

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0205

Roll No.

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B. Tech.(SEM. VII) ODD SEMESTER THEORY EXAMINATION
2010-11**ADVANCED CONTROL SYSTEM**

Time : 3 Hours

Total Marks : 100

Note : Attempt all questions.1. Attempt any **two** of the following :

- (a) Show that the transfer function of the system is invariant under linear transformation of state variables. Obtain the transfer function of the following system :

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

$$Y = [2 \ 1 \ -1] X.$$

- (b) A feedback system has a closed-loop transfer function :

$$\frac{Y(s)}{U(s)} = \frac{10(s+4)}{s(s+1)(s+3)}$$

Construct two different State Model for this system.

- (c) Show that the system given by :

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

is not controllable.

Attempt any **two** of the following :

- (a) What are sample and hold circuits ? Obtain the transfer function and frequency response of zero order hold.
- (b) Consider the discrete-time system shown in Fig. 1. Obtain pulse transfer function of the system. Choose $T = 1$ sec

and $G(s) = \frac{1}{s(s+1)}$.

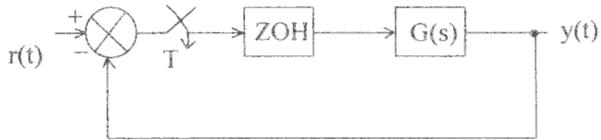


Fig. 1

- (c) Explain in brief the Jury's stability criterion. Investigate the necessary and sufficient condition for stability of the following characteristics polynomial :

$$F(z) = 2z^4 + 7z^3 + 10z^2 + 4z + 1.$$

3. Attempt any **four** parts of the following :

- (a) Determine the stability of the following system by Lyapunov Method :

$$\dot{X} = AX, \text{ where } A = \begin{bmatrix} -1 & -2 \\ 1 & -4 \end{bmatrix}.$$

- (b) State and explain Popov's criterion.
- (c) What do you understand by the term singular points ? Also explain the role of eigen values to determine different types of singular points.
- (d) Explain the basic concept of Describing Function Method.
- (e) What are the typical optimal control problem ? Explain each one.
- (f) Determine the solution of nonhomogeneous state equation

$$\dot{X} = AX + BU \text{ is } X(0) = X_0.$$

- (f) Differentiate between infinite and finite regressions for continuous time system.
5. Attempt any **four** parts of the following :
- (a) State Fuzzy rules of Mamdani.
 - (b) What are the main functions in an adaptive control system ? Explain.
 - (c) Give the classification of Model-reference adaptive control system. Also explain.
 - (d) Draw the general configuration of self-tuning adaptive control and explain each block in brief.
 - (e) Explain MIT rule in brief with suitable example.
 - (f) Explain the advantages and disadvantages of Neural-based control system in brief.