

Code: 9A13501

R9

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2013

DIGITAL CONTROL SYSTEMS
(Electronics & Control Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Explain the advantages and disadvantages of digital control system.
(b) With suitable diagram explain any one method of digital to analog conversion.

- 2 (a) Find the z transform and their ROC of the following discrete sequences:

(i) $f(k) = \{3, 1, 2, 5, 7, 0, 1\}$

(ii) $f(k) = \{2, 4, 5, 7, 0, 1, 2\}$

- (b) Find the inverse z – transform of:

$$X[z] = \frac{z + 0.2}{(z + 0.5)(z - 1)} \quad |z| > 1.$$

- 3 (a) Solve the difference equation:

$x(k + 2) - x(k + 1) + 0.25 x(k) = u(k + 2)$ where $x(0) = 1$ and $x(1) = 2$ The input function $u(k)$ is given by $u(k) = 1, k = 0, 1, 2, \dots$

- (b) Explain how $j\omega$ – axis of the S plane maps into Z – plane.

- 4 Using partial fraction expansion programming method, obtain a state space representation of the following pulse transfer function:

$$\frac{Y[z]}{U[z]} = \frac{1 + 6z^{-1} + 8z^{-2}}{1 + 4z^{-1} + 3z^{-2}} \text{ Hence obtain state transition matrix.}$$

- 5 Investigate the following system for controllability and observability:

$$\frac{Y[z]}{U[z]} = \frac{z^{-1}(1 + 0.8z^{-1})}{1 + 1.3z^{-1} + 0.4z^{-2}}$$

- 6 Explain Jury stability test and Routh stability criterion with suitable examples.

- 7 Explain the design procedure of digital control systems with digital controller through bi-linear transformation.

- 8 (a) Explain the concept of pole placement.
(b) Derive Ackerman's formula.
