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BIEEE-002

B.Tech. ELECTRICAL ENGINEERING (BTELVI)

00811

Term-End Examination

June, 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. Define the properties of Z-transform related to : **10**

(a) Shifting theorem (Left and Right)

(b) Initial and Final value theorem.

2. Find Z-transform of following : **10**

(a) sin wt

(b) $t\, u_s(t)$

(c) $t\, e^{at}$

(d) impulse function

3. Explain the specification of transient response in terms of Z - plane with suitable diagram. **10**

4. Explain how to get the solution of non-homogeneous state equation. **10**

5. Determine the stability of the system described by **10**

$x^{\circ} = Ax$, where $A = \begin{bmatrix} -1 & -2 \\ 1 & -4 \end{bmatrix}$ by the second method of Liapunov.

6. Explain the properties of state transition matrix Q(t). Obtain the Q(t) for given equation. **10**

$x^{\circ} = Ax$ where

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$$

7. Write short note on : **10**

(a) Bilinear transformation

(b) Routh stability criterion on the r plane.

8. (a) Define the concept of complete controllability and observability. **10**

(b) Check the controllability and observability

$$A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}, \quad B \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$C = [1 \quad 2]$$

9. Find optimal control **10**

$u^{o}(k)$, $k = 0,1,2.....10$, Such that the performance index $J = \frac{1}{2}\sum_{k=0}^{10} \{x^2(k) + 2\, u^2(k)\}$ is minimized.

Subject to the equality constraint
$x(k+1) = x(k) + 2u(k)$
initial state is x (0) = 1
final state is x (11) = 0

10. Derive the expression of Riccati equation. **10**
