

# 淡江大學 100 學年度碩士班招生考試試題 51

系別：機械與機電工程學系      科目：自 動 控 制

考試日期：2 月 28 日(星期一) 第 2 節

本試題共 4 大題， 1 頁

- (1) (a) Plot the root locus of the following system (Fig. 1). (15%)  
 (b) Determine the range of  $K$  such that the following system (Fig. 1) would be a stable system. (10%)

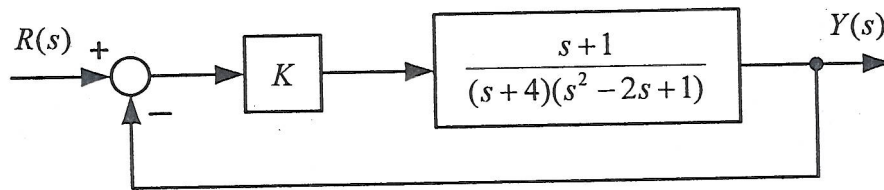


Fig. 1

- (2) (a) Determine the transfer function  $\frac{Y(s)}{R(s)}$  of the following state equation. (10%)  
 (b) Design the controller such that the roots of the characteristic equation of the feedback system are at  $-1, -1+j$  and  $-1-j$ . (15%)

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} u, \quad y = [1 \ 0 \ 0] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

- (3) Draw the Bode diagram (magnitude plot and phase plot) of the following system:

$$G(s) = \frac{2(1+0.1s)}{s(1+s)(1+s/50)^2} \cdot (\log 2 = 0.301; \log 5 = 0.699) \quad (25\%)$$

- (4) (a) Determine the transfer function  $\frac{Y(s)}{R(s)}$  of the following system (Fig. 2). (10%)

- (b) Compute the steady-state errors of the following system (Fig. 2) with  $R(s) = \frac{1}{s}$ , and  $R(s) = \frac{1}{s^2}$ , respectively. (15%)

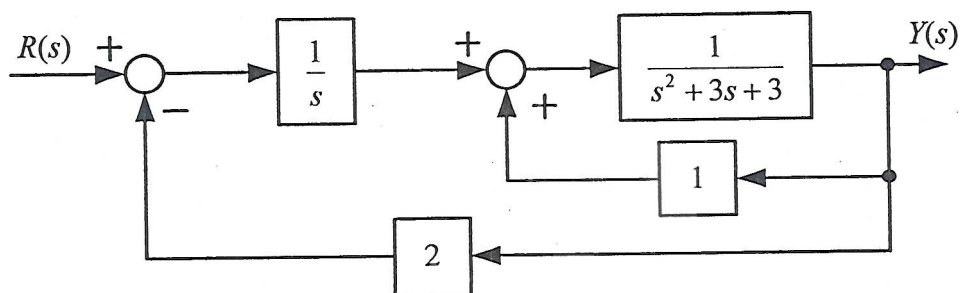


Fig. 2