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Total No. of Pages : 01

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M.Tech. (EE) (2013 Onwards) (Sem.-1)

**DIGITAL CONTROL SYSTEM**

Subject Code : MTEE-104

Paper ID : [E1367]

Time : 3 Hrs.

Max. Marks : 100

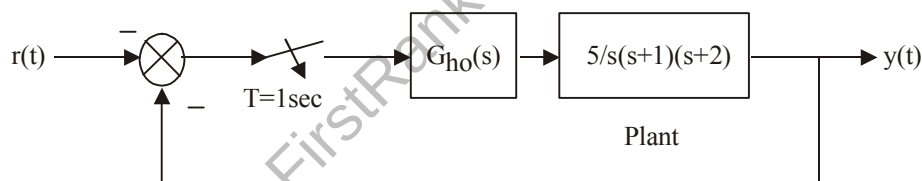
**INSTRUCTION TO CANDIDATES :**

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

1. What is a digital controller? Discuss methods to implement a digital controller.
2. Investigate the controllability and observability of the following system.

$$x(k+1) = \begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k), \quad y(k) = \begin{bmatrix} 1 & 1 \end{bmatrix} x(k).$$

3. A sampler and ZOH are introduced in the forward loop as shown below in the figure. Study the stability of the sampled-data system via bilinear transformation and show that the stable linear continuous time system becomes unstable upon the introduction of a sampler and ZOH.



4. Compare the characteristics of time-domain responses of continuous - time and discrete - time system.
5. Find state model for the following difference equation. Also draw state diagram.

$$y(k+3) + 5y(k+2) + 7y(k+1) + 3y(k) = 0$$

6. Find the inverse z-transform of the following function and plot the poles on the Z-plane.

$$F(z) = \frac{z^2}{(z-1)(z-0.2)}$$

7. Develop relationship between controllability, observability and transfer function of discrete - data control system.
8. Discuss Routh stability criterion used in digital control systems.