61466

Name : ....
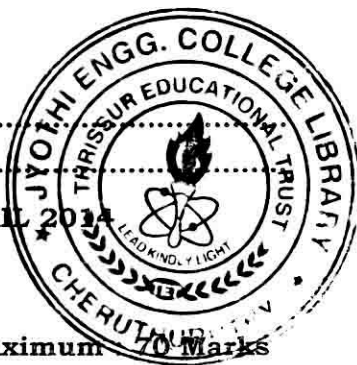
Reg. No: ....

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2014
(09 Scheme)

AI 09 604 – ADVANCED CONTROL THEORY

Time : Three Hours   Maximum : 70 Marks

Part A
Answer all questions

1. Give practical examples of controllable and uncontrollable systems.

2. State sampling theorem.

3. Define degrees of freedom.

4. What is system sensitivity?

5. What do you mean by asymptotic stability?   (5 x 2 = 10 Marks)

Part B
Answer any four questions.

6. Mention the effects of pole – zero compensation.

7. Define the terms state variable, state vector and state.

8. State and prove Cayley Hamilton theorem.

9. List out the characteristics of PI and PD control.

10. Which performance criterion is more commonly used? Why?

11. Write short notes on Robust Control Systems.   (4 x 5 = 20 Marks)

Part C
Answer all questions.

12. (a) Derive the necessary and sufficient conditions for arbitrary pole placement.   (10 Marks)

            (OR)

  (b) Discuss in detail about the design of a state observer.   (10 Marks)

13. (a) Obtain the state transition matrix of the following discrete time system given by $x(k+1) = Gx(k) + Hu(k)$ and $y(k) = Cx(k)$ where

$$G = \begin{pmatrix} 0 & 1 \\ -0.16 & -1 \end{pmatrix}; \ H = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \text{ and } C = \begin{pmatrix} 1 & 0 \end{pmatrix}$$ (10 Marks)

            (OR)

  (b) Determine the stability of the sampled data control system having the following characteristic polynomial $2z^4 + 8z^3 + 12z^2 + 5z + 1 = 0$ using Jury's stability criterion.   (10 Marks)

14. (a) Explain in detail about the circuit realizations of PD and PID controllers.   (10 Marks)

            (OR)

  (b) Describe in detail about Cohen and Coon rules for controller tuning.   (10 Marks)

15. (a) Explain in detail about the design of robust control systems.   (10 Marks)

            (OR)

  (b) Consider the non linear system described by the equations $x_1^{\bullet} = -3x_1 + x_2$ and $x_2^{\bullet} = x_1 - x_2 - x_2^3$. Using the Krasovskii method for constructing the Lyapunov function with P as identity matrix, investigate the stability of the equilibrium state.   (10 Marks)

                                  (4 x 10 = 40 Marks)

******