

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2021****Subject Code:3151908****Date:15/12/2021****Subject Name:Control Engineering****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) Discuss about the requirements of good control system.	03
	(b) Explain Hydraulic PID controller with neat sketch.	04
	(c) Obtain the transfer function for hydraulic system with proportional plus Integral plus derivative control action.	07
Q.2	(a) State the advantages of state-space representation over conventional control system analysis method.	03
	(b) What does a block diagram represent? List its salient characteristics.	04
	(c) What is Modern control theory? Compare Modern control theory with conventional control theory.	07
OR		
	(c) Draw a neat sketch of generalized hydraulic control system. Explain the elements of hydraulic control system in brief.	07
Q.3	(a) For an RLC circuit, Derive the state model	03
	(b) Explain about the transient and steady state response of the system. Also list out the standard test signals and explain any one of them.	04
	(c) Derive unit-step response for first-order control system. Discuss salient features of the response curve and error curve with a neat sketch.	07
OR		
Q.3	(a) What is meant by Step input, Impulse input and Ramp input?	03
	(b) Draw generalized unit step response for 2 nd order system and define following: Rise time, Delay time, Settling time.	04
	(c) Derive transfer function of room heating system with usual notations.	07
Q.4	(a) Define the following terms: (1) Resonant peak (2) Gain Margin	03
	(b) Describe with neat sketch of a pneumatic proportional controller.	04

- (c) Briefly discuss performance specifications of frequency response analysis for linear controls systems. 07

OR

- Q.4** (a) What is Transfer function? Write down Advantages and disadvantages of Transfer function. 03
- (b) Discuss the effect of time constant on first order system response for unit step input. 04
- (c) Explain pneumatic proportional plus integral control action and obtain its transfer function. 07

- Q.5** (a) List out the basic elements of a Pneumatic system. 03
- (b) Discuss about gain margin and phase margin for frequency response of control system. 04
- (c) Derive unit impulse response for a generalized second order system for underdamped, critically damped and overdamped cases with usual notations. Also derive the relation of maximum overshoot (for underdamped case). 07

OR

- Q.5** (a) Write the comparison between a Pneumatic system and Hydraulic system. 03
- (b) Discuss the effect of damping on the position of closed loop poles of the 2nd order system with diagram. 04
- (c) Discuss stepwise procedure of plotting the root-locus for a given open-loop transfer function 07