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B.Tech. ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

December, 2013

BIEEE-002 : DIGITAL CONTROL SYSTEM

Time : 3 Hours *Maximum Marks : 70*

*Note : (1) Attempt **any seven** questions.*
*(2) **Each** question **carry equal** marks.*

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1. Draw the block diagram of Digital control system and explain functions of each block. **10**

2. Discuss about process of sampling in brief and define the following terms : **10**

(a) Sample and hold (S/H)

(b) Quantization of continuous signal.

3. Obtain Z-transform of cosine function **10**

$$x\ (t) = \begin{cases} \cos wt & 0 \le t \\ 0 & t < 0 \end{cases}$$

4. Determine the initial value $x(0)$ of the Z-transform of $x(t)$ is given by **10**

$$x(z) = \frac{(1-e^{-T})z^{-1}}{(1-z^{-1})\,(1-e^{-T}z^{-1})}$$

5. Obtain the block diagram for the following pulse-Transfer function system by :
(a) Standard programming 5
(b) Ladder programming 5

6. Consider the system described by $y(k) - 0.6y(k-1) - 0.81 \; y(k-2) + 0.67 \; y(k-3) - 0.12 \; y(k-4) = x(k)$ 10
where $x(k)$ is the input and $y(k)$ is output of the system. Determine the stability of the system by using "pulse-Transfer function".

7. Consider the following characteristics equation : 10
$p(z) = z^3 - 1.3z^2 - 0.08z + 0.24 = 0$
Determine whether or not any of the roots of the characteristic equation lie outside the unit circle in the z-plane. Using the bilinear-Transformation.

8. Consider the following system. 10

$$\frac{y(z)}{u(z)} = \frac{z+1}{z^2+1.3z+0.4}$$

Show the state-space representation in the following form :
(a) Controllable canonical form
(b) Observable - canonical form

9. Determine the stability of the equilibrium state of the following system. 10
$x^0{}_1 = -x_1 - 2x_2$
$x^0{}_2 = x_1 - 4x_2$
Explain the "Liapunov stability Analysis of liner Time - Invariant continuous-time system.

10. Construct the Jury stability table for the following characteristic equation : 10
$p(z) = a_0 z^4 + a_1 z^3 + a_2 z^2 + a_3 z + a_4$
where $a_0 > 0$, write the stability conditions.