R15

Code No: 127CG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, September - 2021
DIGITAL CONTROL SYSTEMS
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks
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1.a) Explain in detail about sample and hold operations.
b) Obtain the inverse z-transform of the following [7+8]

$$X(z) = \frac{2(2z^2+1)}{(z-3)(z-1)}$$

2.a) How z-transforms are used in solving difference equations? Explain.
b) Obtain the z-transform of the following: [7+8]

$$t + te^{-at} + k$$

3.a) How discrete time systems can be represented in state space? Explain.
b) Check whether the system whose pulse transfer function given below is state observable or not

$$\frac{Y(z)}{U(z)} = \frac{(z+2)}{(z+1)(z+4)}$$

[7+8]

4.a) Explain the Duality between Controllability and Observability.
b) Consider the following system. Derive the state space representation in the observable canonical form

$$\frac{Y(z)}{U(z)} = \frac{z+1}{z^2+4z+2}$$

[7+8]

5.a) Draw Constant frequency loci and explain the stability of a discrete time control system.
b) Examine the stability of the following characteristic equation

$$P(z) = 4z^4 - 2z^3 + z^2 + 6z - 1 = 0$$

[7+8]

6.a) Explain the steps in Jury stability test.
b) Discuss in detail about Primary strips and Complementary Strips. [7+8]

7. Explain the design of lag compensator in w-plane. [15]

8.a) Explain the advantages and disadvantages of Full order state observers.
b) Discuss about the design of state feedback controller through pole placement. [7+8]

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