Duration: 3hrs **[Max Marks:80]**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1		Attempt any FOUR	[20]
	a	With suitable block diagram, explain the sample and hold circuit	
	b	State and explain sampling theorem	
	c	Write any five advantages of digital control over analog control system.	
	d	Explain Mason's gain formula for Signal Flow Graph.	
	e	Discuss in detail about the stability of a system in the z plane.	
2	a	Discuss ZOH as low-pass filter using clear diagrams of its frequency response characteristics.	[10]
	b	Determine the stability of the system having characteristics equation P (z) = z4 – 1.2 z3 + 0.07 z2 + 0.3 z – 0.08 = 0 using Jury's Stability Criterion.	[10]
3	a	Draw a typical block diagram of a digital control system and explain each block in detail.	[10]
	b	A feedback system has a closed loop transfer function Y(s)/R(s) = 10(s+4) / s(s+1)(s+3) Construct three different state models for this system: i) one where the system matrix A is diagonal matrix ii) one where A is in first companion form iii) one where A is in second companion form	[10]
4	a	With neat block diagram explain the full order observer.	[10]
	b	Design a deadbeat controller for a discrete-time system which is described by following open-loop pulse transfer function. Assume loop to be closed by negative unity feedback. $G(z) = \frac{2(z+0.5)}{(z-1)(z-0.61)}$	[10]
5	a	What are the state space representation forms and explain them.	[10]
	b	Describe bilinear transformation approach for discretization of continuous time systems in detail. Also, comment on the mapping between s-plane and z-plane under such discretization.	[10]
6	a	Prove Ackermann's formula for the determination of the state feedback gain	[10]
	b	Define Controllability and Observability of a system. Discuss any one method to determine Controllability and Observability of a system.	[10]

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