

M. TECH.
(SEM -II) THEORY EXAMINATION 2018-19
DIGITAL CONTROL SYSTEM

Time: 3 Hours**Total Marks: 70****Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 7 = 14**

- (a) List the advantages of digital control system.
- (b) What are hold circuits?
- (c) What is asymptotic stability?
- (d) List the condition for stability in Routh-hurwitz table.
- (e) Give the formulae to find the asymptotic path to reach infinite pole/zero.
- (f) Define resonant frequency.
- (g) What are the uses of lead compensator?

SECTION B**2. Attempt any three of the following:****7 x 3 = 21**

- (a) Describe the sample and hold operations?
- (b) Explain the Duality between controllability and observability.
- (c) Describe the location marginal pricing and congestion management.
- (d) Obtain the Z-transform of the following:
 - (i) $x(t) = \frac{1}{a}(1 - e^{-at})$
 - (ii) $t^2 e^{-at}$
- (e) List the difference between the Jury stability test and stability analysis using bilinear transformation coupled with routh stability criterion?

SECTION C**3. Attempt any one part of the following:****7 x 1 = 7**

- (a) Write the state transition matrix and its properties?
- (b) Explain about the digital compensator design using frequency response plots.

4. Attempt any one part of the following:**7 x 1 = 7**

- (a) Explain about the frequency response specifications.
- (b) Explain the necessary and sufficient conditions for design of statefeedback controller.

5. Attempt any one part of the following:**7 x 1 = 7**

- (a) List out the construction rules of root locus plot.
- (b) Explain about optimal digital control system.

6. Attempt any one part of the following:**7 x 1 = 7**

- (a) Discuss about the transient response specifications.
- (b) Explain the design procedure of lead-lag compensator using frequency response plot.

7. Attempt any one part of the following:**7 x 1 = 7**

- (a) A second order discrete time system is characterized by the difference question $y(n) - 0.1 y(n-1) - 0.02 y(n-2) = 2 x(n) - x(n-1)$. Determine $y(n)$ For $n \geq 0$ when $x(n) = u(n)$ and the initial conditions are $y(-1) = -10$ and $y(-2) = 5$

- (b) Determine the causal signal $x(n)$ having the Z transform

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