

Con. 5128-07.

CD-6744

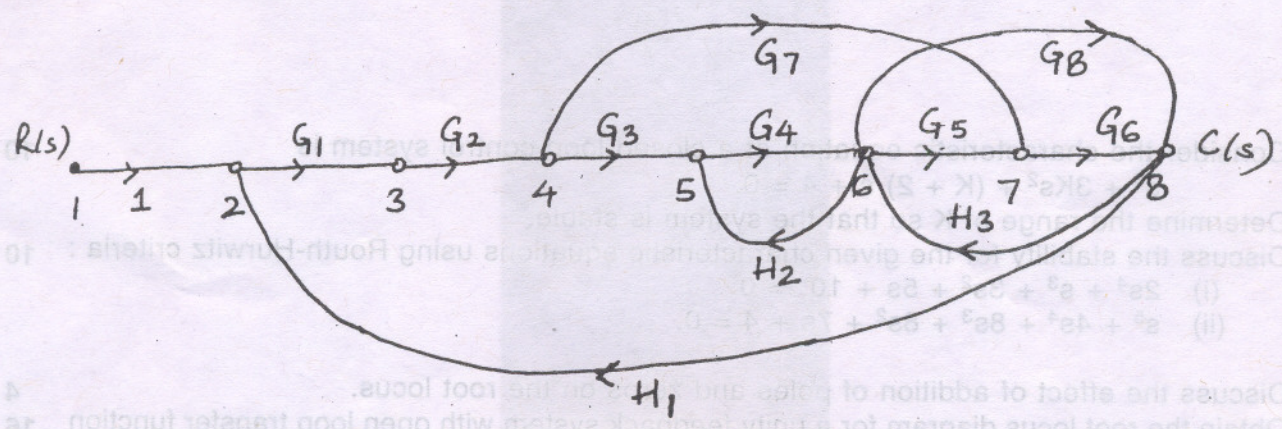
(REVISED COURSE)

(3 Hours)

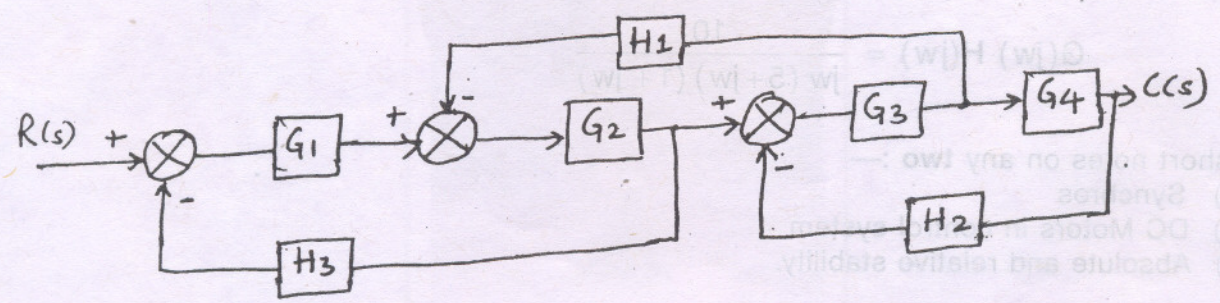
[ Total Marks : 100

N.B. (1) Question No. 1 is compulsory.  
 (2) Attempt any four questions from remaining six questions.

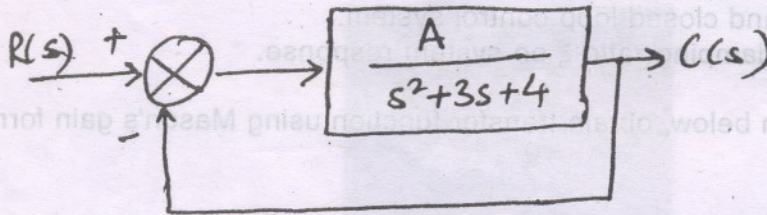
1. (a) Show the pole locations of—
  - (i) Undamped system 5
  - (ii) Critically damped system
  - (iii) Overdamped system.
- (b) Define gain margin and phase margin. 5
- (c) Compare open-loop and closed loop control system. 5
- (d) Explain the effect of damping ratio  $\xi$  on system response. 5
2. (a) For the diagram given below, obtain transfer function using Mason's gain formula. 10



- (b) Obtain transfer function for the system given below using block diagram reduction technique. 10



3. (a) A unity feedback system has open loop transfer function  $G(s) = \frac{A}{s(s+p)}$ . Determine the value of A and P so that the setting time and peak overshoot will be 4 seconds and 10% respectively. 10
- (b) The block diagram of a closed loop system is shown below. Calculate the steady state error for values of A = 10 and 100. Hence state the effect of increasing the gain on the steady state error of the system. 10



4. (a) Consider the characteristic equation of a closed loop control system is  $s^3 + 3Ks^2 + (K + 2)s + 4 = 0$ . Determine the range of K so that the system is stable. 10
- (b) Discuss the stability for the given characteristic equations using Routh-Hurwitz criteria : 10
- (i)  $2s^4 + s^3 + 3s^2 + 5s + 10 = 0$
- (ii)  $s^5 + 4s^4 + 8s^3 + 8s^2 + 7s + 4 = 0$ .
5. (a) Discuss the effect of addition of poles and zeros on the root locus. 4
- (b) Obtain the root locus diagram for a unity feedback system with open loop transfer function 16

$$G(s) = \frac{K}{s(s^2 + 6s + 10)}$$

For the system to be stable, determine the range of K.

6. (a) State and explain Nyquist stability criteria. 5
- (b) Draw Bode plot for the system whose open loop transfer functions is given by 15

$$G(j\omega) H(j\omega) = \frac{10}{j\omega(5+j\omega)(1+j\omega)}$$

7. Write short notes on any two :- 20
- (a) Synchros
- (b) DC Motors in control system
- (c) Absolute and relative stability.