

Code: R7420203

R7**B.Tech IV Year II Semester (R07) Supplementary Examinations March/April 2013****DIGITAL CONTROL SYSTEMS**
(Electrical and Electronics Engineering)

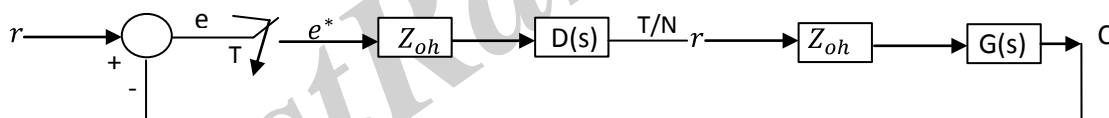
Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

- 1 (a) What are the advantages of discrete data control systems over continuous data control systems?
- (b) With neat diagrams explain in detail various analog to digital converters.
- 2 (a) Find z - transform of $f(k) = (0.1)^k u_s(k) + 0.5k (0.1)^{k-1} u_s(k-1)$.
- (b) Find inverse z - transform of $F(z) = \frac{z(z+1)}{(z-1)z^2-z+1}$.
- 3 (a) Explain the concept of mapping between s -plane and z -plane.
- (b) Find the closed loop transfer function $C(z)/R(z)$ of the following multi rate discrete - data

control systems. The sampling period is 1 S. 'N' is an unspecified integer ≥ 1 . Transfer functions are: $D(s) = \frac{1}{s+1}$, $G(s) = K/s$



- 4 (a) Derive the relationship between state equations and transfer function.
- (b) Find state transition matrix of $A = \begin{bmatrix} 3 & 0 & 0 \\ 2 & 4 & 1 \\ 2 & 1 & 4 \end{bmatrix}$.
- 5 (a) Explain the concept of duality between controllability and observability.
- (b) Find whether the following system is controllable or not.

$$X [CK + 1]T = \begin{bmatrix} -1 & 1 & 0 \\ 0 & -4 & 2 \\ 0 & 0 & -10 \end{bmatrix} X (KT) + \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} u (KT)$$

$$\text{And } Y(KT) = [1 \ 0 \ 1] X (KT).$$

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- 6 (a) Explain how bilinear transformation can be used for stability analysis of a given system.
(b) Obtain stability of the following characteristic equations by finding the value of 'K' using Jury's stability test:
(i) $z^4 + 0.2z^3 - 0.25z^2 - 0.05z + k = 0$.
(ii) $z^3 + 5z^2 - z + 5k = 0$.
- 7 Explain in detail the digital PID controller design using three rectangular integration schemes.
- 8 Explain in detail the design procedure of full order state observer.

FirstRanker