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

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 :

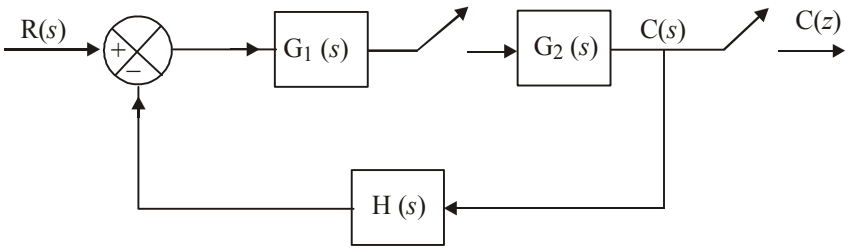

Figure - 1

Q9 Explain briefly :

a) Stability of discrete time systems.

b) Describing function of ideal relay.