

國立臺北科技大學 114 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

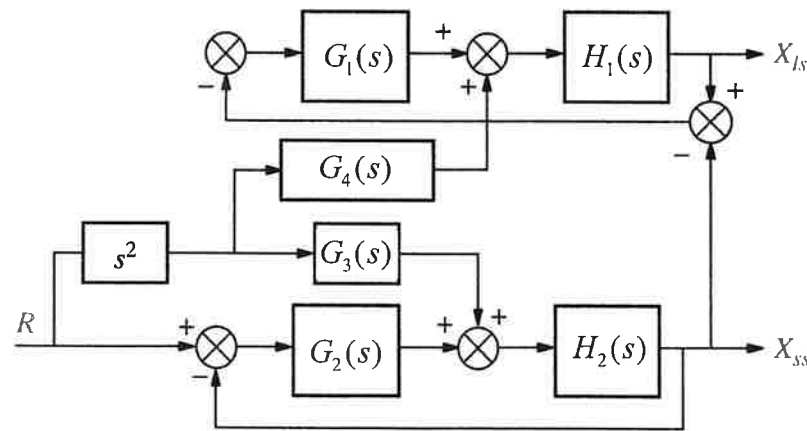
注意事項：

1. 本試題共 4 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. For the unity feedback system with the plant $G(s) = \frac{10}{s^7 + 2s^6 - 3s^5 - 10s^4 - s^3 - 2s^2 + 3s}$.

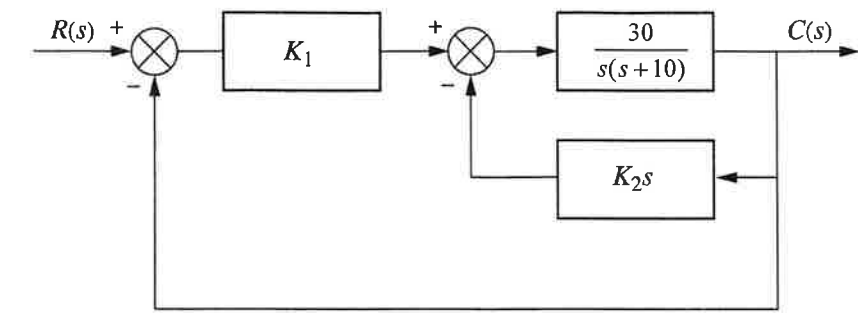
- 10% (a) Find out how many poles of the plant $G(s)$ are in the right half-plane, left half-plane, and on the $j\omega$ -axis.
- 10% (b) Find out how many poles of the closed-loop system are in the right half-plane, left half-plane, and on the $j\omega$ -axis.
- 5% (c) Determine the system type and the value of the appropriate static error constant of the closed-loop system.

2. Given the following system.



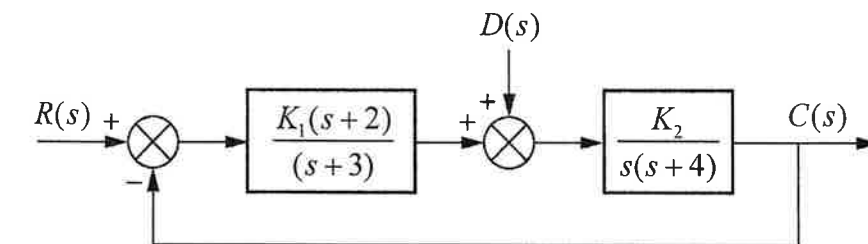
- 5% (a) Draw the signal-flow graph of the whole system.
- 10% (b) Use Mason's rule to find the transfer function $X_{ss}(s)/R(s)$.
- 10% (c) Use Mason's rule to find the transfer function $X_{ls}(s)/R(s)$.

3. Given the following system.



- 5% (a) Find the equivalent transfer function $C(s)/R(s)$.
- 5% (b) Find the values of K_1 and K_2 to yield a 16% overshoot and a settling time of 0.2 sec. for the closed-loop system's step response.
- 10% (c) Sketch the root locus for the variations in the value of $K_1 \geq 0$, when $K_2 = 1$.
- 10% (d) Sketch the root locus for the variations in the value of $K_2 \geq 0$, when $K_1 = 1$.

4. Given the following system with the step inputs for both the input $R(s)$ and the disturbance $D(s)$.



- 10% (a) Find the total steady-state error.
- 10% (b) Find the sensitivity of the steady-state error for changes in K_1 and K_2 .