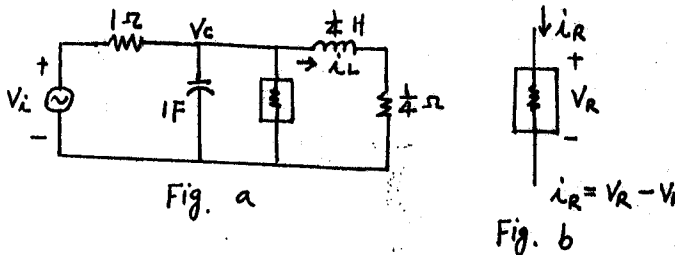
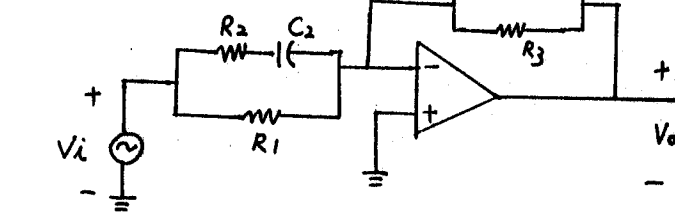


一. RLC 電路如 Fig. a 所示, 其非線性電阻特性為 Fig. b.



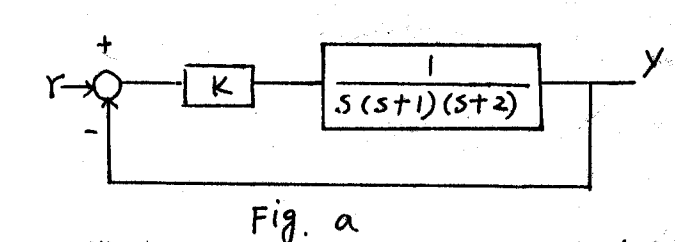
- (a) (10%) 試求此電路 state equations.  
 (b) (10%) 試求此電路 equilibrium points, when  $V_i = 8$  volt.

二. 如下列電路所示.

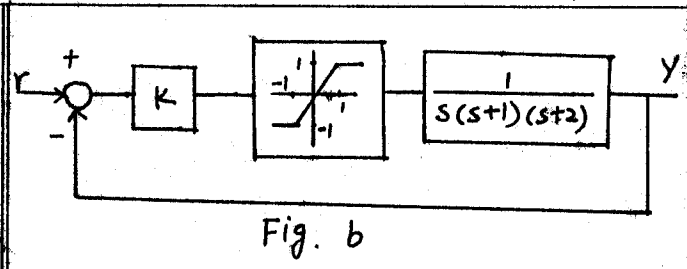


- (a) (7%) 試求 Transfer function  $\frac{V_o(s)}{V_i(s)} = ?$   
 (b) (6%) 繪出 Pole-zero pattern, assuming that  $R_4 C_4 > (R_1 + R_2) C_2$   
 (c) (7%) 試說明此電路為何種 Controller (PD, PI, or PID) or Compensator (Lead, Lag, Lag-Lead)?

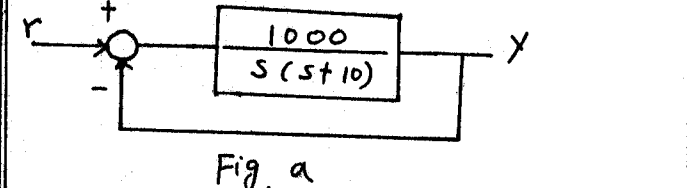
三. (a) (10%) 一系統如 Fig. a 所示, 試繪出 Root-Loci for  $0 \leq K < \infty$ , 並判別系統穩定的 K 值範圍.



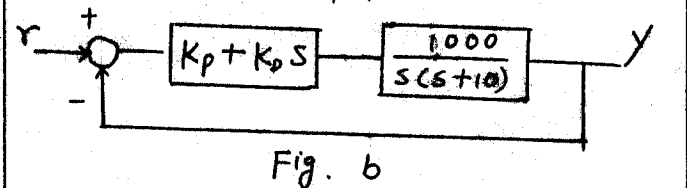
- (b) (10%) 一系統如 Fig. b 所示, 利用 (a) 之結果, 試討論此 closed-loop system 的 performance. (對不同大小的 r 討論 output y 的 response 情形.)



四. (a) (10%) 如 Fig. a 所示



- 試求: (i) system type?  
 (ii)  $e_{ss}$  | unit-step input = ?  
 (iii)  $e_{ss}$  | unit-ramp input = ?  
 (b) (10%) 如 Fig. b 所示.



- 試求  $K_p$  及  $K_d$ , so that ramp-error constant  $K_v = 1000$ , and damping ratio = 0.70?

五. (a) (10%) 解釋下列名詞:

- (i) Integral control.
- (ii) Robust Control.
- (iii) Internal model principle.
- (iv) Separation principle.
- (v) BIBO stability.

(b) (10%) 有一系統如下:

$$\dot{x}_1 = -x_1 + x_1^2 x_2$$

$$\dot{x}_2 = -x_2 - x_1^3$$

(0,0) 為其 equilibrium point, 試利用 Lyapunov stability theorem 判別此系統的 stability.