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

PAPER ID : 2056 Roll No.

B.Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2012-13

CONTROL SYSTEM

Time : 3 Hours *Total Marks : 100*

Note :—*(1) Attempt* ***all*** *questions*

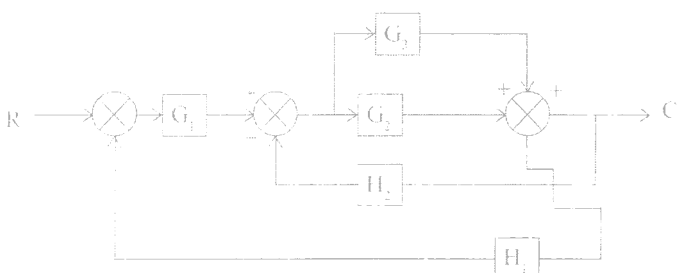
(2) Notations used have usual meaning.

(3) Assume any relevant data, if missing.

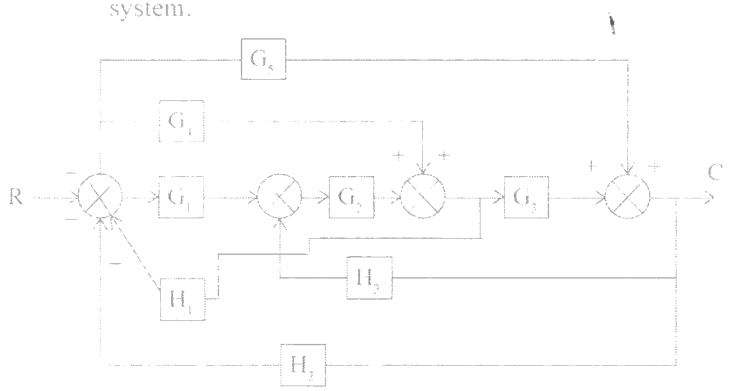
1. Attempt any **TWO** parts of the following : **(10×2=20)**

(a) List the advantages and disadvantages of an open loop and closed loop system.

(b) Using block diagram reduction technique, determine the overall transfer function relating the output & input for a system represented by



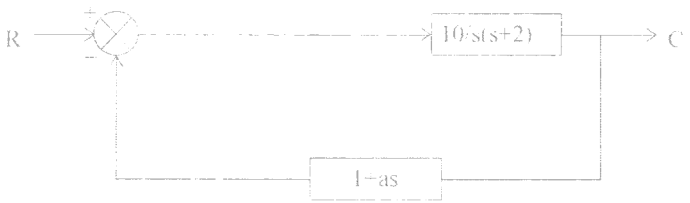
(c) Draw the Signal Flow graph and then find the transfer function by using mason's gain formula for the following system.



2. Attempt any **TWO** parts of the following : **(10×2=20)**

(a) Compare and contrast transient and steady state response of a control system. Also discuss various test input signals for a control system.

(b) The block diagram of a positive control system with velocity feedback is shown in Fig. Determine the value of 'a' so that the step response has a maximum overshoot of 20%.

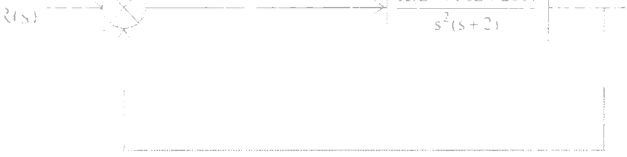


(c) Determine the position, velocity and acceleration error constants of an unity feedback control system with the forward path gain given by $\frac{K}{s^2(s+1)(s+2)}$.

3. Attempt any **TWO** parts of the following : **(10×2=20)**

(a) With the help of neat schematic diagram explain the constructional features of stepper motor. Explain its important operational features.

(b) Consider the closed loop feedback control system shown in Fig. Using Routh Hurwitz criterion, determine the range of K for which the system is stable. Find also the number of roots of the characteristic equation that are in the right half of s-plane for K = 0·5.



(c) The open loop transfer function of a system is given by

$$G(S)H(s) = (s - 2)/(s*s+2s+2)\ (s+3).$$

Sketch the root locus for the system.

4. Attempt any **TWO** parts of the following : **(10×2=20)**

(a) What is M, N circles ? Explain the physical significance of these circles in stability study.

(b) Sketch the polar plot of G(S) = 10/S(S+1).

(c) Sketch the Bode plot for the transfer function

$$G(S) = 1000/(1+0·1s)\ (1+0·001s)$$

And determine, phase margin, gain margin and stability of the system.

5. Attempt any **TWO** parts of the following : **(10×2=20)**

(a) The open loop transfer function of type two system with unity feedback is given by

$$G(S) = K/S(1+s)$$

Design a lead compensator to meet the following specifications :

(i) Acceleration constant Kv = 12 sec^{-1}.

(ii) P.M. = 40 degree.

(b) Explain about phase lag compensation by Root Locus Method with proper expression & plot.

(c) Write short notes on the following :—

(i) Diagonalization

(ii) Controllability

(iii) Observability