EIGHTH SEMESTER B.Tech DEGREE EXAMINATION APRIL/MAY 2017

13.802 NON-LINEAR AN ADAPTIVE CONTROL (A)

Time : 3 Hours　　　　　　　(Model Question)　　　　　　　Max.marks : 100

PART A

(Answer **ALL** questions from PART A)

1.　　The response of a system is　$u(y)=y\dfrac{d^2 y}{dt^2}$ +7 $\dfrac{dy}{dt}$　Test whether the

　　　system is linear or non-linear

2.　　Explain the concept of Phase plane analysis. How it can be used for stability

　　　analysis.

3.　　Investigate the stability using liapunov method for the given non-linear system

$$\overset{'}{E}$$
$$¿$$
$$¿$$
$$\acute{E}+k\,\acute{E}+k1¿$$

4.　　Explain the importance of Gain scheduling in adaptive control system.

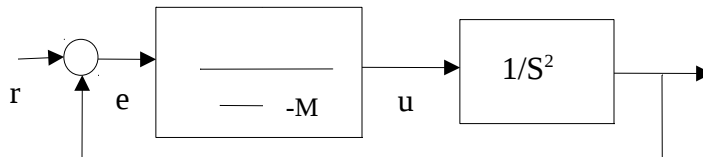5.　　Briefly explain adaptive predictive control scheme

(5x4=20 Marks)

Part – B

(Answer **ANY ONE** full question from each module)

Module - I

6　Consider a system shown below with an ideal relay. Determine the singular point.
Construct the phase trajectories corresponding to the initial conditions
c(0) = 2,　$c(0)=1.5$　, take r = 2 volts and M=1.2 volts.

(20 marks)

OR

7　A second order system is described by the equation　$\acute{e}+0.3\acute{e}+e=0$　, assume

initial conditions as (1.5,0). Construct the phase trajectory using the method of

isoclines. Choose slope as -2.0, -1.0, -0.5, 0, 0.5, 1.0 and 2.0.

(20 marks)

Module – II

8 What is describing function. Derive the describing function for system with Dead- zone and Saturation non-linearity.

(20 marks)

OR

9(a). How stability analysis are performed using describing function analysis. Explain in detail. (10 marks)

9(b). Explain Liapunov stability analysis. Determine the stability of the system given below using Liapunov method

$$\dot{x}_1 = x_2 \qquad \dot{x}_2 = -x_1 - x_2$$

(10 marks)

Module – III

10. Explain the design procedure for developing an MRAS using MIR rule with necessary diagram (20 marks)

OR

11. Describe Model Reference Adaptive controller using Liapunov theory in detail

(20 marks)

Module – IV

12. Explain Self tuning regulator using Pole placement design in detail.

(20 marks)

OR

13. Compare the performance of Indirect and Direct Self Tuning Regulator designs in detail. (20 marks)

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