大葉大學九十學年度研究所碩士班招生考試試題紙			
系所 組別	考 試 科 目 （中 文 名 稱）	考 試 日 期	備　　註
電機工程 丁組	控制系統	4 月 22 日 第 3 節	可以使用尺，一般掌上計算器及一般工程用計算器。不用抄題。

1. Given d**x**/dt = **A**x(t) + **B**u(t), y(t)=**C**x(t). **A**=[0 3 1 , **B**=[10 , **C**=[1 0 0]
   2 8 1 0
   -10 –5 2] 0] (10%)
   Use **Routh-Hurwitz** Stability Criterion to determine the **stability** of the system.
2. Given d**x**/dt = **A**x(t) + **B**u(t). **A**=[-3 -3 -1 , **B**=[1
   1 0 0 0
   0 1 0] 0]
   Design a **state-feedback gain K** such that u(t)=-**K***x(t) so that the **eigenvalues** of the closed-loop system are **-2, -2, -2**。 (10%)

3(a). Determine **Z-transform** of a sequence, f(k)=exp(-k), k>=0, and its **region of convergence.** (8**%)**

3(b). Find the **inverse Z-transform** of

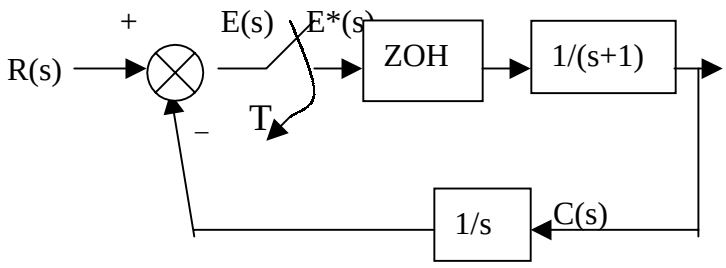
$$F(z) = \frac{z(2z+1)}{(z-1)(z-2)(z-3)}$$ (8%)

3©. Find the **initial and final values of f(k)** if its Z-transform is

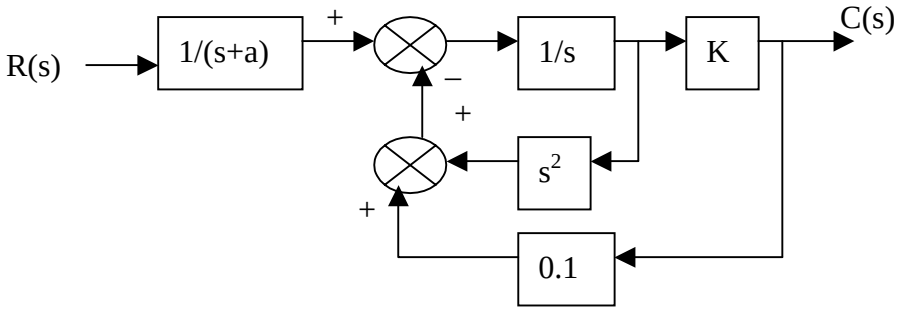
$$F(z) = \frac{0.792z^2}{(z-1)(z^2 - 0.416z + 0.208)}$$ (8%)

4. Given the block diagram of a discrete-time control system as follows, where ZOH is Zero-Order-Hold with its transfer function of $H_o(s)=(1-\exp(-Ts))/s$。T is the sampling period.
   (a). Find **C(s)/R(s) when Ts = 1 sec**. (8%)
   (b). **Discuss its stability**. (8%)

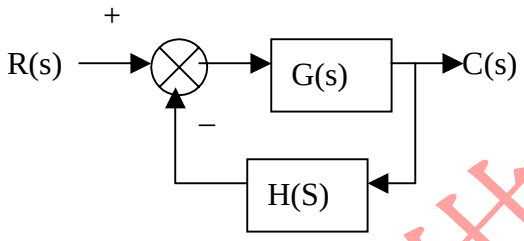
s-domain	z-domain
1/s	$1/(1-z^{-1})$
1/(s+1)	$1/(1-z^{-1}e^{-T})$
$1/s^2$	$Tz^{-1}/(1-z^{-1})^2$



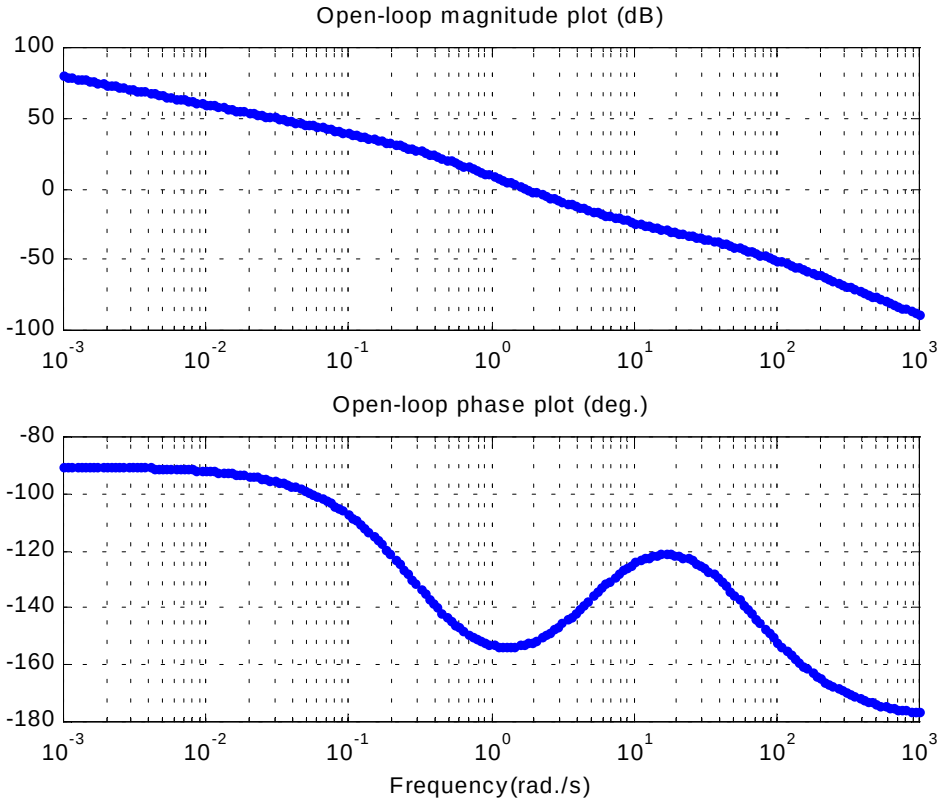
5. Use **Mason's signal flow** graph method to find **C(s)/R(s)**. (10%)



6. Given the block diagram and transfer functions: G(s)=10/[s(s+1)], H(s)=5, find **sensitivity $S^{T(s)}_{G(s)}$ and $S^{T(s)}_{H(s)}$** respectively if T(s) is the closed-loop transfer function of the system when **ω=1 rad/s**. (10%)



7. Given **Bode diagram** of a specified continuous-time control system, **find its 3rd order Transfer function**. (10%)



8. A plant with its transfer function as $G(s)=1/(s^2 + 3s +2)$. If we want to use a continuous-time PID(Proportional-Integral-Derivative) controller with its transfer function $D(s) = (s^2 + 6s + 15)/s$ in cascaded with G(s), **draw its root locus clearly.** (10%)