

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

PAPER ID : 0205

Roll No.

B. Tech.

**(SEM. VII) EXAMINATION, 2008-09
ADVANCED CONTROL SYSTEM**

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all questions.

1 Attempt any two parts : 10×2=20

- (a) Obtain the solution of a state equation $\dot{x}(t) = Ax(t) + Bu(t)$ in the state transition matrix.
- (b) Establish the relationship between state model and transfer function.
- (c) Test whether the following system is controllable and observable or not :

$$\dot{x}(t) = Ax(t) + Bu(t) \text{ and } y(t) = Cx(t)$$

where

$$A = [0 \ 1 \ 1, \ 0 \ 0 \ 2, \ -5 \ 0 \ 5]$$

$$B = [0, \ 0, \ 2]$$

$$C = [1 \ 2 \ 3]$$

2 Attempt any two parts : 10×2=20

- (a) Express the output $c(t)$ in the form of Zero-order Hold sampled data system of the given figure

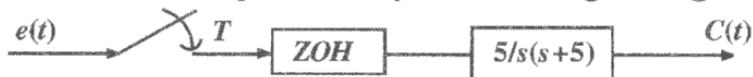


Fig. 1

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[Contd...

- (b) Consider that the characteristic equation of a third-order discrete - data control system is given as

$$F(z) = z^3 - 1.25z^2 - 1.375z - 0.25.$$

State whether system is stable or not stable.

- (c) Find the state space representation in the (i) Controllable Canonical form (ii) Diagonal canonical form for the system with transfer function.

$$C(z)/R(z) = (z + 6)/(3z^2 + 5z + 1).$$

3 Attempt any **two** parts : 10×2=20

- (a) Write the statement of Cayley Hamilton theorem; also compute state transition matrix and matrix exponential.
- (b) Explain the non linearity issues of Dead Zone and Relay.
- (c) What is Lyapunov stability criterion ? Determine whether the following system is stable or not :

$$d^2x/dt^2 + dx/dt + (dx/dt)^3 + x^2 = 0.$$

4 Attempt any **two** parts : 10×2=20

- (a) Formulate the optimal control problem using state space approach.
- (b) With the help of schematic diagram explain the principle of causality in dynamic programming.
- (c) Discuss the Bang-Bang control concept.



Attempt any **two** parts :

10×2=20

- (a) What is a fuzzy-neural integrated system ?
Discuss the salient features of neural network, also discuss its application.
- (b) Establish the relationship between PI and Fuzzy control, PD and Fuzzy logic control.
- (c) Compare PI, PD and PID controllers with the Fuzzy logic controller.
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