

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

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B.Tech.

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

CONTROL SYSTEM

Time : 3 Hours

Total Marks : 100

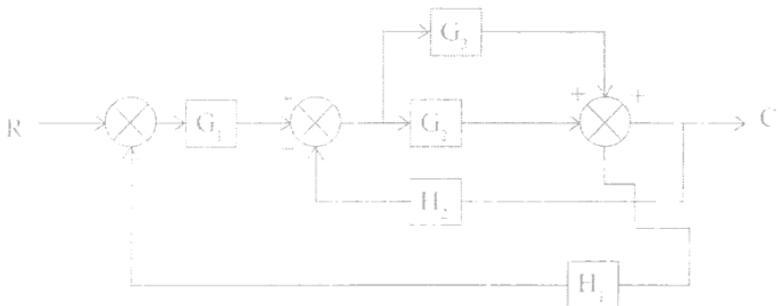
Note :—(1) Attempt all questions

(2) Notations used have usual meaning

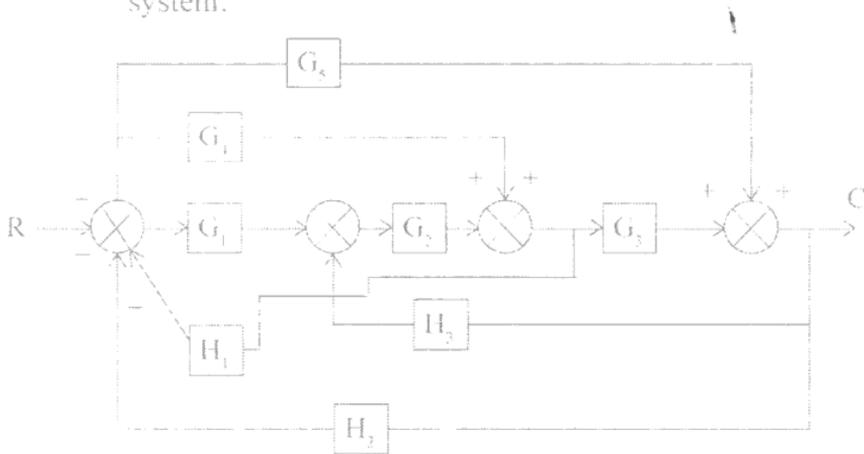
(3) Assume any relevant data, if missing.

I. 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)

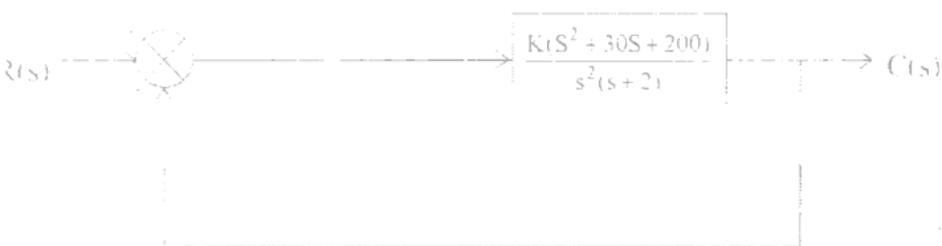
- (a) Compare and contrast transient and steady state response of a control system. Also discuss various test input signals for a control system.
- (b) The block diagram of a positive control system with velocity feedback is shown in Fig. Determine the value of 'a' so that the step response has a maximum 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

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

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 $K_v = 12 \text{ sec}^{-1}$.
 - (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