淡江大學97學年度碩士班招生考試試題

系別：電機工程學系控制晶片與系統組
電機工程學系機器人工程碩士班　　科目：控　制　系　統

准帶項目請打「V」	
V	簡單型計算機

本試題共 1 頁，4 大題

1. A system is represented by the state and output equations:

$$\dot{x}(t)=\begin{bmatrix}0 & 1\\ -2 & -2\end{bmatrix}x(t)+\begin{bmatrix}1\\ 1\end{bmatrix}u(t).$$
$$y(t)=\begin{bmatrix}2 & 3\end{bmatrix}x(t)$$

Find

a. the characteristic equation; (10%)

b. the poles of the system; (10%)

c. the unit step response of system. (10%)

2. Find the following for the system in Fig. 1:

a. The equivalent single block that represents the transfer function, $T(s)=\dfrac{C(s)}{R(s)}=?$ (10%)

b. The damping ratio, natural frequency, percentage overshoot, settling time, peak time, rise time, and damped frequency of oscillation for a step input. (10%)

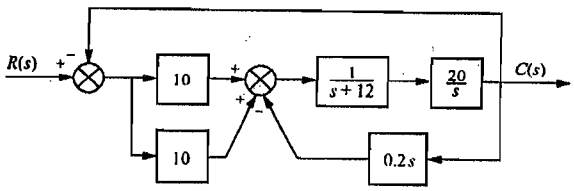

Fig. 1

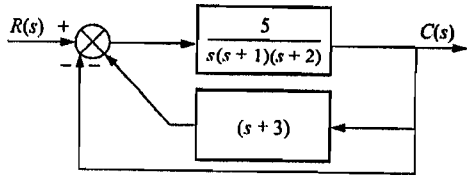

Fig. 2

3. For the system shown in Fig. 2

a. Find K_p, K_v, K_a. (10%)

b. Find the steady-state error for an input of $50u(t)$, $50tu(t)$, and $50t^2u(t)$, respectivelly. (10%)

4. For the unity feedback system of Fig. 3 with

$$G(s)=\frac{K(s+4)}{s(s+1)(s+2)}$$

Find the following:

a. The range of K that keeps the system stable. (10%)

b. The value of K that makes the system oscillate. (10%)

c. The frequency of oscillation when K is set to the value that makes the system oscillate. (10%)

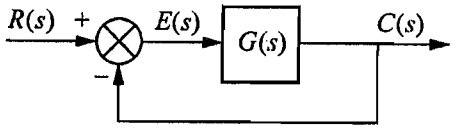

Fig. 3