Reg.No. _____

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)

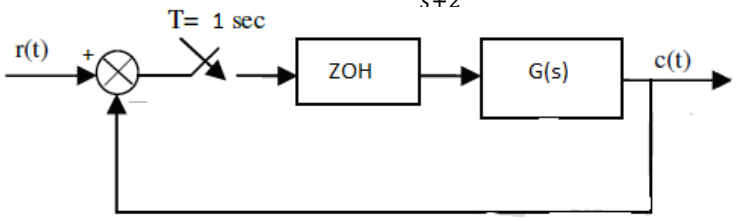
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – April/May – 2017

Code : 14EI2016 **Duration : 3hrs**

Sub. Name : Digital Control System **Max. marks : 100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Enumerate basic elements of a digital control system and show the block diagram representation of such a system. Also discuss briefly about functioning these elements.	CO1	10
	b.	Describe about the basic discrete-time signals.	CO1	10
		(OR)		
2.	a.	Discuss in detail about the successive approximation type analog to digital converters with neat schematic diagram.	CO1	10
	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
3.	a.	Check for stability by using Jury's stability criterion applied to sampled data control system for the following characteristic equation $z^3-0.2z^2-0.25z+0.05=0$	CO1	10
	b.	For the sampled data control system shown in figure, find the response to unit step input, where $G(s) = \frac{1}{s+2}$ 	CO2	10
		(OR)		
4.	a.	Demonstrate the working of practical Sample-and-hold circuit and also obtain the model of Sample-and-Hold Operation.	CO2	10
	b.	Consider a discrete time system $y(k+2)+\frac{1}{4}y(k+1)-\frac{1}{8}y(k) = 3r(k+1)-r(k)$ with input $r(k) = (-1)^k \mu(k)$. And initial conditions $y(-1) = 5, y(-2) = -6$ Find the output $y(k); k \geq 0$	CO3	10
5.	a.	Using Parallel realization, realize the given pulse transfer function $D(z) = \frac{z(z+2)}{(z+1)(z+3)(z+4)}$	CO2	10
	b.	Derive the Steady state errors for various inputs and systems. Also determine the Positional error constant, Velocity error constant and Acceleration error constant.	CO3	10
		(OR)		
6.	a.	Describe the procedure for tuning a controller using Ziegler-Nichols tuning method based on Ultimate gain and Period.	CO2	12
	b.	Discuss the basic routes to the design of digital controller in detail.	CO3	8
7.	a.	Obtain the state model of the system whose transfer function is given as, $\frac{Y(s)}{U(s)} = \frac{10}{3^3+4S^2+2S+1}$	CO3	10

	b.	A discrete time system is described by the difference equation, $(k+2)+5y(k+1)+6y(k)=u(k)$; $y(0)=y(1)=0$; T=1. Determine a state model in canonical form.	CO2	10
		(OR)		
8.	a.	Mention the drawbacks in transfer function model Analysis.	CO2	5
	b.	Check whether the given system is Controllable and Observable. $A=\begin{bmatrix}0 & 0 & 1\\ -2 & -3 & 0\\ 0 & 2 & -3\end{bmatrix}; B=\begin{bmatrix}0\\2\\0\end{bmatrix}; C=\begin{bmatrix}1 & 0 & 0\end{bmatrix}$	CO3	15
		Compulsory:		
9.	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 vriable form and Jordan canonical form.	CO3	20

ALL THE BEST