

Code No: 127CG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, July/August - 2022

DIGITAL CONTROL SYSTEMS

(Electrical and Electronics Engineering)

Time: 3 Hours

Max.Marks:75

Answer any five questions
All questions carry equal marks

- 1.a) What is a data control system? Explain with an example.
b) Discuss in detail about the analog to digital conversion systems. [7+8]
- 2.a) Explain different theorems of Z-transforms.
b) Obtain the Z- transform of the function $e^t + 2t^3$. [7+8]
- 3.a) Discuss in detail about the State Space Representation of discrete time systems.
b) What is a pulse transfer function? Explain its significance. [7+8]
- 4.a) Explain in detail about the tests for observability and controllability of discrete time control systems.
b) What is state transition matrix? Give its properties. [7+8]
- 5.a) Explain in detail about the features of Constant frequency loci.
b) Discuss about Jury stability test with an example. [7+8]
- 6.a) Discuss in detail about the Primary strips and Complementary Strips.
b) Examine the stability of the following characteristic equation [7+8]
$$P(z) = z^4 + 3z^3 - 0.4z^2 + 0.2z - 0.05 = 0$$
- 7.a) Explain the Transient and steady – State response Analysis of discrete time control systems.
b) Discuss about the design of a digital controller based on the frequency response method. [7+8]
- 8.a) Discuss the design procedure of full order observers.
b) Consider the system $\mathbf{x}(k+1) = \mathbf{Gx}(k) + \mathbf{Hu}(k)$ where
$$\mathbf{G} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix}, \mathbf{H} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$$

Determine a suitable state feedback gain matrix K such that the system will have the closed loop poles at $z = 0.5 + j0.5, z = 0.5 - j0.5$. [7+8]

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