Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA ENGINEERING – SEMESTER –IV• EXAMINATION – SUMMER - 2017

Subject Code: 3341701 Date: 27-04-2017

Subject Name: Control Instrumentation System

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make Suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of programmable & Communication aids are strictly prohibited.**
5. **Use of only simple calculator is permitted in Mathematics.**
6. **English version is authentic.**

Q.1 Answer any seven out of ten. **14**

1. Define Characteristic equation
2. Error constants of the system are measure of:
   a) Relative stability
   b) Transient state response
   c) Steady state response
   d) Steady state as well as transient state response
3. The required for the response to rise and stay within the tolerance band is called as:
   a) Rise time
   b) Pickup time
   c) Settling time
   d) Transient time
4. A signal flow graph is a:
   a) Special type of graph for analyzing the modern control system
   b) Pictorial representation of the simultaneous equations describing a system
   c) Polar graph
   d) Log- log graph
5. Proportional band of the controller is expressed as:
   a) Gain
   b) Ratio
   c) Percentage
   d) Range of control variables
6. When derivative action is included in a proportional controller, the proportional band:
   a) Increases
   b) Reduces
   c) Remains unchanged
   d) None of the above
7. Define time response
8. In closed loop control system, with positive value of feedback gain the overall gain of the system will
   a) Decrease
   b) increase
   c) be unaffected
9. The integral control:
   a) Increases the steady state error
   b) Decreases the steady state error
   c) Increases the noise and stability

d) Decreases the damping coefficient

10. Define steady state response.

Q.2	(a)	Derive Transfer Function for single tank level system.	**03**
		OR	
	(a)	State Mason's gain formula.	**03**
	(b)	Obtain differential equation for basic mechanical system.	**03**
		OR	
	(b)	List out six rules for finding out Transfer Function from block diagram reduction technique.	**03**
	(c)	Explain closed loop with block diagram and example.	**04**
		OR	
	(c)	Obtain mathematical model for series RLC circuit.	**04**
	(d)	Explain any two Standard test signals with their equations.	**04**
		OR	
	(d)	Prepare table for force-voltage and force-current analogy for mechanical system	**04**
Q.3	(a)	List out and draw the standard test signal.	**03**
		OR	
	(a)	Draw the block diagram of first order control system and output response of it with unit step input.	**03**
	(b)	Define Gain Margin and Phase Margin.	**03**
		OR	
	(b)	Explain Polar plot in brief.	**03**
	(c)	Explain steady state error & error constants.	**04**
		OR	
	(c)	Draw the time response of second order control system for unit step input and labeled the following terms: Rise time, Peak time, Maximum Peak Overshoot, Settling time	**04**
	(d)	Write short note on Nyquist stability criterion	**04**
		OR	
	(d)	Explain Bode plot in brief.	**04**
Q.4	(a)	State the necessary condition for stability.	**03**
		OR	
	(a)	Describe concept of root locus in brief	**03**
	(b)	Explain the procedure to evaluate the stability using Routh-Hurwitz criteria.	**04**
		OR	
	(b)	Classify control system stability according to location of roots of characteristic equation.	**04**
	(c)	Define: Process load, process lag, self regulation, control lag, transportation lag, dead time, cycling	**07**
Q.5	(a)	Compare various modes of control action.	**04**
	(b)	Explain PID mode of control action in detail	**04**
	(c)	Sketch output for various modes of control action for step changes only	**03**
	(d)	Give brief idea about cascade control scheme.	**03**