Code: 9A13501

R9

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2012

DIGITAL CONTROL SYSTEMS

(Electronics and Control Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Explain the types of A/D converters.
(b) Compare zero order hold and first order hold.

2 (a) Obtain the z-transform of K^3.
(b) Determine the initial and final value of $X(z) = \frac{(1-e^{-T}).z^{-1}}{(1-z^{-1})(1-e^{-T}z^{-1})}$.

3 (a) Solve the following difference equation by use of z-transform method.
$x(k+2) + 3x(k+1) + 2x(k) = 0$
$x(0) = 0, \quad x(1) = 1$
(b) Explain the mapping between S plane and Z-plane.

4 (a) Obtain the inverse of the matrix (2I-G). Where G= $\begin{bmatrix} 0.1 & 0.1 & 0 \\ 0.3 & -0.1 & -0.2 \\ 0 & 0 & -0.3 \end{bmatrix}$
(b) Give the matrix A= $\begin{bmatrix} 0 & 1 \\ -25 & -4 \end{bmatrix}$ $B = [0 \quad 1]$. Find the G and H for T= 1 sec

5 (a) Explain the conditions for complete observability of discrete time systems.
(b) Test the following system for complete observability:
$x(k+1).T = G.x(kT) + HU(kT), \quad y(kT) = C \times (kT).$
G= $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$ $H = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ $C = [4 \quad 5 \quad 1]$

6 (a) Explain the types of stability methods in Z-plane.
(b) Find the stability of the following system using Jury's method.
$P(Z) = Z^3 - 1.3Z^2 - 0.08Z + 0.24 = 0.$

7 (a) Explain bilinear transformation.
(b) Explain the need for compensation.

8 Explain the design of digital controllers using pole placement methods.

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