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BIEEE-017

00561

B.Tech. ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

December, 2013

BIEEE-017 : ADVANCED CONTROL SYSTEM

Time : 3 Hours *Maximum Marks : 70*

*Note : Attempt **any seven** questions out of **10** questions. Use of scientific calculator is **permitted**.*

1. Consider the state space model of a system with **10**

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -1 & 1 \\ 0 & -1 & -10 \end{bmatrix}; B = \begin{bmatrix} 0 \\ 0 \\ 10 \end{bmatrix}; \quad C = [1 \quad 0 \quad 0]$$

Obtain characteristic polynomial and transfer function of the system.

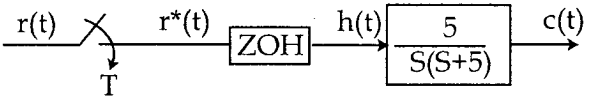
2. (a) Show that the system given by **2x5=10**

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix} x + \begin{bmatrix} 1 \\ -1 \end{bmatrix} u$$

is not controllable.

(b) Explain the procedure for designing state observer.

3. For the system shown find the output at the sampling instants C(KT). The input is a unit impulse and the sampling period is 0.1s. Find the final value C(KT) as $K \to \infty$ **10**



4. State and explain Jury's stability criterion. For the following characterstic polynomial investigate the necessary and sufficient condition of stability : **10**

$F(z) = z^4 + 17z^3 + 2z^2 + 2z + 2$

5. An ideal relay is introduced as a non linearity in a unity feedback linear servo system with forward transfer function. **10**

$$G(S) = \frac{100}{S(0.1S + 1)}$$

The relay has a maximum output of 10 volts. Discuss the stability of the system.

6. Write notes on : **2x5=10**
   (a) Popov's stability criterion.
   (b) Common non-linearities.

7. Find an extremal for the functional **10**

$J(X) = \int_0^{\pi/2} [\dot{X}^2(t) - X^2(t)]\, dt$ which satisfies the boundary conditions. $X(0) = 0$ and $X\left(\pi/2\right) = 1$

8. Explain : **2x5=10**
   (a) Constrained optimization.
   (b) Linear quadratic problem.

9. What do you understand by adaptive control ? Give the classification of Model Reference adaptive control. Also explain its features. **10**

10. (a) Give the scheme for self tuning control system.

(b) State Fuzzy rules of Mamdani. **2x5=10**
