

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VIII (NEW) - EXAMINATION – SUMMER 2018****Subject Code: 2180913****Date: 30/04/2018****Subject Name: Advanced Control Systems(Departmental Elective - III)****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.

- Q.1** (a) What is disturbance signal in control system? Explain how disturbance can be reduced using feedback control system. **03**
(b) Explain observability for a state space system using suitable block diagram. **04**
(c) Determine the necessary and sufficient condition for a system to be completely state controllable using Kalman's Controllability test. **07**
- Q.2** (a) Explain Pell's Method in Phase Plane Analysis **03**
(b) Explain State Space Representation of Nth Order Linear Differential Equation **04**
(c) Explain why do we need state variable approach to control system analysis? How it is superior to classical approach? **07**
- OR**
- (c) Explain Cayley Hamilton Theorem and discuss how it can be used to find the state transition matrix. **07**
- Q.3** (a) Write and prove the properties of State Transition Matrix (STM). **03**
(b) Define the terms State Variable and State Transition Matrix. **04**
(c) Discuss the concept of Kalman's controllability and observability test in detail. **07**
- OR**
- Q.3** (a) Explain the design procedure of a full state observer **03**
(b) Explain Lienard's Method in Phase Plane Analysis **04**
(c) Write a short note on advantages and limitations of state variable approach. **07**
- Q.4** (a) Draw and explain generalized block diagram of state space equations **03**
(b) Give comparison between transfer function based control design and state variable based control design. **04**
(c) Prove that the necessary and sufficient condition for arbitrary pole placement is that the system is completely state controllable. **07**
- OR**
- Q.4** (a) When is a system said to be completely controllable? **03**
(b) Discuss basic feature of following non linearities 1).non linear friction **04**
2).on off controller
(c) Explain need for reshaping of root locus plot. **07**
- Q.5** (a) Explain the construction of a phase trajectories by delta method **03**
(b) Explain Liapunov's second method and his stability theorem. **04**
(c) Explain sampled data control system using suitable block diagram **07**
- OR**
- Q.5** (a) Explain positive definite, positive semi definite and indefinite function **03**
(b) Discuss necessary and sufficient condition for state observation **04**
(c) What are the singular points? Explain different singular points adopted in non linear control system? **07**
