

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-IV EXAMINATION – WINTER 2025****Subject Code:3142003****Date:18-11-2025****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.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Differentiate between open loop and close loop system.	03
	(b) Define and explain the following terms related to the transfer function of a system. Poles, Zeros, Characteristic equation, pole- zero plot, order.	04
	(c) Define the resistance and capacitance of liquid level system. Derive the transfer function of simple liquid level system.	07
Q.2	(a) Discuss translational element.	03
	(b) Define the following terms. Stable systems, Unstable system, Critically stable system, Conditionally stable system.	04
	(c) What is force current system? Which are the analogues quantities according to this method?	07
OR		
	(c) Explain the analysis of gear train with inertia and friction.	07
Q.3	(a) Write the note on open loop system with real life example.	03
	(b) Define and Explain the following terms. State variable, State vector, State trajectory, State, State space.	04
	(c) Rules of Block Diagram Reduction.	07
OR		
Q.3	(a) Explain a closed loop system stating real life examples.	03
	(b) Define the Type and Order of a system.	04
	(c) Define the following terms related to SFG. Source node, sink node, chain node, Forward path and its gain, Feedback loop and its gain, Self-loop, Non-touching loops.	07
Q.4	(a) Derive the expression for Peak time.	03
	(b) Discuss the various standard inputs used in the control system analysis.	04
	(c) Derive the expression for static error coefficients. How these coefficients are useful in determining the steady state error?	07
OR		
Q.4	(a) Explain how at a given point on the root locus, the gain can be determined.	03
	(b) Define the following terms. Delay time, Rise time, Peak time, and Settling time.	04
	(c) Derive the formula for the steady state error of 'TYPE 2' system for step, ramp and parabolic inputs.	07
Q.5	(a) Design the liquid level control system with interaction.	03
	(b) What is corner frequency? Explain.	04
	(c) How to determine gain margin and phase margin from the Polar plot or Nyquist plot?	07

OR

Q.5	(a)	What is Bode plot?	03
	(b)	Explain: G.M., P.M., ω_{gc} , ω_{pc} .	04
	(c)	List all steps of Nyquist Criterion.	07
