Paper Code: EIC 701	Roll No.									

B.Tech.
(SEM VII) ODD SEMESTER EXAMINATION2015-16
CONTROL SYSTEM-II

[Time: 3 hrs.] **[Max. Marks: 100]**

Note- ***Attempt All Questions. All Questions carry equal marks*:-**

Q1 Attempt any *four* parts of the following:- **[4x5=20]**

(a) Explain the properties of Digital to Analog conversion used in sampled data control system.

(b) Explain the working of Sample and Hold operations used in a digital control system.

(c) Consider the system given by equation

$$y(k+2) - 3/4\ y(k+1) + 1/8\ y(k) = r(k)$$

Find the stability of the system assuming initial conditions

Y(0) = 0, y(1) = 1; r(k) = (unit step).

(d) Give the limitations of the Z-transform method.

(e) Find the Z-transform of the sequence $f(k) = (1/2)^k$ for k = 0,1,2....

(f) Explain frequency-domain characteristic of the zero order hold.

Q2. Attempt any *four* parts of the following:- **[4x5=20]**

(a) Explain the relationship between the pulse transfer function G(s) and the Z- transfer function G(z).

(b) Find the transfer function of discrete data control system with sampler in forward path of a closed loop system.

(c) Explain the modified Z-transfer function with suitable diagram.

(d) What are the specifications required in time domain for the designing of a position servo system.

(e) What do understand by digital PID controller?

(f) Explain the Multirate Discrete-Data system with block diagram.

Q3. Attempt any *two* parts of the following:- **[2x10=20]**

(a) State and prove the similarity transformation theorem. Find the Eigen vectors for the given matrix F = [0 1 0; 3 0 2; -12 -7 -6].

(b) Using the Cayley-Hamilton technique, find e^{At} for A =[0 1; -2 -3].

(c) State and prove the Lyapunov stability theorem for linear digital system.

Consider the system given by the equation

$$x_1(k+1) = 2\,x_1(k) + 0.5\,x_2(k) - 5$$

$$x_2(k+1) = 0.8x_2(k) + 2$$

Investigate the stability of the equilibrium state using direct method of Lyapunov.

Q4. Attempt any *two* questions of following:- [2x10=20]

(a) How the optimal control problem is formulated? Explain briefly.

(b) Find the optimal value of K so that

$J = [e^2(k) + 0.75u^2(k)]$ is minimized. Given that F=1,G=1,Q=2,R=1.5

(c) Determine the value of damping ratio $\zeta > 0$ so that when system is subjected to a unit step input r, the following performance index is minimized

$$J = \int (e^2 + \dot{e}^2)dt$$

The system is unity feedback of the transfer function $1/s(s + 2\zeta)$

Q5. Write short notes on any *two* of the following:- [2x10 = 20]

(a) What is digital quantization explain it briefly.

(b) Give the general description of a micro-controllers.

(c) Microprocessor based position control system.