

國立臺北科技大學 102 學年度碩士班招生考試

系所組別：2130 電機工程系碩士班丙組

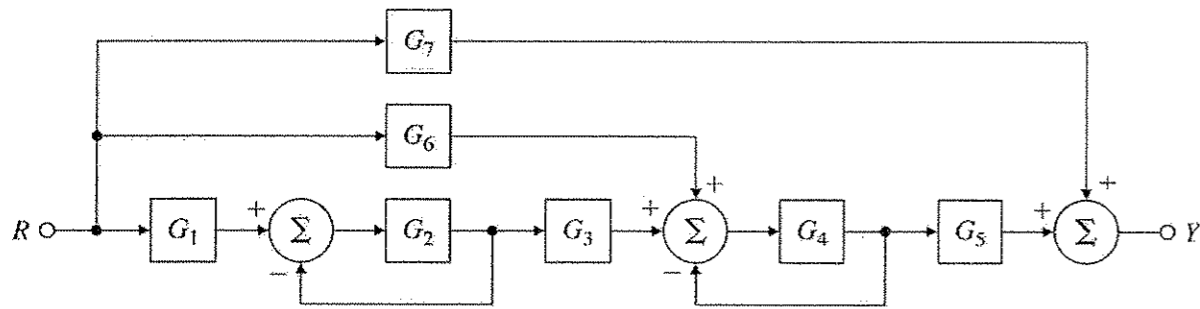
第一節 控制系統 試題

第一頁 共一頁

注意事項：

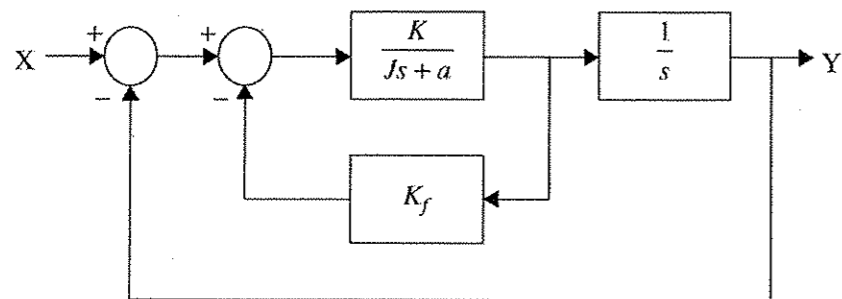
1. 本試題共 5 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Find the transfer function for the following block diagram. (20%)

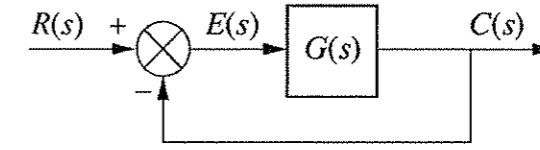


2. For the following block diagram of a servomotor with $J=1 \text{ kg}\cdot\text{m}^2$ and $a=1 \text{ N}\cdot\text{m}/\text{rad}/\text{sec}$, if the maximum overshoot and the peak time of the unit-step input are 0.2 and 0.1 sec., respectively,

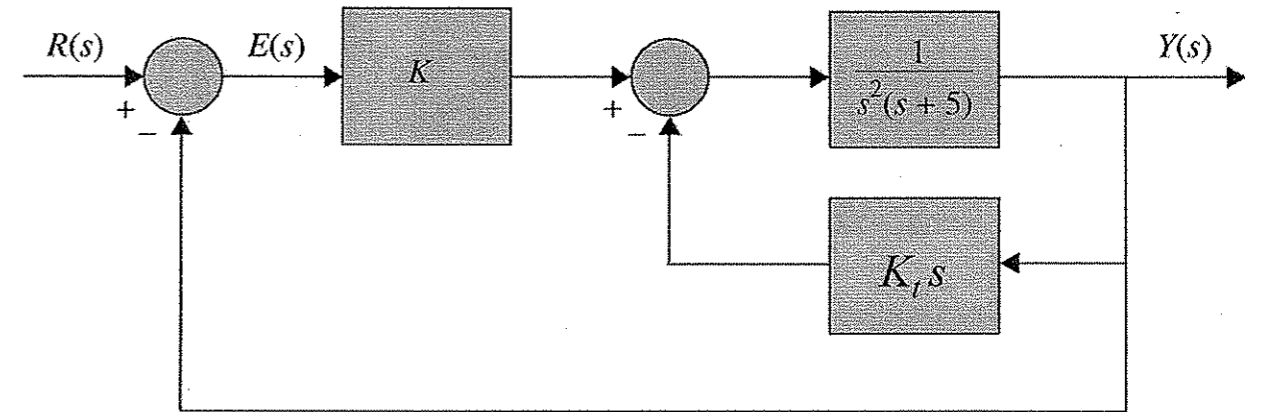
- a) Find its damping ratio and natural frequency. (10%)
- b) Find the gain K and velocity feedback K_f . (10%)



3. For the following unity feedback system with $G(s) = \frac{K(s+4)}{s(s+0.5)(s+1)(s^2+0.4s+4)}$, find the range of K for stability. (20%)



4. For the following control system with tachometer feedback and $K=10$, construct the root locus of the characteristic equation for $K_t \geq 0$. (20%)



5. For the following system,

- a) Determine the controllability and observability. (10%)
- b) Consider that output feedback is applied by feeding back y_2 to u_2 ; that is, $u_2 = -ky_2$, where k is a real constant. Determine how the value of k affects the controllability and observability. (10%)

