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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, October/November - 2020
DIGITAL CONTROL SYSTEMS
(Electrical and Electronics Engineering)

Time: 2 Hours   **Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks
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1.a) Obtain the Inverse z-transforms of the following functions

i) $F(z) = \frac{1}{z(z-0.2)}$ ii) $F(z) = \frac{10z}{(z^2-1)}$

  b) Write the limitations of z-transforms.   [9+6]

2.a) Discuss the merits and demerits of digital controllers.

  b) What is a pulse transfer function? Obtain the pulse transfer function of ZOH.   [6+9]

3.a) Obtain the state equations of discrete data systems with sample and hold devices.

  b) What is similarity transformation in digital control system? Explain.   [7+8]

4.a) Derive the state transition matrix using z-transform method.

  b) Determine the transfer function for the system described by

$$x(k+1) = A\,x(k) + B\,u(k) \quad \text{where A=} \begin{array}{cc} 0 & 1 \\ -0.25 & 1 \end{array}, \text{B=} \begin{array}{c} 1 \\ 0.5 \end{array}$$

$$c(k+1) = D\,x(k) \quad \text{where D= } 1 \quad 1$$ [7+8]

5.   Consider a discrete data system that has the following characteristic equation $F(z) = z^3 + 3.3z^2 + 1.5z + 0.8 = 0$, Comment on system stability using Jury's test.   [15]

6.   What is bilinear transformation? Explain how system stability can be predicted using bilinear transformation.   [15]

7.a) Obtain the transfer function of digital PI controller using various realization methods. Also draw its block diagram.

  b) Distinguish between lag and lead compensators in digital domain.   [9+6]

8.   What is pole placement approach? Explain the design of state feedback controller using pole placement approach using direct substitution method.   [15]

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