Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – SUMMER 2015

Subject Code: 141701 **Date: 03/06/2015**

Subject Name: Control Theory

Time: 10.30am-01.00pm **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)**	Differentiate between open loop system and closed loop system.	**07**
	(b)	Briefly explain the first order system and its time response to a unit step input.	**07**
Q.2	**(a)**	Define the following terms in relation to time response of a system. (1) Rise time (2) Peak time (3) Steady state error (4) Overshoot	**07**
	(b)	Prepare a mathematical model of a series R-C circuit connected to a DC supply. Obtain the transfer function between capacitor voltage and supply voltage.	**07**
		OR	
	(b)	Prepare a mathematical model of a series R-L circuit connected to a DC supply. Obtain the transfer function between inductor current and supply voltage.	**07**
Q.3	**(a)**	Explain with suitable example how MATLAB can be used to obtain state space representation of a system from its transfer function and vice versa.	**07**
	(b)	Select a block diagram of your choice and obtain the corresponding signal flow graph. The derived signal flow graph must contain minimum two non-touching loops. Obtain the transfer function of this system using Mason's gain formula.	**07**
		OR	
Q.3	**(a)**	Select a block diagram of your choice. The selected diagram must contain minimum three loops. The block diagram must contain summing points, take-off points and minimum 10 blocks. Obtain the transfer function of this system using block diagram reduction techniques.	**07**
	(b)	Briefly discuss the mathematical model of a thermal system.	**07**
Q.4		Explain the Root-locus technique in detail with a suitable example.	**14**
		OR	
Q.4	**(a)**	Write a short note on Routh-Herwitz stability criteria.	**07**
	(b)	Briefly discuss the mathematical model of a mechanical system.	**07**
Q.5	**(a)**	What do you mean by frequency response analysis? Obtain the general expression of steady state output for a system with a transfer function G(s) and connected to a sinusoidal input u(t) = A sin(wt).	**07**
	(b)	Select a suitable example and explain how MATLAB can be used to obtain Bode plots.	**07**
		OR	
Q.5	**(a)**	Write a short note on Bode plots. Define gain margin and phase margin.	**07**
	(b)	Briefly explain polar plots and its significance.	**07**

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