**Printed Pages:2** **Sub Code: NEE011/ NEN011/ EEE011**

**Paper Id:** **120228** **Roll No.** | | | | | | | | | | |

**B.Tech**
**(SEM. VI) THEORY EXAMINATION 2018-19**
**DIGITAL CONTROL SYSTEM**

***Time: 3 Hours*** ***Total Marks: 100***

**Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt *all* questions in brief.** **2 x 10 = 20**

a. What do you mean by quantization?
b. Explain ideal sampler.
c. What do you by stability of a discrete time system?
d. What do you mean by Eigen vectors?
e. What do you mean by state of a dynamic system?
f. What re the observability test of nonlinear invariant systems?
g. What are the classical tools for the analysis of nonlinear system?
h. What do you mean by bounded input bounded output stability?
i. What are the energy constraints with time optimal control?
j. Explain the principle of optimality.

**SECTION B**

**2. Attempt any *three* of the following:** **10 x 3 = 30**

a. Derive the relation for frequency domain characteristic of the zero order hold.
b. Explain and derive the relations for steady state accuracy of discrete time system.
c. Explain the conversion of state variable model into transfer function of a SISO system. Also explain its invariance properties.
d. Explain Lyapunov's stability theorem and stability of linear systems.
e. Derive discrete Euler Lagrange equation for the optimal design of digital control systems

**SECTION C**

**3. Attempt any*one* part of the following:** **10 x 1 = 10**

(a) Explain mathematical modelling of the Sampling process.
(b) Explain first order hold and obtain the transfer function for it.

**4. Attempt any *one* parts of the following:** **10 x 1 = 10**

(a) Design a digital compensator for discrete time system using root locus.
(b) Determine the nature of the transient response of a discrete time system whose characteristic equation is given by

$$z^2 - 1.9z + 0.9307 = 0$$

The sampling interval T = 0.02 sec.

**5. Attempt any *one* parts of the following:** **10 x 1 = 10**

(a) Explain a closed loop position control system and transform it into state
(b) What do you mean by controllability and observability of a linear time invariant system? Explain controllability tests.

**6. Attempt any *one* part of the following: 10 x 1 = 10**

(a) What is Jury stability criterion?Explain stability on the z-plane.

(b) Check the stability of the equilibrium state of the system described by

$$\dot{x_1} = x_2$$
$$\dot{x_2} = -x_1 - x_1^2 x_2$$

**7. Attempt any *one* part of the following: 10 x 1 = 10**

(a) Explain discrete Maximum (minimum) Principle for the solution of continuous data control systems.

(b) Explain the method of dynamic programming for the optimal linear digital regulator design using the principle of optimality.