

## 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) $t^2 e^{-at}$
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- (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

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