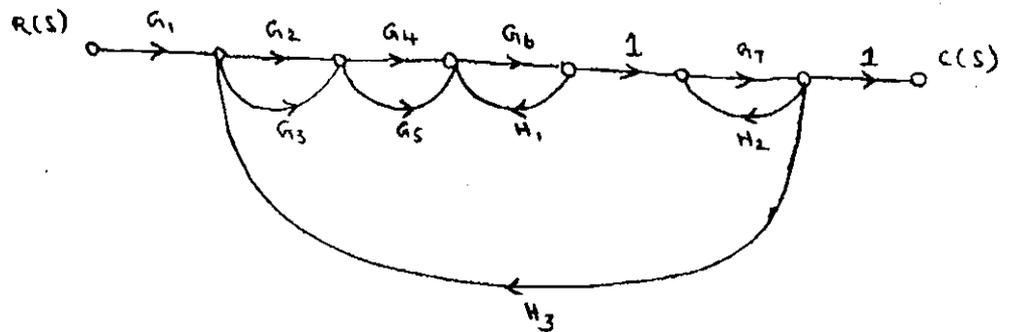
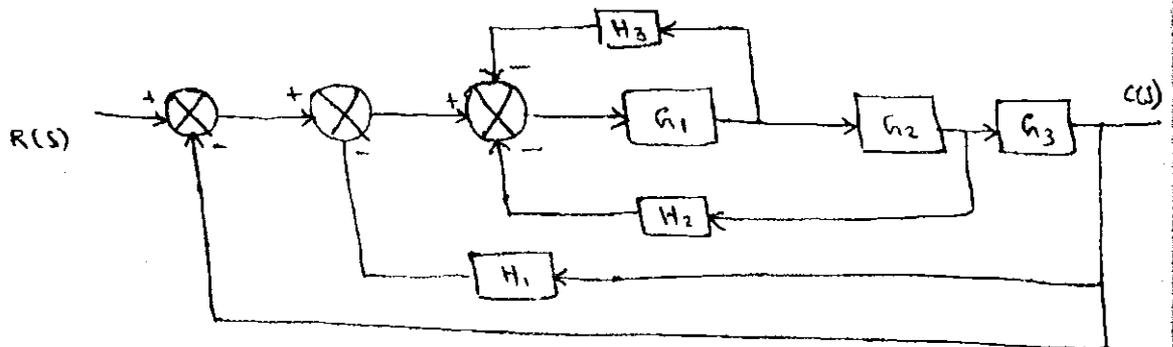


11. (a) Find $C(s) / R(s)$ of the signal flow graph shown in the fig below using Mason's gain formula.



Or

- (b) Using block diagram reduction techniques find $C(s) / R(s)$.



12. (a) (i) List out and define all the time domain specifications. (6)
 (ii) Obtain the unit step response and unit impulse response of the following system. (10)

$$C(s)/R(s) = 10 / (s^2 + 2s + 10)$$

Or

- (b) (i) Derive the generalized error coefficients of a typical closed loop system. (8)
 (ii) For a closed loop system with $G(s) = 1/(s+5)$ and $H(s) = 5$ calculate generalized error coefficients and find error series. (8)

13. (a) The open loop transfer function of an unity feed back system is given by $G(s) = 10(s + 3)/s(s + 2)(s^2 + 4s + 100)$.

Draw the Bode plot and hence find the gain margin and phase margin. (16)

Or

- (b) (i) Sketch the polar plot for the system with open loop transfer function $G(s)H(s) = 1/(s + 4)(s + 2)$ on a plain paper. (8)

- (ii) Write short notes about Constant M and N circles. (8)

14. (a) The open loop transfer function of an unity feed back system is given by $G(s)H(s) = K(1 + 2s)/s(1 + s)(1 + s + s^2)$. Sketch complete Nyquist plot and hence find the range of K for stability using Nyquist criterion. (16)

Or

- (b) Using Routh-Hurwitz criterion, determine the stability of the closed loop system that has the following characteristic equations. (16)

(i) $P(s) = s^5 + 2s^4 + 2s^3 + 4s^2 + s + 2$

(ii) $P(s) = s^5 + 2s^4 + 3s^3 + 6s^2 + 5s + 3$.

15. (a) Design a lead compensator for the system whose open loop transfer function is $G(s) = 10/s(s + 1)$ so that the compensated system has an undamped natural frequency $\omega_n = 3$ rad/sec and damping ratio $\delta = 0.5$. (16)

Or

- (b) Consider the type 1 open loop system $G(s) = 4/s(s + 2)$. Design a suitable compensator $G_c(s)$ to meet the following specifications :

(i) damping ratio $\delta = 0.45$

(ii) velocity error constant $K_v = 20 \text{ sec}^{-1}$. (16)