1. (50%) Consider a unity negative feedback system as shown in Fig. 1. The Bode plot of the open loop system $G(s)$ is shown in Fig. 2. Please answer the following questions regarding the performance of the closed-loop systems.
   (a) (10%) Please estimate the phase margin and gain margin of the system.
   (b) (5%) Please estimate the bandwidth of the system.
   (c) (5%) Please estimate the steady-state error due to unit step input.
   (d) (10%) Please estimate the percent overshoot due to unit step input.
   (e) (10%) Please estimate the damping ratio of the system.
   (f) (10%) Please plot the corresponding Nyquist plot of $G(s)$.

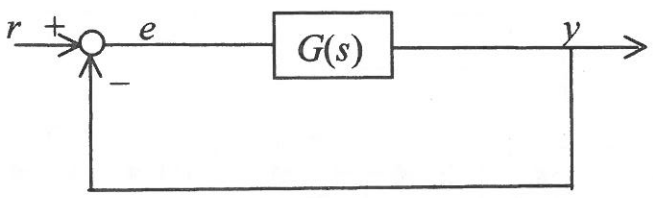


Fig. 1

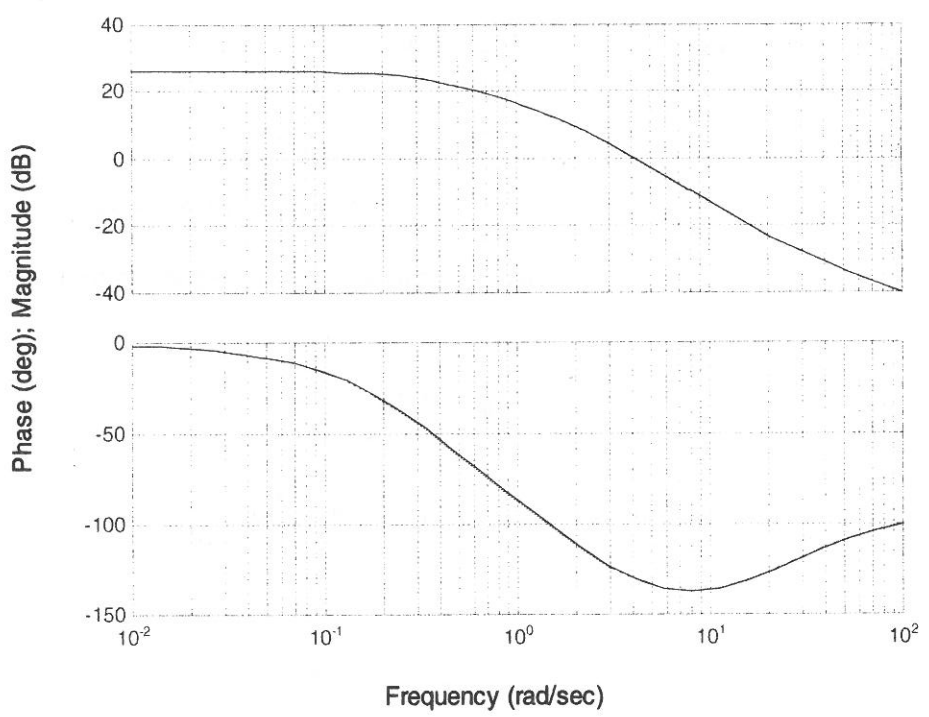
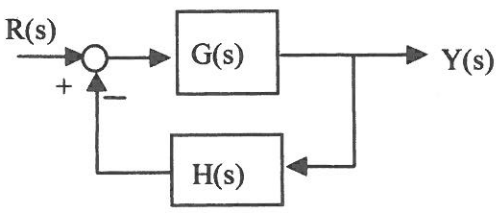


Fig. 2

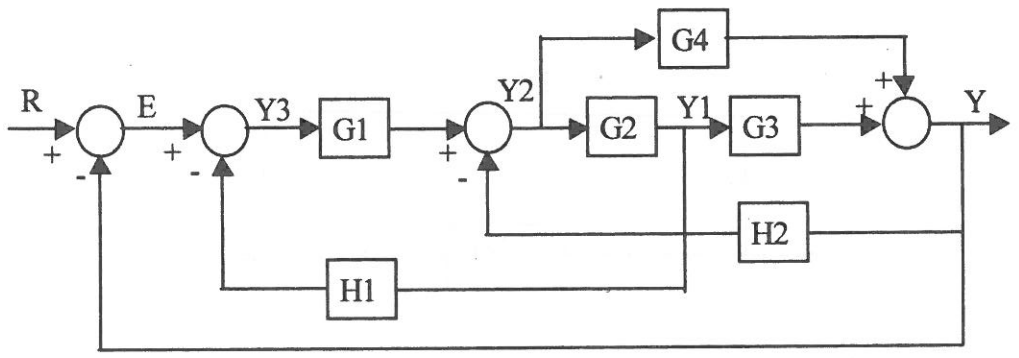
2. (20%)　$G(s)=\dfrac{s}{s^2+2s+1}$,　$H(s)=\dfrac{1}{s}$



(a) Find the closed-loop transfer function M(s).

(b) Find the sensitivity function S_G^M.

3. (10%) Using Mason's rule, find the closed-loop transfer function Y/R.



4. (20%) For the unity-feedback control system $G(s)=\dfrac{500}{s(s+50)(s+200)}$, determine the step-, ramp-, and parabolic-error constants, and the steady-state error for a unit-step input $u_s(t)$, a unit-ramp input $tu_s(t)$, and a parabolic input $(t^2/2)u_s(t)$, respectively.