Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –IIst SEMESTER–EXAMINATION – JULY- 2012

Subject code: 1720301 **Date: 06/07/2012**

Subject Name: Digital Control

Time: 10:30 am – 13:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Write a short note on Smith Predictor.	**08**
	(b)	How IMC in conventional form is represented for stable plants? Explain with block diagram.	**06**
Q.2	**(a)**	Explain Dead-beat and Dahlin controller. Design a dead-beat controller for , $G(z) = \frac{z^{-2}}{1 - z^{-1}}$	**07**
	(b)	List out various steps to design a pole placement controller for 1-DOF and 2-DOF controller.	**07**
		OR	
	(b)	Design a 2-DOF PID controller, which eliminates the effect of proportional kick and Derivative kick.	**07**
Q.3	**(a)**	Find ZOH equivalent of K/ (τs+1).	**03**
	(b)	Explain the Ziegler-Nicholas Tuning method for PID controller.	**03**
	(c)	State and explain internal model principle.	**08**
		OR	
Q.3	**(a)**	Design a Pole-Placement Controller for , $G(z) = z^{-1} \frac{0.0288+0.0265z^{-1}}{1-1.7788z^{-1}+0.7788z^{-2}}$ Where, ρ = 0.8827 & ω = 0.1309.	**10**
	(b)	Explain how internal stability ensures controller realizability.	**04**
Q.4	**(a)**	Design a Bump less PID controller having K=2, τ_d= 2.5 s, τ_i= 40s and T_s=1s.	**06**
	(b)	Write a short note on Anti-windup controller.	**08**
		OR	
Q.4	**(a)**	Derive an expression for ARIMAX prediction error model.	**07**
	(b)	What are the steps to design Internal Model Controller for stable plants?	**07**
Q.5	**(a)**	Derive the equation of Minimum Variance Control law for ARMAX system.	**06**
	(b)	Derive equations for Generalized Predictive control for ARIX model.	**08**
		OR	
Q.5	**(a)**	What is the non-minimum phase system? Explain with example.	**04**
	(b)	Write a short note on Prediction Estimator.	**10**

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