南台科技大學 101 學年度研究所考試入學招生考試

系組： 電機系甲組、電機系海外　　准考證號碼：□□□□□□

科目： 控制系統　　(請考生自行填寫)

注意事項	一、 請先檢查准考證號碼、報考系(組)別、考試科目名稱，確定無誤後再作答。 二、 所有答案應寫於答案紙上，否則不予計分。 三、 作答時應依試題題號，依序由上而下書寫，作答及未作答之題號均應抄寫。

1. For the system with $G(s)=\frac{Y(s)}{X(s)}=\frac{500}{s+5}$

(1) What's the system time constant τ? (5%)

(2) What's the band-width ω_c (rad/sec)? (5%)

(3) If we take the waveform in Fig.1 as input x(t), please plot the approximate resulting output y(t). (5%)

Fig. 1 Waveform of input signal x(t)

(0V: t=0sec~1sec; 1V: t=1sec~2sec; 0V: t=2sec~3sec)

(4) Let x(t)=sin(5t) , the resulting steady-state output y(t)= Asin(ωt + Ø). A=? ω =? Ø =? (5%)

2. For the system with $G(s)=\frac{Y(s)}{X(s)}=\frac{9}{s^2+9}$

(1) Please plot its unit-step response? (5%)

(2) Please plot the resulting output y(t) when input x(t)=sin(3t). (5%)

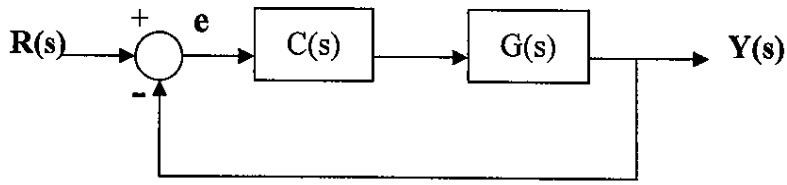

Fig. 2 Unit-feedback system

3. Consider the system shown in Fig.2, where C(s)=$\frac{120}{s+3}$ and G(s)=$\frac{s+2}{s+4}$.

(1) Find the steady-state error for r(t)=**5**u(t)，where u(t) is the unit step. (5%)

(2) To make the steady-state error $e(\infty)=0$，how to modify the controller C(s)? (5%)

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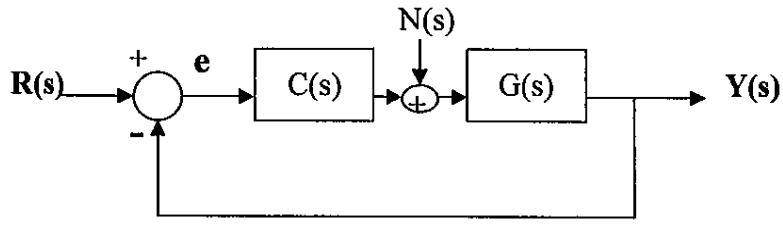

Fig. 3 Unit-feedback system considering noise input

4. Consider the system shown in Fig.3 , if C(s)=$\frac{s-1}{s+1}$, G(s)=$\frac{1}{s-1}$,

(1) The transfer function from n to y is Gyn(s)= $\frac{Y(s)}{N(s)}=?$ (5%)

(2) The transfer function from r to y is Gyr(s)= $\frac{Y(s)}{R(s)}=?$

Is the system stable? (5%)

5. Consider the system with state-space model : $\begin{cases}\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}-3 & 0\\ 0 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}1\\ 1\end{bmatrix}u\\ y=\begin{bmatrix}1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+[0]u\end{cases}$

(1) Please evaluate $G(s)=\frac{Y(s)}{U(s)}$ =? Is the system stable? (5%)

(2) When we focus on the output response y(t), what's the main difference between state-space model and transfer function? (5%)

6. Consider the system shown in Figure 4, where $G(s)=\frac{K(s+3)}{s(s+1)(s+2)(s+4)}$.

(1) Sketch the root locus for the system. (8%)

(2) For what rang of K is the system stable? (7%)

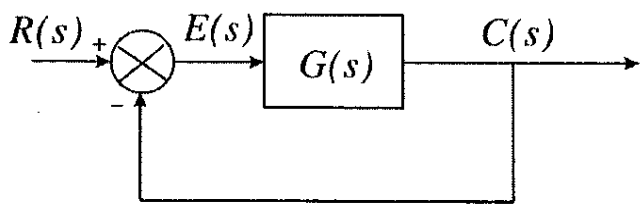

Fig. 4 Space vehicle control system

7. Consider the system as shown in Fig. 5.

(1) Write the state equations. (5%)

(2) Is the system realization controllable? Observable? (10%)

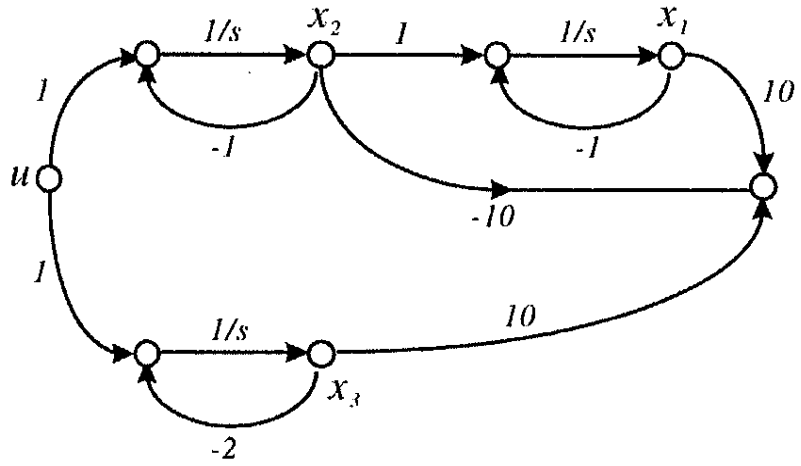

Fig. 5 Control system

8. Draw the Bold plots for the system shown in Figure 4, where $G(s)=\dfrac{K(s+3)}{s(s+1)(s+2)}$. (10%)

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