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 :	**14EI2016**	**Duration :**	**3hrs**
Sub. Name :	**DIGITAL CONTROL SYSTEMS**	**Max. marks :**	**100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Illustrate the working of Digital to Analog converter in detail.	CO1	7
	b.	Describe the working of R-2R ladder type D/A Converter with its equivalent circuits.	CO1	7
	c.	Describe about the basic discrete-time signals.	CO1	6
		(OR)		
2.	a.	Determine the Initial Value $x(0)$ and Final value $x(\infty)$ of the given z-domain signal. $$X(z)=\frac{1-3z^{-1}}{1-3.6z^{-1}+1.8z^{-2}}$$	CO1	5
	b.	Determine the one-sided z-transform of the discrete sequence generated by sampling the given Continuous time functions mathematically. $$x(t)=Sin\omega t$$	CO1	10
	c.	With a neat sketch, explain the configuration of the basic digital control scheme.	CO2	5
3.	a.	Using Bilinear transformation method, check whether the given sampled data control system is Stable or Not. $$z^3-0.2z^2-0.25z+0.05=0$$	CO3	12
	b.	Explain the procedure for finding whether the sampled data control system is stable or not using Jury's Stability test.	CO3	8
		(OR)		
4.	a.	Demonstrate the working of practical Sample-and-hold circuit and also obtain the model of Sample-and-Hold Operation.	CO1	12
	b.	With necessary graphs, illustrate the concept of aliasing in detail.	CO1	8
5.	a.	Explain the z-domain description of sampled continuous-time plants.	CO1	12
	b.	Elaborate the Non-Recursive method of realization in detail.	CO2	8
		(OR)		
6.	a.	Derive the relation between the spectrums of the continuous-time signal to that of the discrete-time sequence and illustrate the process of sampling in detail.	CO1	15
	b.	Using Parallel realization, realize the given pulse transfer function $$D(z)=\frac{z(z+2)}{(z+1)(z+3)(z+4)}$$	CO1	5
7.	a.	Illustrate the procedure for tuning a controller using Ziegler-Nichols tuning method based on Ultimate gain and Period.	CO2	10
	b.	Illustrate the basic routes to the design of digital controller in detail.	CO2	5
		(OR)		
8.	a.	A Single-input system is described by the following state equations.	CO2	12

		$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 \\ 1 & -2 & 0 \\ 2 & 1 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 10 \\ 1 \\ 0 \end{bmatrix} u$$ Using Ackerman's formula, design a state feedback controller which will give closed-loop poles at -1+j2,-1-j2,-6.		
	b.	Find the Inverse of the given Modal Matrix, M= $\begin{bmatrix} 0 & 2 & 3 \\ 8 & 2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$	CO2	**3**
	d.	Describe about the importance of Pole placement technique.	CO2	**5**
	e.			
		<u>Compulsory:</u>		
9.	a.	Explain the hardware features, control schemes and the design of control algorithm for a Digital Temperature Control in an Air-flow System.	CO2	**12**
	b.	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 Jordan canonical form.	CO2	**8**

ALL THE BEST

Course Outcome:

CO1: Use Z transforms to analyse Discrete Systems.
CO2: Design controllers for a digital process.
CO3: Test the Stability of Discrete Systems