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

Total No. of Questions : 09

B.Tech.(EIE) (2011 & Onwards) (Sem.–5)

NON LINEAR AND SAMPLED DATA CONTROL SYSTEMS

Subject Code : EI-303

M.Code : 58022

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) What are the advantages of state space over transfer function?

(b) Discuss the effect of pole-zero cancellation on the system observability.

(c) State the conditions for completely controllable system.

(d) A simple mass, spring and viscous friction system shown in figure 1. Comments on its stability.

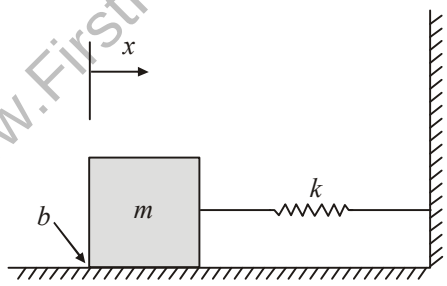

Fig.l.

(e) Write down the advantages of digital control system.

(f) Define state transition matrix

(g) If $f(t)$ =sin (ωt), what is its Laplace and Z-transform?

(h) Define Backlash, Dead zone, and Saturation.

(i) What is meant by adaptive control?

(j) What are the limitations of Piecewise linear approximation and phase plane method.

SECTION-B

Q2. A feedback system is characterized by the closed-loop transfer function :

$$T(s) = \frac{s+6}{(s+3)(s+2)}$$

Draw and state variable diagram for this system and obtained state space model by series decomposition.

Q3. Find the inverse Z transform of :

$$Y(z) = \frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$$

Q4. Explain the Krasovskii's method of constructing Liapunov functions for Nonlinear systems.

Q5. Obtain the transfer function and frequency response of zero order hold?

Q.6. Check if all the roots of characteristic equation lie within the unit circle?

$$2z^4 - 7z^3 + 10z^2 + 4z + 1 = 0$$

SECTION-C

Q7. Define observability of the system. List down the methods used for the testing of observability. Comment on the observability of the system described the following state equation :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

Q8. State and prove the direct method of Liapunov for stability analysis of linear system. Find out the stability of the system defined by the following equation using Liapunov direct method.

$$[\dot{x}] = \begin{bmatrix} -1 & 2 \\ 1 & -4 \end{bmatrix} x$$

Q9. Write a short note on :

(a) Fuzzy Logic Controller

(b) Describing Function

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.