Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–II(New course)• EXAMINATION (Remedial) – WINTER- 2015

Subject Code: 2720301 **Date: 09/12/2015**

Subject Name: Digital Control

Time: 2:30 pm to 5:00 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)**	Evaluate the effect of an integrating controller $Gi(Z) = \frac{Z+1}{Z-1}$; when used with a non oscillating plant given by $G(Z) = \frac{Z}{Z-a}$, where a>0.	**07**
	(b)	Examine the effect of using derivative controller $Gd(Z) = \tau d \frac{Z-1}{z}$; on the oscillating plant $G(Z) = \frac{Z}{Z+a}$; a>0.	**07**
Q.2	**(a)**	Discuss about Internal stability with necessary derivations.	**07**
	(b)	Design controller for plant transfer function $G(Z) = Z^{-1} \frac{1-0.85\,Z^{-1}}{1-0.8\,Z^{-1}}$ with integral mode such that the closed loop characteristic polynomial is equal to $(1-0.7\,Z^{-1})^2$	**07**
		OR	
	(b)	Design controller for plant transfer function $G(Z) = Z^{-1} \frac{1-0.9\,Z^{-1}}{1-0.8\,Z^{-1}}$ with integral mode such that the closed loop characteristic polynomial is equal to $(1-0.7\,Z^{-1})^2$.	**07**
Q.3	**(a)**	Discuss about Internal Model principle with necessary derivations	**07**
	(b)	Find the ZOH equivalent of $\frac{K}{(\tau S+1)}$.	**07**
		OR	
Q.3	**(a)**	Discuss about Ziegler – Nichols method of tuning.	**07**
	(b)	Find the ZOH equivalent of $\frac{10}{(5S+1)}$ obtained with sampling time of 0.5 second.	**07**
Q.4	**(a)**	Discuss about 2-DOF controller with Integral Action at steady state.	**07**
	(b)	Discuss Bump less PID controller with Tc=Sc.	**07**
		OR	
Q.4	**(a)**	Discuss PID controller with filtering and Tc=Sc.	**07**
	(b)	Discuss about 2-DOF PID controller with Tc=Sc(1).	**07**
Q.5	**(a)**	Discuss about IMC design for stable plant.	**07**
	(b)	Discuss about prediction error model through noise splitting with necessary derivations.	**07**
		OR	
Q.5	**(a)**	Discuss about ARIMAX prediction error model.	**07**
	(b)	Discuss about Minimum Variance Controller for ARMAX systems with necessary derivations.	**07**

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