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Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
JUNE 2009

AI 04 605—ADVANCED CONTROL THEORY

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

1. (a) Write short notes about optimal control system.
   (b) What is the need of Linear Observer ?
   (c) Explain the concept of controllability with example.
   (d) Write short notes about Jury stability test.
   (e) Discuss about the different modes in controller.
   (f) Mention the tuning rules of cohen and coon rules method.
   (g) Explain stability in the sense of Liapunov.
   (h) What is meant by Equilibrium State in Liapunov Stability Analysis.

   (8 × 5 = 40 marks)

2. (a) Explain the necessary and sufficient conditions for arbitrary pole placement. (15 marks)

   Or

   (b) A single-input system is described by the following state equation :

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}-1 & 0 & 0\\ 1 & -2 & 0\\ 2 & 1 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}10\\ 1\\ 0\end{bmatrix}u$$

   Design a state feedback controller which will give close of loop poles at $-1 \pm j2, -6$.

   (15 marks)

3. (a) Derive the Transfer function of Linear Discrete system. (15 marks)

   Or

   (b) Consider the system with state equation :

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u$$

   Check whether the system is completely controllable or not.

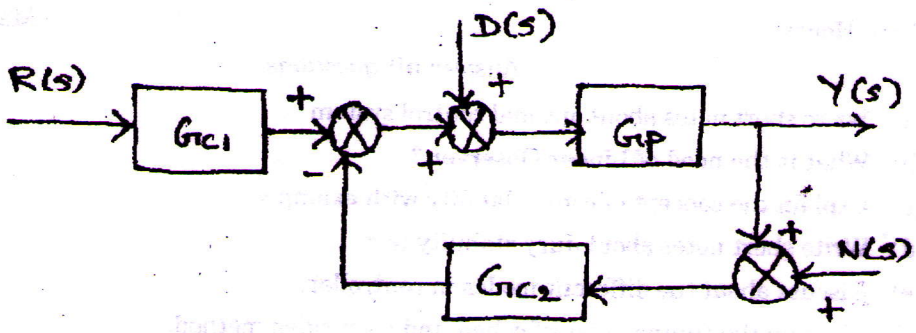
   (15 marks)

Turn over

4. (a) Explain in detail about the Effect of proportional, internal, derivative and composite control modes on the response of controlled process. (15 marks)

Or

(b) Show that the control system given below is two degree of freedom system.



(15 marks)

5. (a) Explain in briefly about the design consideration of Robust Control system. (15 marks)

Or

(b) Explain in detail about Basic Stability Theorem with constant 'V' curves. (15 marks)

[4 × 15 = 60 marks]