B.Tech. ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

December, 2013

BIEEE-009 : DIGITAL CONTROL SYSTEM DESIGN

Time : 3 hours *Maximum Marks : 70*

Note : *(i) Attempt **any seven** questions.*

*(ii) Each question carry **equal** marks.*

1. Solve the following differential equation by using z-transformation method. **10**

$x(k+2)+3x(k+1)+2x(k) = 0$ where $x(0) = 0$ $x(1) = 1$.

2. Discuss about the following : **10**

(a) Digital control system and continuous time control system

(b) Smapling process.

3. Write down the stability criterion by Jury's Test and examine the stability of the characteristic equation given by : **10**

$P(z) = z^3 - 1.1z^2 - 0.1z + 0.2 = 0.$

4. The control system with a digital PID controller is shown in fig 1. **10**

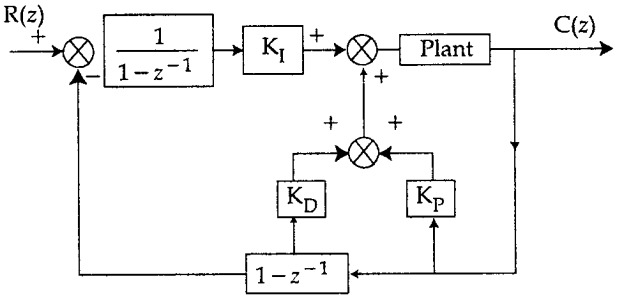

Fig 1

Find the transfer function.

5. Find the z-transform of unit-step function that is delayed by 1 sampling period. **10**

6. Discuss about the differences between zero input stability and bounded input and bounded output stability (BIBO). **10**

7. Consider the characteristic polynomial $\Delta(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1$ employing stability constraints by Jury's-stability criterion, determine the mesility. **10**

8. For the following transfer function whose sampling period T = 0.05 sec, find the break away point and break in point by root locus method. **10**

$$G(z) = \frac{kz}{z-1} \cdot \frac{1-e^{-T}}{z-e^{-T}}$$

9. Obtain the state-space representation for the following pulse-transfer function system in controllastic canonical form **10**

$$\frac{Y(z)}{U(z)} = \frac{z^{-1} + 2z^{-2}}{1 + 4z^{-1} + 3z^{-2}}$$

10. Show that the following system is not completely observable **10**

$X((K+1)T) = C_2 \times (KT) + H_U(KT)$

$Y(KT) = C \times K(T)$

$$C_2 = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}, \quad H = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \quad C = [4,\ 5,\ 1]$$