109MZ04

國立臺北科技大學 109 學年度碩士班招生考試

系所組別：1112 機械工程系機電整合碩士班甲組

第二節　自動控制　試題（選考）

注意事項：

1. 本試題共 5 題，每題 20 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

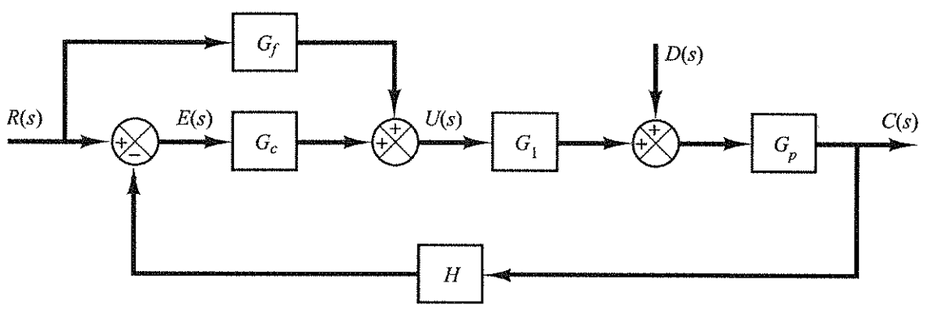
1. The transfer function of a closed-loop control system is given below. Find the impulse response of this system. (20%)

$$M(s)=\frac{Y(s)}{R(s)}=\frac{6(s+3)}{(s+8)(s^2+4s+8)}$$

2. Consider the following closed-loop control system,

(a). Try to find the Transfer Function of $C(s)/R(s)$. (10%)

(b). Try to find the Transfer Function of $C(s)/D(s)$. (10%)



3. Consider the following closed-loop control system, where the transfer function of the plant $G(s)=5/s(s+1)(5s+1)$, and the transfer function of the controller $G_c(s)=K$,

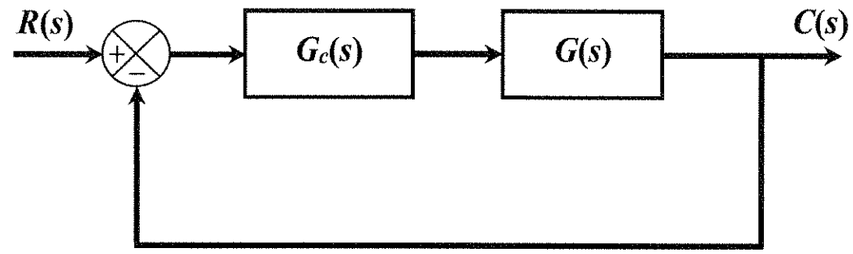
(a). Find the Transfer Function of $C(s)/R(s)$, and check the numbers of closed loop poles and zeros. (6%)

(b). Determine the root locus on the real axis. (2%)

(c). Determine the angles and centroid of the asymptotes. (4%)

(d). Determine the breakaway point. (4%)

(e). Determine the points of the root locus crossing the imaginary axis, and the corresponding value of K. (4%)



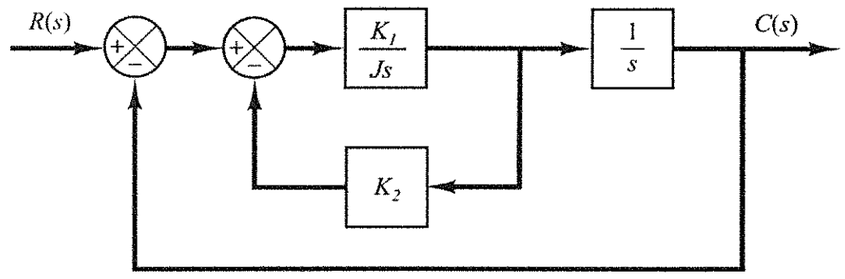
4. Consider the following closed-loop control system, where the maximum overshot M_p=25%, and the peak time $t_p=2$ sec, when subject to a unit step input. ($J=1\text{kg-m}^2$)

(a). (4%) Find the closed-loop transfer function $C(s)/R(s)$.

(b). (5%) Try to find the damping ratio ζ of this system.

(c). (5%) Try to find the undamped natural frequency ω_n of this system.

(d). (6%) Try to decide K_1 and K_2.



注意：背面尚有試題

5. Consider a feedback control system given below, where the transfer function of the plant $G(s) = 2(s-1)/(s+2)^2(s^2+2s+2)$, and the transfer function of the controller $G_c(s)$, If $G_c(s) = K$,

   (a). Determine the range of K, so that the unit-feedback control system is stable. (4%)
   (b). Determine the range of K, so that there is only one unstable pole in the system. (4%)
   (c). Determine all the root locus crossing points on the imaginary axis. (4%)
   (d). Determine the departure angle of its root locus at the complex poles. (4%)
   (e). If $G_c(s) = K/(s+a)$, and a pair of the system poles are located at $-1 \pm 1.5j$, please determine K and a. (4%)