APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

08 PALAKKAD CLUSTER

Q. P. code **(pages: 3)** **Name:**

Reg No:

SECOND SEMESTER M.TECH. DEGREE EXAMINATION MAY 2016

(POWER ELECTRONICS)

Subject id:08EE6252 **DIGITAL CONTROL SYSTEMS**

Time:3 hours **Max.marks: 60**

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

(graph sheets and semi log sheets can be provided.)

Q.no.	Module 1	Marks
1.a	Derive the transfer function of zero order hold circuit	3
	Answer b or c	
b	Explain series programming and parallel programming	6
c	Solve the difference equation $y(k+2) - y(k+1) + 0.25y(k) = u(k+2)$ where $y(0) = 1$, $y(1) = 2$. The input fi]unction $u(k)$ is given by $u(k) = 1$, $k = 0,1,2,...$	6

Q.no.	Module 2	Marks
2.a	Define stability analysis of a discrete time system	3
	Answer b or c	
b	Explain static error coefficients of a discrete time system,	6

c Consider the discrete time unity feedback control system (with sampling period T=1s) 6

whose open loop pulse transform function is given by G(z) = $\frac{k(0.3679z+0.2642)}{(z-0.3679)(z-1)}$

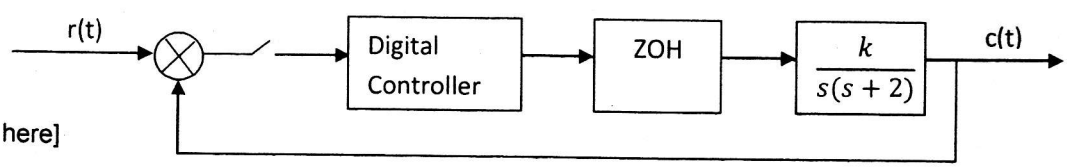
Determine the range of gain *k* for stability by using Jury's stability test. Also obtain the frequency of sustained oscillation.

Q.no.	Module 3	Marks
3.a	Mention the effect of sampling period on transient response specifications.	3

Answer b or c

b Design a digital controller for the system shown in figure using root locus method to Meet the following specifications 6

a) $k_v \geq 2.5$ b) § = 0.5 c) Settling Time ($T_s \leq 2s$)



tion here]

6

c Explain the design procedure for a lead compensator based on frequency response approach for discrete time system.

	Module 4	Marks
no.		
4.a	Obtain an expression of pulse transfer function of a discrete time system from state model.	3
	Answer b or c	
b	Obtain the state variable model for the difference equation $y(k+3) + 5y(k+2) + 7y(k+1) + 3y(k) = r(k+1) + 2r(k)$	6
c	Obtain the diagonal canonical form of representation forthe system defined by difference equation $y(k+2) + 3y(k+1) + 2y(k) = 5r(k+1) + 3r(k)$	6

Q.no.	Module 5	Marks
5.a	Derive a method for the solution of linear time invariant discrete time state equation]	4
	Answer b or c	
b	A discrete time system is described by difference equation $y(k+2) + 5y(k+1) + 6y(k) = u(k)$ $y(0) = y(1) = 0$, T = 1sec.Determine the state transition matrix	8
c	Explain the method of discretization of continuous time space equation.]	8

Q.no.	Module 6	Marks
6.a	Explain the concept of controllability and Observability	4
	Answer b or c	
b	Consider a digital control system described by input output relation in the form of following difference equation $c(k+2) + 2c(k+1) + c(k) = u(k+1) + u(k)$ Check if the sytem is completely state controllable	8
c	Derive Ackermann's formula for pole placement technique using state feedback for discrete time systems.	8