No. of Printed Pages : 03 **Roll No. .....**

BB-24

M. Tech. EXAMINATION, May 2018

(Second Semester)

(B. Scheme) (Main & Re-appear)

EE(I&C)

MIC508B

NONLINEAR AND ADAPTIVE CONTROL

Time : 3 *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section. All questions carry equal marks.

Section I

1. What is Describing Function ? Derive expression for describing function of relay with dead-zone non-linearity. **15**

2. A non-linear system is described by the following equations :

$$\ddot{x} + \dot{x} + x^3 = 0$$

$x(0) = 1$, $\dot{x}(0) = 0$. Construct its phase trajectory using method of isoclines. **15**

Section II

3. Explain Popov's Stability criterion for linear. plant and for non-linear systems. **15**

4. (a) Define positive definite matrix. **5**

(b) Explain Liapunov's direct method of stability. **5**

(c) Describe the stability in Liapunov's sense. **5**

Section III

5. (a) Explain indirect adaptive control **6**

(b) What is Adaptive Control ? Explain the steps in designing adaptive controllers. **9**

6. (a) Explain the principle of gain scheduling in adaptive control. **6**

(b) Explain block diagram adaptive control applied to an example system. **9**

Section IV

7. Explain, how we can use VSC for state estimation of uncertain systems. Give detailed analysis. **15**

8. (a) How do we design the sliding mode surface ? What are the advantages of VSC ? **10**

(b) Explain charttering in VSC. **5**