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.	Discuss in detail about the configuration of the basic digital control scheme and design a PC based liquid control system.	CO1	10
	b.	Determine the one-sided z-transform of the discrete sequence generated by sampling the given Continuous time functions mathematically. $x(t) = e^{-at} Cos\omega t$	CO1	10
(OR)				
2.	a.	Obtain the inverse z-transform of the following function. $F(z)=\frac{1}{1-1.5Z^{-1}+0.5Z^{-2}}$	CO1	10
	b.	Write short notes on R-2R digital to analog converter.	CO2	10
3.	a.	Explain the procedure for finding whether the sampled data control system is stable or not using Jury's Stability test.	CO2	10
	b.	A discrete time system is described by the transfer function $G(z) = \frac{Y(Z)}{R(Z)} = \frac{1}{Z^2+a_1Z+a_2}; a_1 = -\frac{3}{4}, a_2 = \frac{1}{8}$ Find the response of $(i) r(k) = \mu(k), (ii) r(k) = \delta(k)$	CO2	10
(OR)				
4.	a.	Determine the z-domain transfer function for the following transfer functions. $(i) H(s) = \frac{a}{(s+a)^2}$ $(ii) H(s) = \frac{s}{s^2+\omega^2}$	CO3	10
	b.	Discuss in detail about the hold operation and derive a model of Sample-and-Hold operation.	CO1	10
5.	a.	Explain the position form and velocity form of Digital PID algorithms.	CO2	15
	b.	Compare the analog and digital controller.	CO2	5
(OR)				
6.	a.	Explain the hardware features, control schemes and the design of control algorithm for a Digital Temperature Control in an Air-flow System.	CO2	10
	b.	Describe about the importance of Pole placement technique.	CO2	10
7.	a.	Transform the given state model into a canonical state model and also compute the state transition matrix, e^{At}. $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} [u]$ and $y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$	CO3	20
(OR)				

8.	a.	Construct a state model for a system characterized by the differential equation, $\frac{d^3y}{dt^3} + \frac{d^2y}{dt^2} + \frac{dy}{dt} + 6y + u = 0$. Give the block diagram representation of the state model.	CO2	15
	b.	State the condition for observability by kalman's method.	CO2	5
		<u>Compulsory:</u>		
9.	a.	Consider the matrix A. Compute e^{At} by using matrix exponential method. A=$\begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$	CO3	15
	b.	How the state transition matrix of discrete time system $A^k$is computed using Cayley-Hamilton theorm	CO2	5

ALL THE BEST