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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****Paper ID : [A2336]****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**Q1 Answer briefly :**

- a) Define the term controllability.
- b) Why nonlinear control is required?
- c) Find out the equilibrium points for the following system

$$\dot{x} = -x + x^2$$

- d) Discuss the method of isoclines.
- e) What are the disadvantages of Z transform?
- f) How can you linearize a nonlinear system?
- g) How can you choose a Lyapunov function? Explain.
- h) Define pulse transfer function.
- i) What do you mean by sample and hold? Explain.
- j) What is Jury's stability test?

SECTION-B

Q2 Write a short note on “*solution of state variable model*”.

Q3 A system is described by the following equation:

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

If the initial conditions are $x(0) = 1$ and $\dot{x}(0) = 0$. Construct its trajectory on the phase plane diagram.

Q4 Explain variable gradient method for finding out the Lyapunov's function.

Q5 Find out the transfer function of a first order hold circuit.

Q6 Find out the stability of the following characteristic equation:

$$P(z) = z^4 - 1.2z^3 + 0.07z^2 + 0.3z - 0.08 = 0$$

SECTION-C

Q7 Discuss the advantages and disadvantages of describing function analysis. Find out the describing function of Backlash.

Q8 Find out the pulse transfer function of the following system :

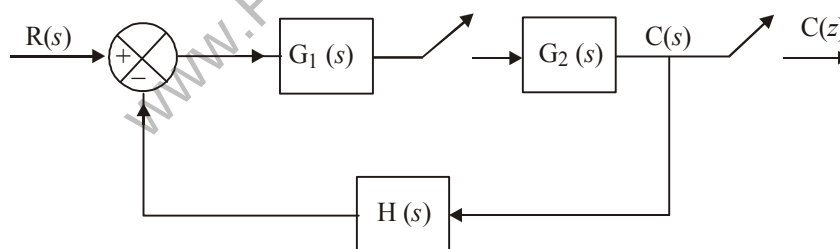


Figure - 1

Q9 Explain briefly :

a) Stability of discrete time systems.

b) Describing function of ideal relay.