R16

Reg. No:

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
M.Tech I Year II Semester (R16) Regular Examinations May/June 2017
NON LINEAR CONTROL THEORY
(CONTROL SYSTEMS)
(For Students admitted in 2016 only)

Time: **3 hours**   Max. Marks:**60**

(Answer all Five Units **5 X 12 =60** Marks)

UNIT-I

1 a. Derive the describing function of Relay with Hysteresis Non-Linearity   6M
    b. Derive the describing function of Dead-zone and Saturation Non-Linearity   6M

OR

2 Derive the describing function of Relay with Dead-zone and Hysteresis Non-Linearity?   12M

UNIT-II

3 a. Discuss about the phase plane technique which can be used to analyze nonlinear system.   6M
    b. Explain the methods available for construction phase trajectories.   6M

OR

4 Explain the construction of phase trajectories and explain procedure for constructing phase trajectories by Isocline method   12M

UNIT-III

5 a. Using system of Lure problem state the Aizerman's and Kalman's conjecture.   6M
    b. Determine Whether or not following quadratic form is positive definite
$$Q(x_1, x_2) = 10x_1^2 + 4 x_2^2 + x_3^2 + 2 x_1x_2 - 2 x_2x_3 - 4 x_3x_1.$$ 6M

OR

6 Explain construction of Lyapunov function byvariable gradient method.   12M

UNIT-IV

7 State and explain Popov's hyper stability theorem   12M

OR

8 a. Explain the Kalmanstability criterion   6M
    b. Explain the Yakubovichstability criterion   6M

UNIT-V

9   a.   Discuss about reaching condition and reaching mode in detail   6M
    b.   Explain the design of controller for sliding mode control based on
         reaching law   6M

OR

10   Explain the design aspects of flight control and robotic manipulator   12M

*** END ***