

Code: 9A13501

B.Tech III Year I Semester (R09) Supplementary Examinations June 2017

DIGITAL CONTROL SYSTEMS

(Electronics & Control Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) What is analog to digital conversion? Give different A/D converters and explain one of them briefly.
(b) Explain the principle and operation of sample and hold devices. Give applications.
- 2 (a) Write limitations and applications of the Z-transform.
(b) Determine the inverse Z-transform of the following functions.
(i) $F(Z) = \frac{1}{1-1.5Z^{-1}+0.5Z^{-2}}$, (ii) $F(Z) = \frac{Z^2}{Z^2-Z+0.5}$.
- 3 (a) Explain the procedure for obtaining the pulse transfer function of a closed loop transfer function.
(b) Solve the following difference equation by use of the Z-transform method.
 $x(k+2) + 3x(k+1) + 2x(k) = 0, x(0) = 0, x(1) = 1.$
- 4 (a) Obtain the discrete-time state and output equations and the pulse transfer function (when the sampling period $T = 1$) of the following continuous-time system:
 $G(s) = Y(s)/U(s) = \frac{1}{s(s+2)}.$
(b) Explain state space representation of discrete time systems.
- 5 (a) Define controllability and analyze different tests to find controllability of a state model.
(b) Examine whether the discrete data system
 $X(k+1) = Ax(k) + Bu(k); Y(k) = cx(k)$
Where $A = \begin{bmatrix} 0 & -2 \\ -1 & 1 \end{bmatrix}, B = \begin{bmatrix} 2 & 0 \\ 0 & -1 \end{bmatrix}, C = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ is
(i) State controllable. (ii) Observable.
- 6 Explain briefly about Jury's stability test and stability analysis using bilinear transformation.
- 7 (a) Discuss the digital PID controllers.
(b) Write the procedure to design a discrete control system in w-plane.
- 8 (a) What is Ackerman's formula? Explain briefly.
(b) Discuss the design of reduced order observer with neat block diagram.
