Reg.No. ____________

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

		Semester :	**2016-17 ODD**
Code :	**14EI3058**	**Duration :**	**3hrs**
Sub. Name :	**Linear Systems**	**Max. marks :**	**100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Explain the concept of diagonalization.	CO1	5
	b.	Apply the concept of diagonalization to obtain the canonical form for the system given below $\begin{bmatrix}\dot{x_1}\\ \dot{x_2}\\ \dot{x_3}\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 6\end{bmatrix}u$ $Y=\begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}x1\\ x2\\ x3\end{bmatrix}$	CO1	15
		(OR)		
2.	a.	Determine the state model of field controlled dc motor.	CO1	20
3.	a.	Is it possible to determine the transfer function from state space? Justify your answer.	CO1	5
	b.	What is meant by eigen values and characteristic equation?	CO1	5
	c.	Find the eigen values and eigen vectors for the system matrix given. $A=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}$	CO1	10
		(OR)		
4.	a.	A discrete-time system has the transfer function $\frac{Y(z)}{U(z)}=\frac{4z^3-12z^2+13z-7}{(z-1)^2(z-2)}$ Determine the state model of the system in Phase variable form	CO2	10
	b.	Determine the state model of the system in Jordan canonical form.	CO2	10
5.	a.	Design a full order state observer.	CO2	10
	b.	Check whether the given system is controllable or not. $\begin{bmatrix}\dot{x_1}\\ \dot{x_2}\\ \dot{x_3}\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 6\end{bmatrix}u$ $Y=\begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}x1\\ x2\\ x3\end{bmatrix}$	CO2	10
		(OR)		
6.	a.	Explain the concept of Liapunov Stability Theorems.	CO3	10
	b.	Obtain the solution of non homogenous state equations.	CO2	10
7.	a.	Convert the following system matrix to canonical form and hence calculate the state transition matrix e^{At}	CO2	20

		$A = \begin{bmatrix} 4 & 1 & -2 \\ 1 & 0 & 2 \\ 1 & -1 & 3 \end{bmatrix}$		
		(OR)		
8.	a.	Find f(A)=A^7 for $A = \begin{bmatrix} 0 & 3 \\ -2 & -5 \end{bmatrix}$	CO3	20
9.	a.	Consider the system described by the state model $\dot{X} = AX; Y = CX$ where $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}; C = [1 \quad 0]$. Design a full-order state observer. The desired eigen values for the observer matrix are μ_1 = -5; μ_2 = -5	CO3	20

ALL THE BEST