

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-III EXAMINATION – WINTER 2025****Subject Code:3131101****Date:12-12-2025****Subject Name: Control Systems****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. Simple and non-programmable scientific calculators are allowed.

		<b>Marks</b>
<b>Q.1</b>	(a) Explain standard test signals. (b) Compare time response and frequency response of system. (c) Explain any 7 rules of block diagram reduction technique.	03 04 07
<b>Q.2</b>	(a) Write advantages of state space approach over classical methods. (b) Discuss the effect of adding a pole to a closed loop transfer function. (c) Explain Mason's Gain Formula with suitable example	03 04 07
	<b>OR</b>	
	(c) Write a short note on state space representation of a control system.	07
<b>Q.3</b>	(a) Explain in brief about PID controller. (b) Discuss force voltage (F-V) analogous system with analogous quantity. (c) Explain the steps of root locus	03 04 07
	<b>OR</b>	
<b>Q.3</b>	(a) Explain in brief about PD controller. (b) Discuss force current (F-I) analogous system with analogous quantity. (c) Explain nature of Bode plot for i) Poles at the origin ii) Zeros at the origin.	03 04 07
<b>Q.4</b>	(a) Find Laplace transform of $x(t) = \cos 2t$ (b) Explain, how the gain and phase margin are obtained from Nyquist plots? (c) Explain Phase-Lag compensator in detail.	03 04 07
	<b>OR</b>	
<b>Q.4</b>	(a) Find Laplace transform of $x(t) = \sin 2t$ (b) Explain polar plot with suitable example. (c) Explain Phase-Lead compensator in detail.	03 04 07
<b>Q.5</b>	(a) Define: State, State variable, State trajectory.  (b) Define steady state error and obtain its formula (c) Discuss unit step response of first order system.	03  04 07
	<b>OR</b>	
<b>Q.5</b>	(a) Define i) Gain Margin ii) Frequency response iii) Phase Margin (b) Obtain equation of peak time for a second order control system when subjected to unit step input. (c) Discuss impulse response of second order system.	03 04 07

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