Roll No. ☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(EE/Electrical & Electronics/Electronics & Electrical)
(2011 Onwards)
(Electrical Engg. & Industrial Control/Electronic Engg.) (2012 Onwards)
(Sem.–6)

NON-LINEAR AND DIGITAL CONTROL SYSTEMS
Subject Code : BTEE-603
M.Code : 71149

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION–A

1. Answer briefly :

   (a) Discuss the advantages of state space approach over transfer function approach.

   (b) Explain the term Observability.

   (c) What are singular points?

   (d) What do you mean by an equilibrium point?

   (e) Define limit cycle.

   (f) Define describing function.

   (g) Explain dead zone with a suitable example.

   (h) What are the properties of Lyapunov's function?

   (i) What do you mean by zero order hold?

   (j) Discuss the limitations of Z transform.

SECTION-B

2. The transfer function of a control system is given by :

$$G(s) = \frac{4(s+2)}{s(s+3)(s+4)}$$

Draw the state diagram and obtain the state equation.

3. Draw the phase portrait of the following system, using the method of isoclines :

$$\ddot{\theta} + \dot{\theta} + 0.5\theta = 0$$

4. Find out the describing function for Backlash nonlinearity.

5. An autonomous system is expressed as follows :

$$\dot{x}_1 = x_2$$

$$\dot{x}_2 = -m_1 x_2 - m_2 x_1$$

Study the stability of the system using Lyapunov's method and considering the Lyapunov's function as :

$$W = x_1^2 + x_2^2$$

6. Determine the relationship between z and s domains.

SECTION-C
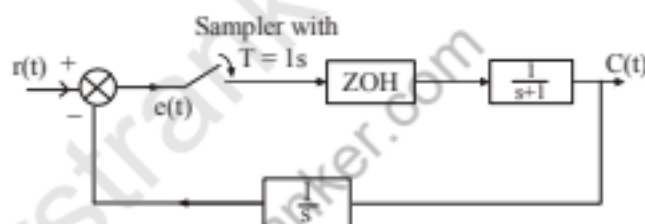
7. A closed loop control system is shown below :

Fig.1

Determine the output in discrete form when a unit step is applied to the input.

8. How can you find out Lyapunov's function by Krasovskii's and Variable gradient methods?

9. Determine whether the system shown below exhibits self sustained oscillations. If so, determine the stability, frequency, and amplitude of the oscillation.
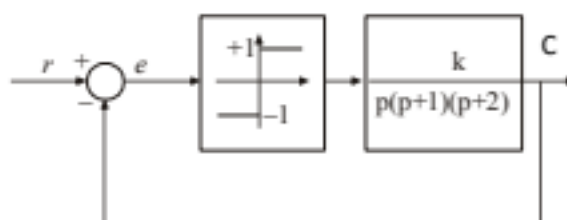

Fig.2

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.