

准帶項目請打「V」	
	簡單型計算機
本試題共 / 頁	

1. Consider the following system represented in state space, where $u(t)$ is the unit step function.

$$\begin{aligned} \dot{x}(t) &= \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t), & x(0) &= \begin{bmatrix} 1 \\ -2 \end{bmatrix} \\ y(t) &= [2 \quad 3] x(t) \end{aligned}$$

Find the output $y(t)$. (20%)

2. Consider the following transfer function

$$T(s) = \frac{18}{s^8 + s^7 + 12s^6 + 22s^5 + 39s^4 + 59s^3 + 48s^2 + 38s + 20}$$

Find the number of poles in the right half-plane, in the left half-plane, and on the $j\omega$ - axis. (20%)

3. For the unity feedback system of Figure 1, where

$$G(s) = \frac{K}{s(s+2)^2}$$

(a) Plot the root locus for $K \geq 0$. (20%)

(b) Find K such that the system has the smallest settling time and overshoot. (10%)

4. For the unity feedback system of Figure 1, where

$$G(s) = \frac{K(s+\alpha)}{s(s+\beta)}$$

is to be designed to meet the following requirements: the steady-state position error for a unit ramp input equals $1/10$; the closed-loop poles will be located at $-1 \pm j1$. Find K , α and β in order to meet specifications. (30%)

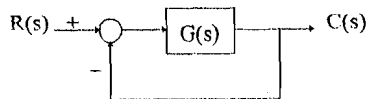


Fig. 1