R09

Code: 9A13501

B.Tech III Year I Semester (R09) Supplementary Examinations December 2015

DIGITAL CONTROL SYSTEMS

(Electronics & Control Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Discuss briefly the methods employed for analog to digital conversion.

(b) Explain the sample and hold operation used in data transmission systems.

2 (a) Obtain the Z-transform of the sine function:

$$x(t) = \begin{cases} \sin wt, & 0 \le t \\ 0, & t < 0 \end{cases}$$

(b) Given $X(Z) = \frac{Z^2+Z+2}{(Z-1)(Z^2-Z+1)}$, compute the inverse Z-transform of X(Z).

3 With the help of well defined illustrations, investigate how the locations of poles and zeroes in s-plane are compared with location of poles and zeroes in the Z-plane.

4 Obtain the state transition matrix of the following discrete – time system.

$x(K+1) = G\,x(K) + H\,u(K)$

$y(K) = C\,x(K)$ Where $G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}$, $H = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$, $C = [1 \quad 0]$

5 What is the principle of duality? Briefly discuss the concept of duality in controllability and observability.

6 (a) With neat sketch, discuss the concepts of primary strip and complementary strips.

(b) Examine the stability of the following characteristic equation:

$P(Z) = Z^4 - 1.2\,Z^3 + 0.07\,Z^2 + 0.3\,Z - 0.08 = 0$

7 (a) Discuss briefly the significance of lead, lag, lead-lag compensators in digital control systems.

(b) Theoretically analyze the transient and steady state response of discrete time systems.

8 (a) Explain about the theory of full-order state observer.

(b) Derive Ackermann's formula for the determination of the observer feedback gain matrix, K_e.

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