Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–III EXAMINATION – SUMMER 2016

Subject Code:X30903 **Date:01/06/2016**

Subject Name:Control Theory

Time:02:30 PM to 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)**	Give the comparison between open-loop and closed-loop system.	**07**
	(b)	Explain the block diagram reduction technique	**07**
Q.2	**(a)**	Give the comparison between time domain and frequency domain system.	**07**
	(b)	What are the various time response specifications? Derive the expressions for any three specifications.	**07**
		OR	
	(b)	The closed loop poles are located at -4+j2 and -4-j2. Find the unit step response of the system and the settling time for 2% tolerance.	**07**
Q.3	**(a)**	Construct the signal flow graph for the following set of simultaneous equations and also derive Transfer function by using the mason's formula. 1) $X_2 = 5X_1 + 8X_3$ 2) $X_3 = -6X_1 + 2X_2 + 7X_3$ 3) $X_4 = 8X_2 + X_3$	**07**
	(b)	Explain Force-voltage analogy and Force-current analogy. .	**07**
		OR	
Q.3	**(a)**	G(s) H(s) = 1/(S+1), determine the stability using Nyquist plot.	**07**

	(b)	Explain the Nyquist stability criterion and also give the advantage of Nyquist plot.	**07**
Q.4	**(a)**	Explain controllability and observability with suitable example.	**07**
	(b)	Draw the bode plot for open loop transfer function $\frac{10}{S(S+2)(S+10)}$	**07**

OR

Q.4	**(a)**	What is State Transition Matrix? Explain the various methods to obtain it.	**07**
Q.4	**(b)**	Draw the root locus plot for $\frac{1}{(S+2)(S+3)}$	**07**
Q.5	**(a)**	Give the properties and advantage of transfer function.	**07**
	(b)	Give the comparison between block diagram method and signal flow graph method.	**07**

OR

Q.5	**(a)**	Find the range of k for which the system whose characteristic equation is given below is stable. $F(s) = S^3+(k+0.5)S^2+4ks+50 = 0$.	**07**
	(b)	Define the minimum phase, non-minimum phase and all-pass system.	**07**

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