國立臺灣師範大學 105 學年度碩士班招生考試試題

科目：**自動控制**　　適用系所：**機電工程學系**

注意：1.本試題共 2 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

1. The basic feedback system block diagram is shown in Fig.1. The output $Y(s)$ is influenced by the control signal $U(s)$ and the disturbance signal $W(s)$.

(1)Please find the transfer functions of $\left.\frac{Y(s)}{Y_r(s)}\right|_{W(s)=0}$, $\left.\frac{Y(s)}{W(s)}\right|_{Y_r(s)=0}$, $\left.\frac{E(s)}{Y_r(s)}\right|_{W(s)=0}$, and $\left.\frac{E(s)}{W(s)}\right|_{Y_r(s)=0}$.(20 分)

(2)Please describe why a feedback structure can reduce the effect of disturbances on the controlled output? (10 分)

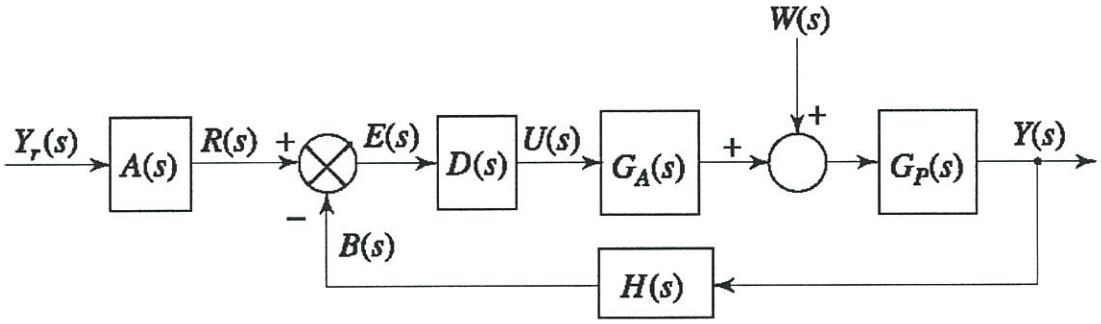

Fig. 1

2. Please use Routh-Hurwitz criterion to find the feedback system which shown in Fig. 2 is stable or not? (10 分)

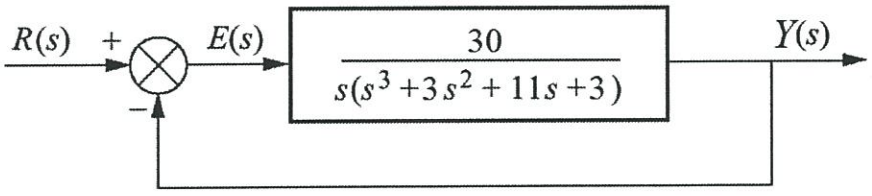

Fig. 2

3. A feedback system is shown in Fig.3. Please calculate the system steady state error with a step input and the sensitivity of the closed-loop transfer function to change in the parameter p. How would you reduce the steady state error and sensitivity in this system?(20 分)

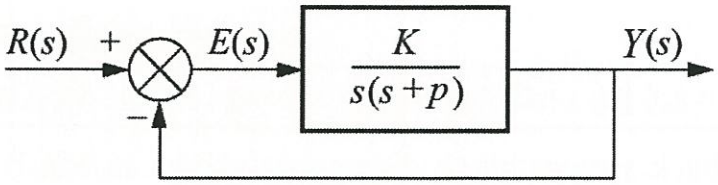

Fig. 3

4. Please sketch a unit step response of a first order unity feedback system with an open loop transfer function $G(s)=\frac{K}{s+\tau}$, and indicate the system time constant and steady state value in this figure.(10 分)

5. Consider a circuit network shown in fig. 4.

(1)Please find the transfer function for the network.(10 分)

(2)Letting R_2 approach to infinity, what are the functions for this network?(5 分)

(3)Removing C_2 (letting C_2=0), what are the functions for this network?(5 分)

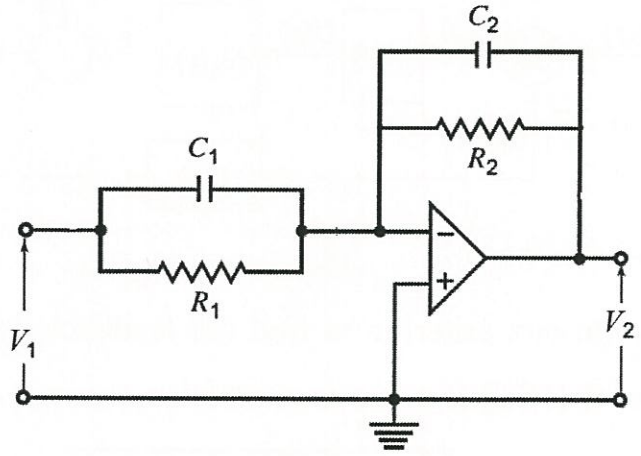

Fig. 4

6. Fig. 5 shows block diagram of a control system. Please calculate the suitable control values for K_p and K_D to let the system specifications are required (maximum overshoot percentage $P.O.\leq 10\%$ and setting time $t_s\leq 0.08$sec). (10 分)

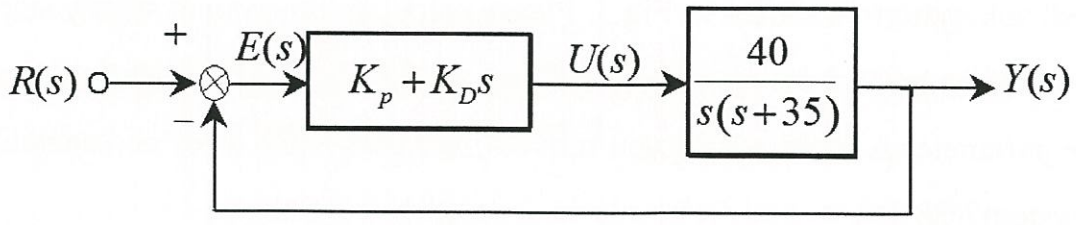

Fig. 5