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**Total Marks: 70** 

# **GUJARAT TECHNOLOGICAL UNIVERSITY**

BE - SEMESTER–VII (OLD) EXAMINATION – SUMMER 2019 Code: 171701 Date: 18/05/2019

Subject Code: 171701

Subject Name:Control System Design

Time: 02:30 PM TO 05:00 PM

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Discuss the Optimal control systems in detail with necessary equations. Brief 07 about the procedure to find out feedback gain for the systems using it.
  - (b) List the steps to design Robust PID controlled systems.
- Q.2 (a) Explain the Pseudo Quantitative Feedback Theory, with suitable example 07
  - (b) What is dead beat response? Give the design procedure for obtaining dead beat 07 response.

### OR

- (b) Explain the duality principle of controllability and observability, with suitable 07 example
  - 07

07

- Q.3 (a) State the condition for observability. Discuss the state observer design with 07 necessary equations and block diagram.
  - (b) With example discuss design of digital controllers using root locus in the z-plane. 07

### OR

- Q.3 (a) Define state variable and state model. If a system has one input, one output and 07 three states, find out the dimensions of the various matrices of the state model.
  - (b) Explain the compensator design with integrated full-state feedback and observer. 07
- Q.4 (a) State an Ackermann's formula. Show the Computation of State Controllability 07 and Observability using it. What is its limitation?
  - (b) Discuss about Internal model design for step input tracking with mathematical 07 arguments.

OR

- Q.4 (a) Explain the implementation of digital (PID, PD and PI) controllers with 07 necessary steps.
  - (b) What do you mean by Eigen value and Eigen Vector? What is the role of its in 07 State Variable Analysis?
- Q.5 (a) Discuss the Lead compensation technique based on frequency response (bode 07 plot). List the necessary steps and explain with suitable example.
  - (b) Discuss importance of robust control system and sensitivity of control system. 07

## OR

- Q.5 (a) State the Computer (MatLab) commands used for State variable analysis with 07 syntax/code and its related outputs. Mention appropriate comments also.
  - (b) Explain the control of uncertain parameter in robust control system. 07

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