Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014

Subject code: 1720301 **Date: 02-12-2014**

Subject Name: Digital Control

Time: 02:30 pm - 05:00 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)** Explain the process of sampling and discretization with any one technique. **07**

(b) Explain about feedback and feedforward contol structures with necessary block diagrams. **07**

Q.2 **(a)** Explain about various digital PID controller structure with block diagrams and equations. **07**

(b) Explain about deadbeat response and deadbeat control with suitable example **07**

OR

(b) For a unity feedback digital control system with G(z) as given below, find a suitable deadbeat controller such that output sample sequence track the unit step input. Comment about the response. **07**

$$G(z) = \frac{0.0003916(z+2.8276)(z+0.19)}{(z-1)^2\,(z-0.2865)}$$

Q.3 **(a)** Explain Zeigler ï Nichols methods for tunning of PID controller. **07**

(b) Determine discrete time PID controller if continuous time PID setting is K=1, Ű = 1.5sec, Ű= 20sec and Ts = 1sec. **07**

OR

Q.3 **(a)** What are the limitations of pole placement controllers and which kind of control design may overcome the same? Explain in brief. **07**

(b) Explain about PID controller tunning through pole placement. **07**

Q.4 **(a)** Comment on the complete observability of the following system. **07**

$$x(k+1) = Gx(k) + Hu(k)$$

and

$$y(k) = Cx(k)$$

$$G = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \quad H = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \quad C = \begin{bmatrix} 4 & 5 & 1 \end{bmatrix}$$

(b) Explain the terms controllability and observability. **07**

OR

Q.4	**(a)**	Explain about LQG Controller design.	**07**
Q.4	**(b)**	State and Explain Ackermann s formula with its application.	**07**
Q.5	**(a)**	Explain about Nyquist plot for control design and stability margins.	**07**
	(b)	Draw the block diagram for Internal Model Control (IMC) feedback configurations and PID tuning through IMC.	**07**

OR

Q.5	**(a)**	Explain the terms Internal Stability and Realizability.	**07**
	(b)	Explain in brief about Minimum Variance Control and Generalized Predictive Control.	**07**

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