

115AT02

國立臺北科技大學 115 學年度碩士班招生考試

系所組別：1501 自動化科技研究所

第二節 自動控制 試題 (選考)

第 1 頁 共 1 頁

注意事項：

1. 本試題共 5 題，每題 20 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Obtain the transfer function $E_o(s)/E_i(s)$ of the operational-amplifier circuit shown in Figure 1. (20%)

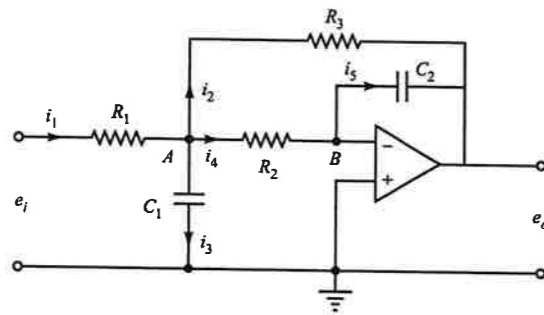


Fig. 1

2. Obtain the transfer function $Y(s)/U(s)$ of the system shown in Figure 2. The input u is a displacement input. (20%)

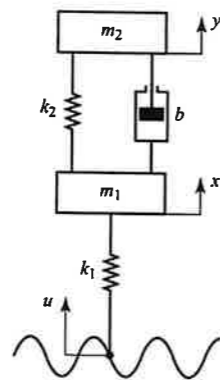


Fig. 2

3. Determine the values of K and k of the closed-loop system shown in Figure 3 so that the maximum overshoot in unit-step response is 25% and the peak time is 2sec. Assume that $J=1\text{kg}\cdot\text{m}^2$. (20%)

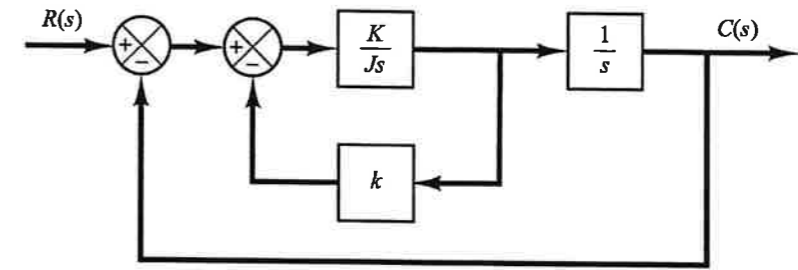


Fig. 3

4. Consider the system defined by

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -25 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Obtain the sinusoidal transfer functions $\frac{Y_1(j\omega)}{U_1(j\omega)}$, $\frac{Y_2(j\omega)}{U_1(j\omega)}$, $\frac{Y_1(j\omega)}{U_2(j\omega)}$ and $\frac{Y_2(j\omega)}{U_2(j\omega)}$. In deriving

$\frac{Y_1(j\omega)}{U_1(j\omega)}$ and $\frac{Y_2(j\omega)}{U_1(j\omega)}$, we assume that $U_2(j\omega)=0$. Similarly, in obtaining $\frac{Y_1(j\omega)}{U_2(j\omega)}$ and $\frac{Y_2(j\omega)}{U_2(j\omega)}$,

we assume that $U_1(j\omega)=0$. (20%)

5. (1) Sketch the root loci for the system shown in Figure 4; (5%) (2) Compute the angles of asymptotes (5%); (3) the intersection of the asymptotes (5%); (4) the breakaway and break-in points. (5%)

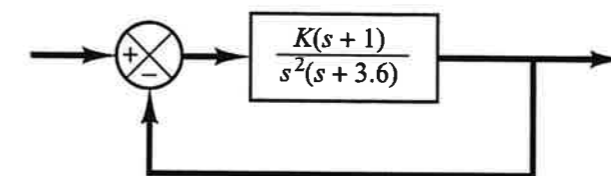


Fig. 4