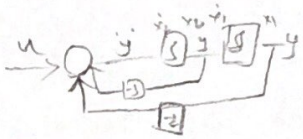
$\dot{x}_1 = -3x_1 + x_2$

$\dot{x}_2 = -2x_1 + u$

3. $\ddot{y} + 3\dot{y} + 2y = u$; write the state equation by using controllable canonical form
   - (a.) $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u$
   - b. $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-3 & -2\\ 1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u$
   - c. $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-3 & 1\\ -2 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}1\\ 0\end{bmatrix}u$
   - d. $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-3 & 1\\ -2 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix}u$

2/2

$\ddot{y} = u - 3\dot{y} + 2y$



$y = x_1$

$\dot{x}_1 = x_2$

$\dot{x}_2 = -2x_1 - 3x_2 + u$

$= \begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}0\\ 1\end{bmatrix}$

4. Find 'C' in the following function $F_{(s)} = \frac{1}{(s+2)(s+1)^2} = \frac{A}{S+2} + \frac{B}{S+1} + \frac{c}{(s+1)^2}$
   - (a.) 1
   - b. -1
   - c. -2
   - d. 2

2/2

$1 = A(s+1)^2 + B(s+2)(s+1) + C(s+2)$

$= As^2 + 2As + A + Bs^2$

$= s^2 + 2s + 1 + Bs^2 + 3Bs + 2B + Cs + 3C$

$A = \frac{1}{(s+1)^2}\Big|_{s=-2} = \frac{1}{1}$

5. The denominator of the transfer function is called
   - a. Characteristic equation
   - (b.) Characteristic polynomial
   - c. Eigenvalues of the vectors
   - d. Poles of the given system

2/2

Please show your work for partial credit.
Each question worth 2 points; this quiz worth 1 % of your final grade.

EE-792 8/10 **QUIZ-4** **SUMMER-18**

First Name: Rishika Reddy Last Name: Sama.

(1) $H_s = \frac{1}{s^2+5s+6}$ is representing a mathematical model of a system; which of the following statement is true

a. Model is stable and controllable
b. Model is unstable and controllable
c. Modal is stable but need to solve it to find controllability
d. Modal is unstable and also needs to solve it to find the controllability

2/2

$s^2+3s+2s+6$

$x_1 = -3x_1 + u$
$x_2 = -2x_2 + u$
$y = x_1 + x_2$

$\begin{bmatrix} 1 & -5 \\ 1 & -2 \end{bmatrix}$ $-2+1 = -1$ $\begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ $|P_c| \neq 0$ $\begin{bmatrix} 1 & 1 \end{bmatrix}$

(2) Modal of a given system is represented with the following equations. $\dot{x_1} = 3x_1 + 2x_2 + u$; $\dot{x_2} = x_1 + u$, which of the following statement is true

a. Controllable, observable
b. Controllable, unobservable
c. Uncontrollable, unobservable
d. Uncontrollable, observable

2/2

$\begin{bmatrix} 3 & 2 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$

$P_c = [B \quad AB]$

$= \begin{bmatrix} 1 & 5 \\ 1 & 1 \end{bmatrix} = 1 - 5 = -4$

$|P_c| \neq 0$ so controllable

(3) Which of the following statement is False

a. Controllable canonical form is controllable but may or may not observable
b. Observable canonical form is observable, but may or may not controllable
c. If a model has a pole zero cancellation then model of the system will be either uncontrollable or unobservable
d. Jordan form is both controllable and observable

0/2

(4) Which of the following statement is FALSE about the pole placement

a. If the model is controllable all the poles can be changed and has a unique solution
b. If uncontrollable poles are among the desired poles then the model has a non-unique solution
c. If uncontrollable poles are not among the desired poles then the model has a non-unique solution
d. None of the above is a TRUE statement.

2/2

(5) Which of the following statements are TRUE about stabilizability.

a. Model is stabilizable if it is controllable.
b. Model is stablizable if it is uncontrollable but none of the uncontrollable poles are unstable.
c. Model is stablizable if it is uncontrollable but none of the uncontrollable poles are stable.
d. Uncontrollable pole can be find out by finding the transfer function, and pole zero cancelled pole is uncontrollable pole.

2/2

Please show your work for partial credit