R09

Code No: C5405

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I Semester Examinations March/April 2011
DIGITAL CONTROL SYSTEMS
(POWER ELECTRONICS & ELECTRIC DRIVES)

Time: 3hours **Max.Marks:60**

Answer any five questions
All questions carry equal marks

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1. Explain the concept of Digital Control Systems with neat block diagram. [12]
2. a) State and explain Initial and Final value theorems.

   b) Determine Final value of x (∞) of

   $x(z) = \frac{1}{1-z^{-1}} - \frac{1}{1-e^{-aT}z^{-1}}$ a>0 using final value theorem. [12]
3. Solve the difference equation by the use of Z – transform method.

   $x(k+2) - 1.3679x(k+1) + 0.3679x(k) = 0.3679u(k+1) + 0.2642u(k)$

   Where u(k) =0 k<0

   u(0) = 1

   u(1) = 0.2142

   u(2) = -0.2142

   u(k) = 0 k=3, 4, 5, ----------

   Determine the output of x(k). [12]
4. a) Explain Sampling Theorem

   b) Obtain the Pulse Transfer Function G (z) for $G(s) = \frac{1}{s+a}$

   c) Obtain the Pulse Transfer Function G (z) for $G(s) = \frac{1-e^{-Ts}}{s}\left(\frac{1}{(s+1)}\right)$ [12]
5. Obtain inverse of matrix (ZI-G) where $G = \begin{bmatrix} 0.1 & 0.1 & 0 \\ 0.3 & -0.1 & -0.2 \\ 0 & 0 & -0.3 \end{bmatrix}$ [12]
6. Represent the State-Space response of the transfer function in controllable canonical form

   $\frac{y(z)}{u(z)} = \frac{z^{-1}+2z^{-2}}{1+4z^{-1}+3z^{-2}}$ [12]

Contd…..2

7. Show that the following system is not completely observable

$$x((k+1)T) = Gx(kT) + Hu(kT)$$

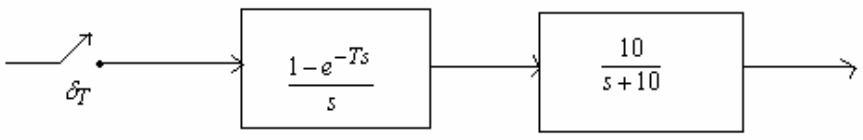
$$y(kT) = Cx(kT)$$

$$G = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \qquad \text{C= [4 5 1],} \quad y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

[12]

8. Obtain G(z) if G(s) is given by



Using Bi-linear transformation if sampling period T=0.1sec [12]

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