Attempt any **two** of the following : 10×2=20

(a) What are the various properties of state transition matrix in reference to state space analysis of the control systems ? Define the terms state, state variable, state vector, state space and state equations.

(b) The transfer function of a control system is given as below :

$$\frac{C(S)}{R(S)} = \frac{S^2+2S+3}{S^4+2S^3+3S^2+5S+7}$$

Obtain its state space representation in controllable canonical form and observable canonical form.

(c) Give the procedure of designing of a cascade lag-lead compensator for a given linear control system. Illustrate the procedure with the help of an example.

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

PAPER ID : 2056 Roll No.

B. Tech.

(SEM. V) EXAMINATION, 2008-09

CONTROL SYSTEM

Time : 3 Hours] *[Total Marks : 100*

Note : Attempt all questions.

1 Attempt any **two** of the following : 10×2=20

(a) Differentiate between open-loop control systems and closed loop control systems. Give an example in each type and explain its working.

(b) Determine C/R for the following system :

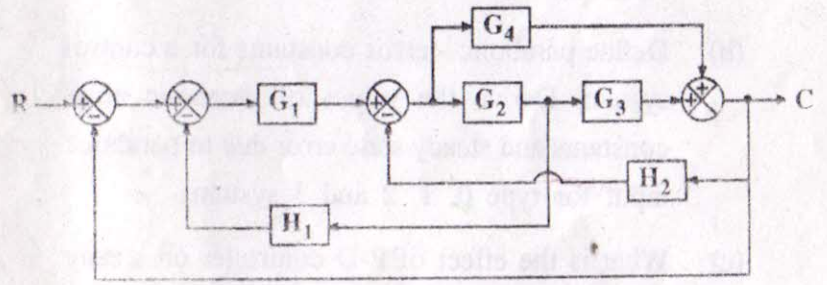

Fig.

(c) Discuss the effect of an unpredictable disturbance on the response of a feedback control system. State and illustrate with examples, the important rules regarding signal flow graph algebra. Define and explain Mason's gain formula, and also show its implementation in an example.

2 Attempt any **two** of the following : **10×2=20**

(a) A unity feedback control system has its forward path transfer function as

$$G(S)=\frac{K}{S(1+ST)}$$

The maximum overshoot in the unit step response of this system is to be reduced from 60% to 20%. Determine the change in factor K to achieve this reduction.

(b) Define parabolic - error constants for a control system. Derive the values of parabolic error constants and steady state error due to parabolic input for type 0, 1, 2 and 3 systems.

(c) What is the effect of P-D controller on steady state error due to a unit ramp input in a second order system. Prove your answer mathematically.

3 Attempt any **two** of the following : **10×2=20**

(a) State and explain the technical differences between an AC servomotor and conventional two phase induction motor.

(b) List various methods of determining the stability of control systems. Discuss their relative merits and limitations.

(c) What are the effects of adding poles and zeros on the root loci of a control system ? What is relation between root-loci and transient response ?

4 Attempt any **two** of the following : **10×2=20**

(a) Discuss exact and asymptotic Bode plots for simple zero and simple pole on real axis.

(b) How can you obtain closed loop frequency response from the given open loop transfer function in terms of Bode plots ? Discuss the Bode plots for non-minimum phase systems with suitable examples.

(c) Constant M-circles and constant N-circles are normally used for unity feedback control systems. Explain how can you analyse a non-unity feedback control system with the help of constant M-circles and constant N-circles.