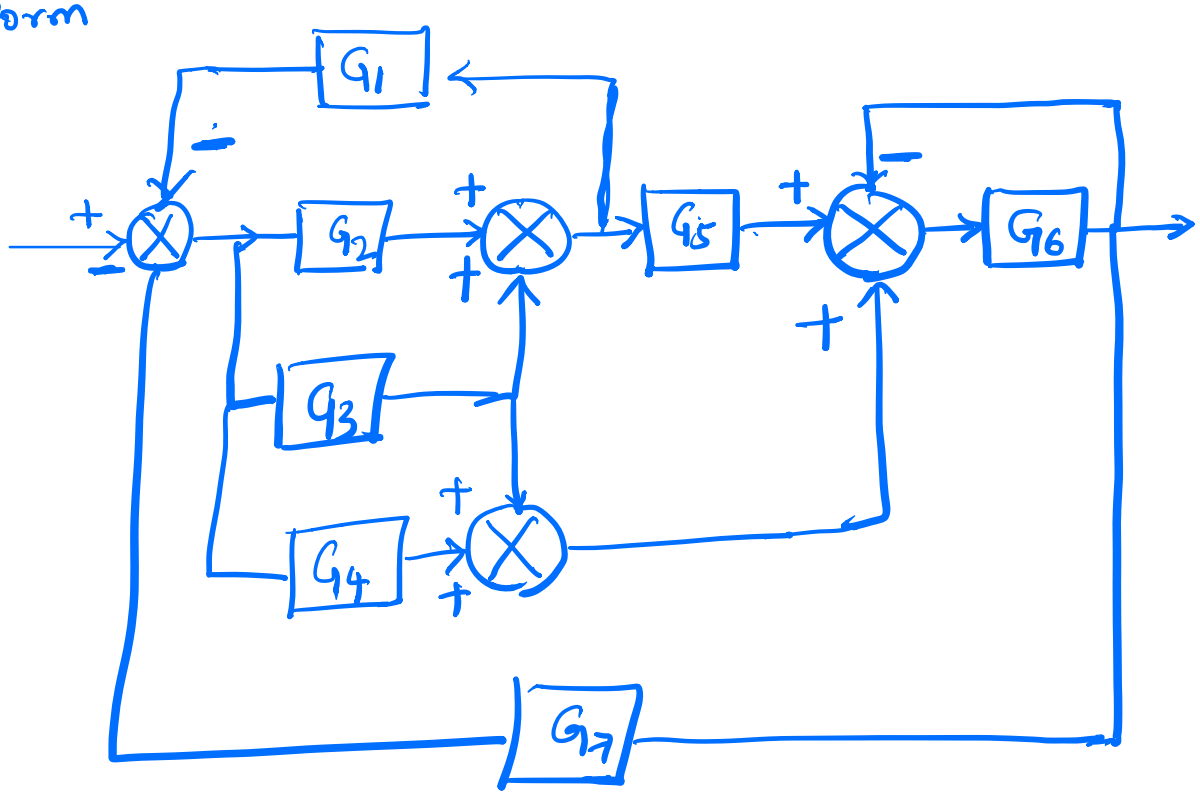
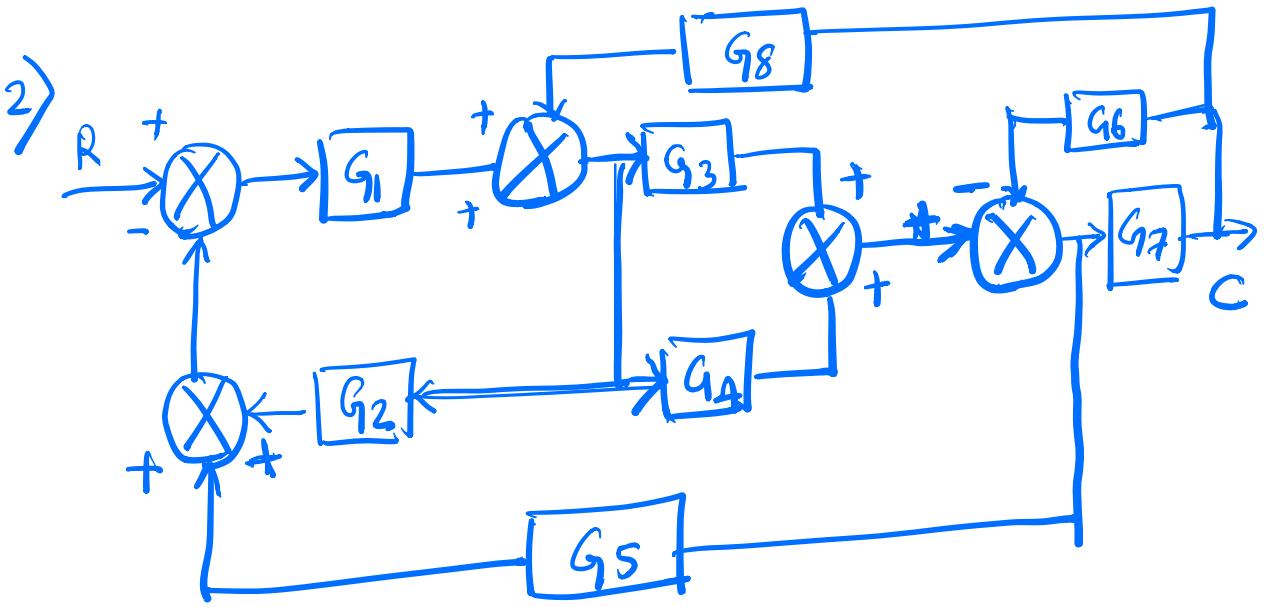
Section: 1 :- Attempt atleast [3] out of 5 questions.

Reduce the block diagrams to a simpler form

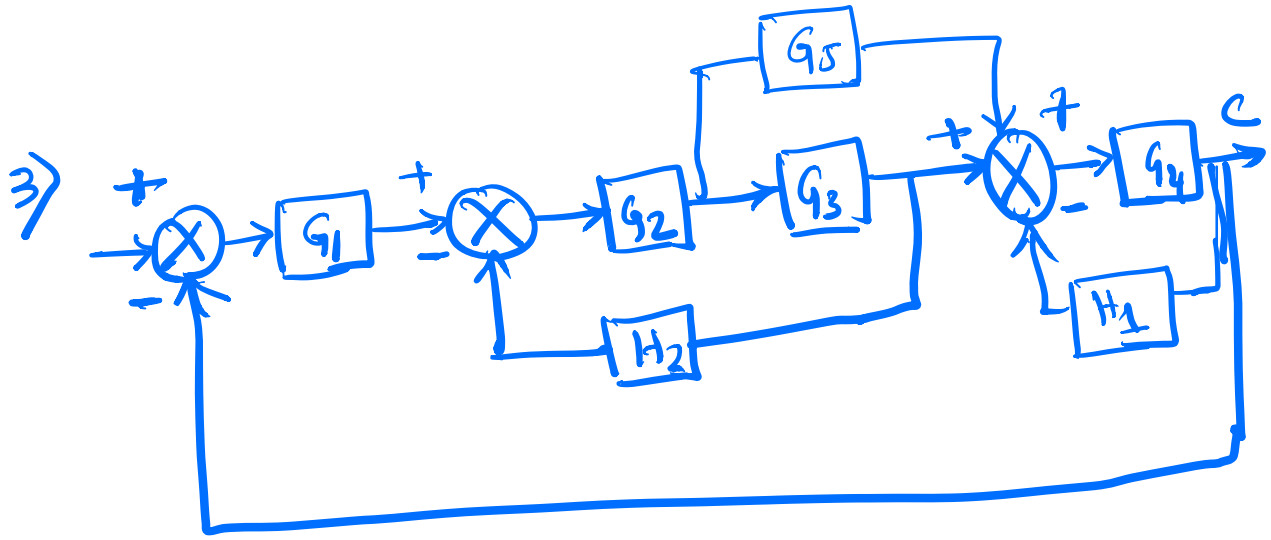
1)



2)

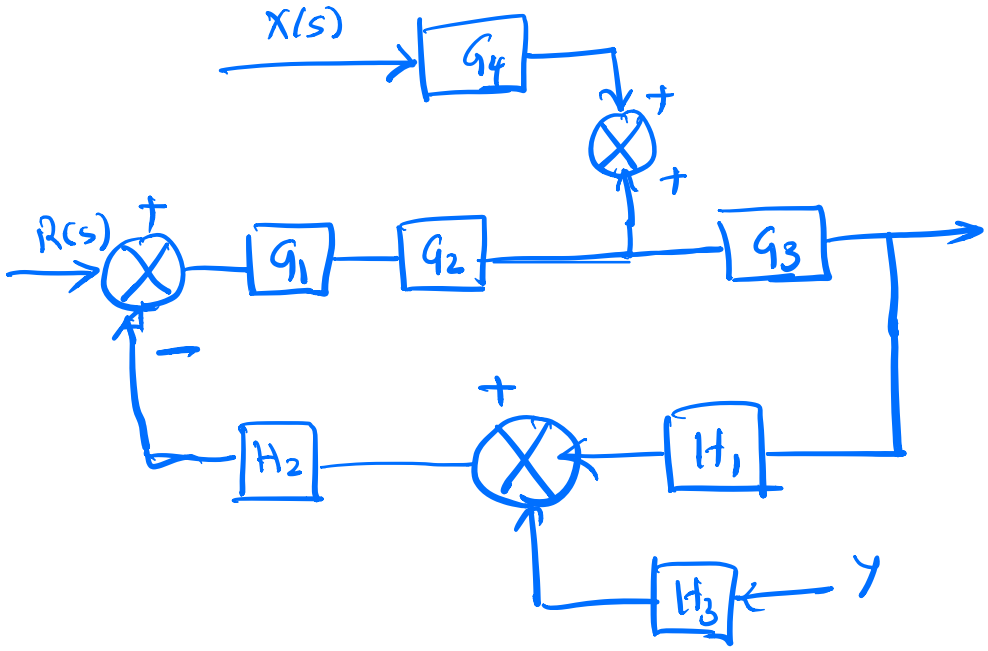


3)

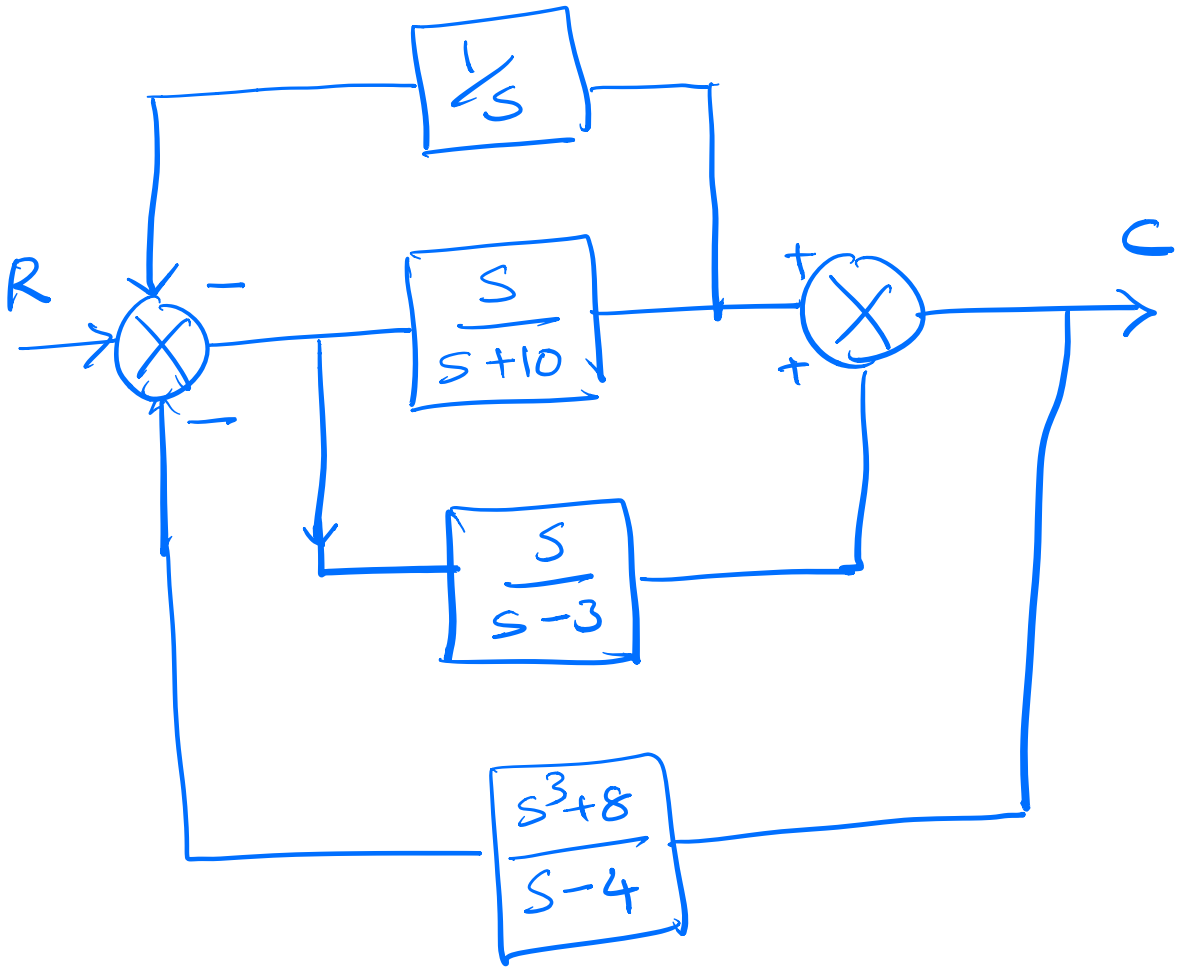


4) Use block diagram reduction technique & obtain the transfer function

(i) C/R (ii) C/X (iii) $\frac{C}{Y}$ and also the total response.

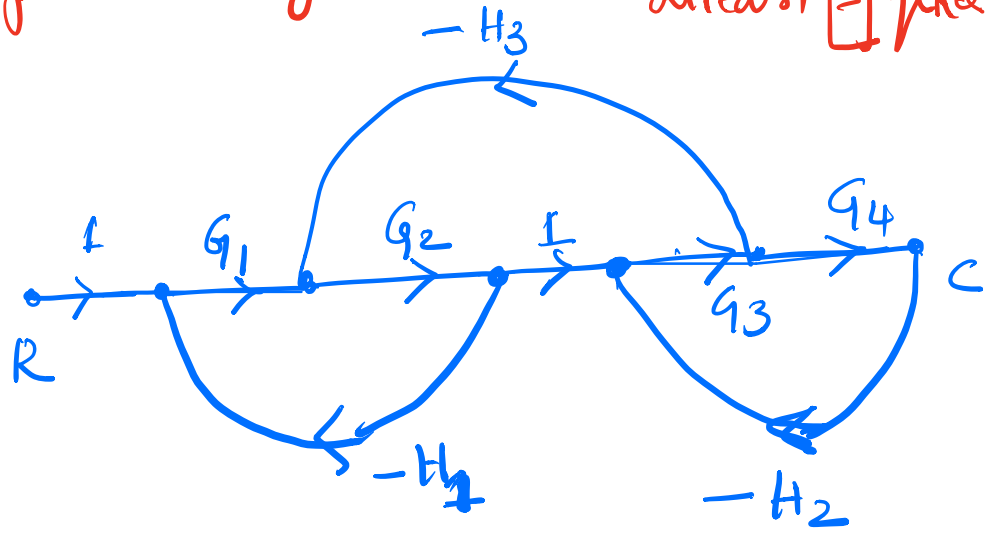


5)

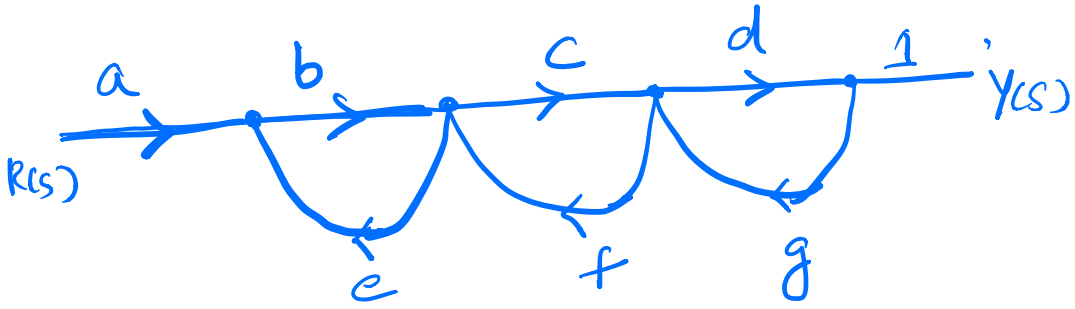


Section - II : Reduce the signal flow graphs using Mason's rule Attempt atleast 3 questions

1)

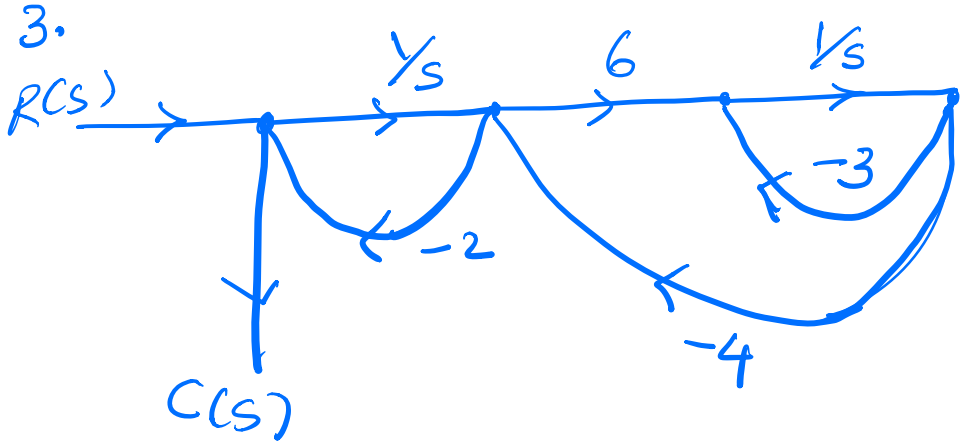


2)



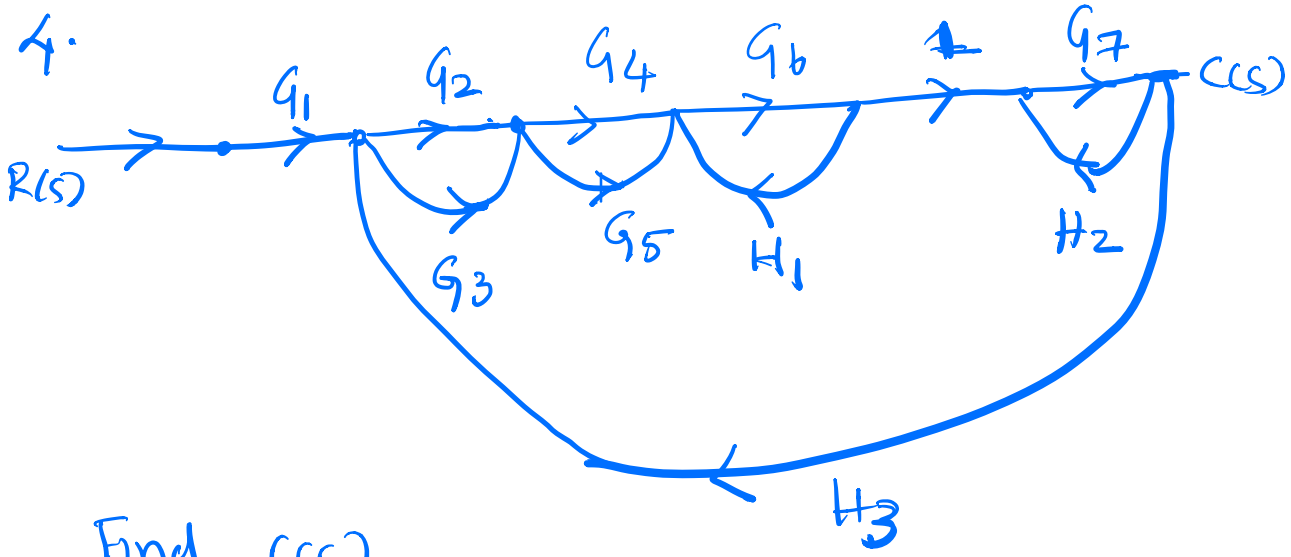
Find $\frac{Y(s)}{R(s)}$

3.



Find $C(s)/R(s)$

4.

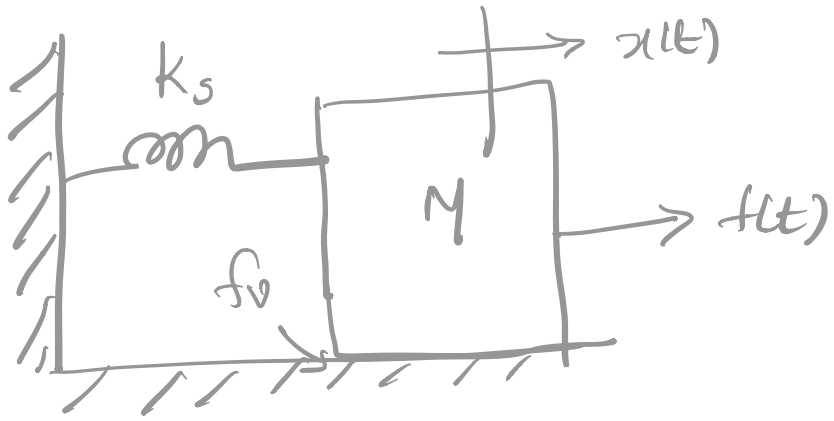


Find $\frac{C(s)}{R(s)}$

5. Draw signal flow graph of problem 3 in section 1 and find out the over all transfer function

Section-III : Answer atleast 2 questions out of five

1) Solve for x(t) in the system if f(t) is a unit step function



$M = 1$ Kg $K_s = 5$ N/m $f_v = 1$ N-s/m

2) A unit step is given as an input to a series R-LC circuit. Determine the relationships between R, L, C for

(a) undamped system

(b) under damped system

(c) over damped system

(d) Critically damped system.

3) For each pair of second order system specifications, find the location of second order poles

a) % OS = 12% $T_s = 0.6$ sec

b) % OS = 10% $T_p = 5$ sec

c) $T_s = 7$ sec $T_p = 3$ sec.

4) A unity feedback system has the following T.F

$$G(s) = \frac{K(s+12)}{(s+14)(s+18)}$$

Find the value of K to yield a 10% error in steady state.

5) Find the value of K of the unity feedback system if the input is $10t^2 u(t)$ & the desired steady state error is 0.061 for this input

$$G(s) = \frac{K(s+3)}{s^2(s+7)}$$

Section-IV: Submit atleast [2] questions out of five

1. Estimate the number of poles on the R.H.P of s-plane

(1) $s^5 + 3s^4 + 5s^3 + 4s^2 + s + 3$

(2) $s^5 + 6s^3 + 5s^2 + 8s + 20.$

(3) $G(s) = \dfrac{240}{(s+1)(s+2)(s+3)(s+4)}$

The above system is under unity feedback.

(4) $G(s) = \dfrac{K(s+2)}{s(s+1)(s+3)}$

Find the range of K for which the closed loop system with unity feedback is stable.

(5) $G(s) = \dfrac{1}{2s^4+5s^3+s^2+2s}$

The above system is connected in unity feedback. Determine its stability