

國立屏東科技大學 九十五 學年度 碩士班暨碩士在職專班招生考試
自動控制(車輛工程系 試題)

1. A unity-feedback system is shown in Fig. 1. It is known that $G = \frac{3}{s^2 + 4s}$, $H = 1$, then

(A) What is its output time response when $R = u_s(t)$? (10 分)

(B) What is the output steady-state error when $R = tu_s(t)$? (10 分)

Note : $u_s(t)$ is a unit-step function.

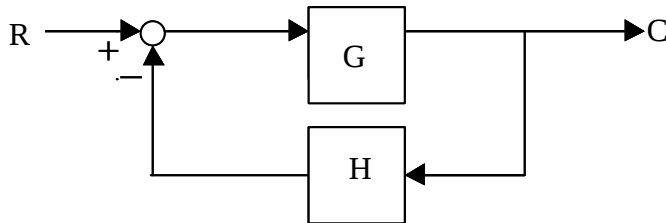


Fig. 1

2. The dynamic equation of a SISO system is:

$$\dot{\mathbf{X}} = \mathbf{A}\mathbf{X} + \mathbf{B}\mathbf{U}$$

$$\mathbf{Y} = \mathbf{C}\mathbf{X} + \mathbf{D}\mathbf{U}$$

where $\mathbf{Y}$ is the output, $\mathbf{U}$ is the input, and

$$\mathbf{A} = \begin{bmatrix} -3 & 4 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \quad \mathbf{B} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \quad \mathbf{C} = [1 \quad 1 \quad 0] \quad \mathbf{D} = 5$$

(A) What is the characteristic equation of the system? (10 分)

(B) Is the system controllable? (10 分)

3. A unity-feedback system is shown in Fig. 1. It is known that $G = \frac{K(s+10)}{s(s+1)(s+100)}$, and $H = 1$,

(A) If $K=1$, give the bode plot of the open-loop transfer function G . (10 分)

(B) If $K=1$, give the Nyquist plot of the system and determine whether the closed-loop system is stable or not? (10 分)

(C) Determine the range of K such that the system is stable. (10 分)

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4. As shown in Fig. 2, i_1 is the current on L_1 and i_2 is the current on L_2 . Let $x_1 = i_1$, $x_2 = i_2$,

$x_3 = \frac{di_1}{dt}$, and $x_4 = \frac{di_2}{dt}$. Please write down its state equation. (15 分)

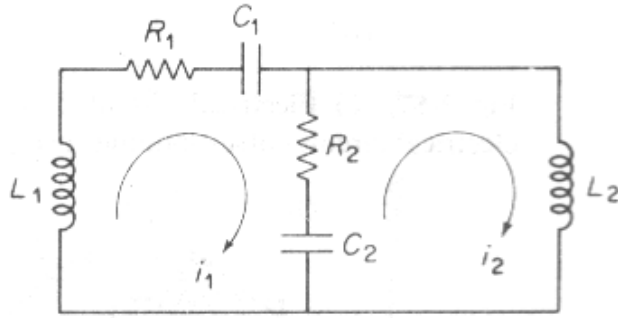


Fig. 2

5. The characteristic equation of a system is

$$s(s + 2)(s + 3)(s + 8) + k(s + 4) = 0.$$

Please construct its root loci and show poles, zeros, and asymptotes. (15 分)