

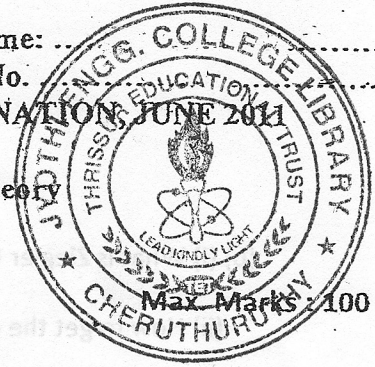
18239

Name:

Reg. No.

SIXTH SEMESTER B.TECH. DEGREE EXAMINATION, JUNE 2011

AI.04.605 – Advanced Control Theory
(2004 Admission)



Duration : 3Hours

Part A

- I. (a) What is a state variable feedback? Explain.
- (b) What is the need for pole placement? Explain.
- (c) Obtain the Z-transform of $1/(s(s+1))$.
- (d) The input-output transfer function of a linear discrete-data system given by $C(z)/R(z) = z^2/(z^3 - z^2 + 0.5z - 0.5)$
 - (i) Draw the state diagram for the system.
 - (ii) Write the dynamic equations for the system.
- (e) Briefly explain the control system parameters.
- (f) Explain Cohen and Coon rules.
- (g) What is a robust control system? Explain.
- (h) Write a note on positive definiteness and negative definiteness.

(8 × 5 = 40 marks)

Part B

- II. (a)(i) How the feedback matrix is computed using Ackermann's formula. (7)
 - (ii) How to determine the closed loop properties from open loop properties? Explain. (8)
- (or)
- (b) (i) Discuss in detail about Non Linear Control systems with suitable examples. (7)
 - (ii) Write a note on Phase Plane Analysis. (8)

- III. (a) Explain the Lyapunov stability analysis with a suitable example.

(or)

- (b) Consider the linear continuous time dynamic system represented by its transfer function

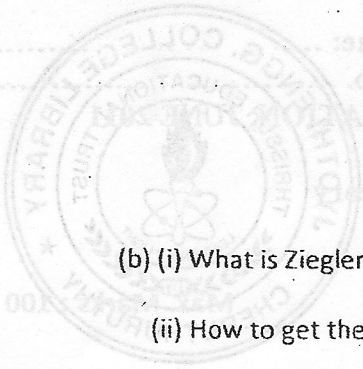
$$H(s) = \frac{(s+3)}{(s+1)(s+2)(s+3)}$$

Prove that any state space model for this system is either uncontrollable or/and observable.

- IV. (a) With suitable examples, explain the design of following controllers

- (i) PI
- (ii) PD
- (iii) PID

(5+5+5)



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(b) (i) What is Ziegler Nichol's rule ? When does it work? Explain (7)

(ii) How to get the desired system performance using IAE, ISE, ITAE and ITSE? Explain. (8)

V. (a) Discuss in detail about the Internal model design for the robust control system. (15)

(or)

(b) What is an Asymptotic stability? Explain with a suitable example. (15)

[4 × 15 = 60 marks]

(8 × 5 = 40 marks)

Part B

(a) (i) How the feedback matrix is computed using Ackermann's formula? (7)
(ii) How to determine the closed loop properties from open loop properties? Explain. (8)

(or)

(b) (i) Discuss in detail about Non Linear Control systems with suitable examples. (7)
(ii) Write a note on Phase Plane Analysis. (8)

(or)

(b) Consider the linear continuous time dynamic system represented by its transfer function

$$H(s) = \frac{(s+3)}{(s+1)(s+2)(s+3)}$$

Prove that any state space model for this system is either uncontrollable or/and observable.

(a) With suitable examples, explain the design of following controllers

(i) PI

(ii) PD

(iii) PID

(2+2+2)