

115EE09

國立臺北科技大學 115 學年度碩士班招生考試

系所組別：2132 電機工程系碩士班丙組

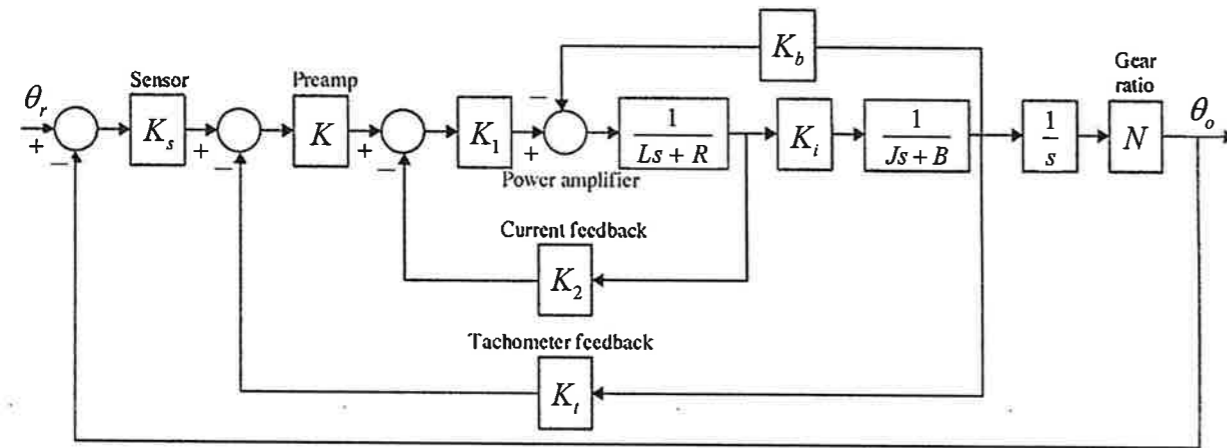
第一節 控制系統 試題 (選考)

第 1 頁 共 1 頁

注意事項：

1. 本試題共 3 題，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. Considering the following position-control system of an electronic word processor.



15% (a) Find the equivalent transfer function $\theta_o(s)/\theta_r(s)$.

10% (b) Let $R = 1 \Omega$, $L = 0.5 \text{ H}$,

$$J = 0.01 \text{ kgm}^2, B = 0.05 \text{ Nms/rad}, N = 1,$$

$$K = 50, K_1 = 10, K_2 = 0.5, K_s = 1, K_i = 0.1, K_t = 0.01, K_b = 1.$$

Find out how many poles of the closed-loop system are in the right half-plane, left half-plane, and on the $j\omega$ -axis.

- 5% (c) Find a value of the gain K such that the steady-state error of the system in (b) is defined.
- 5% (d) Consider the system in (b), find the value of gain K that makes the system critically stable.
- 5% (e) Consider the system in (d), find out how many poles of the closed-loop system are in the right half-plane, left half-plane, and on the $j\omega$ -axis.

2. Given the unity feedback system with the plant $G(s) = \frac{K(s+1)}{s(s+10)}$.

10% (a) When $K = 1$, draw the Nyquist diagram.

10% (b) Use the Nyquist criterion to find the range of gain K for stability.

3. For the unity feedback system with the plant $G(s) = \frac{K}{s(s+1)(s^2+4s+13)}$.

10% (a) Sketch the root locus.

5% (b) Find the break-in or break away point.

5% (c) Find the range of K for stability.

5% (d) Find the $j\omega$ -axis crossing.

5% (e) Find the departure angle from the open-loop pole $-2+j3$.

10% (f) Find the sensitivity of the steady-state error to changes in parameter K with unit step input.