

# 國立臺北科技大學 112 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

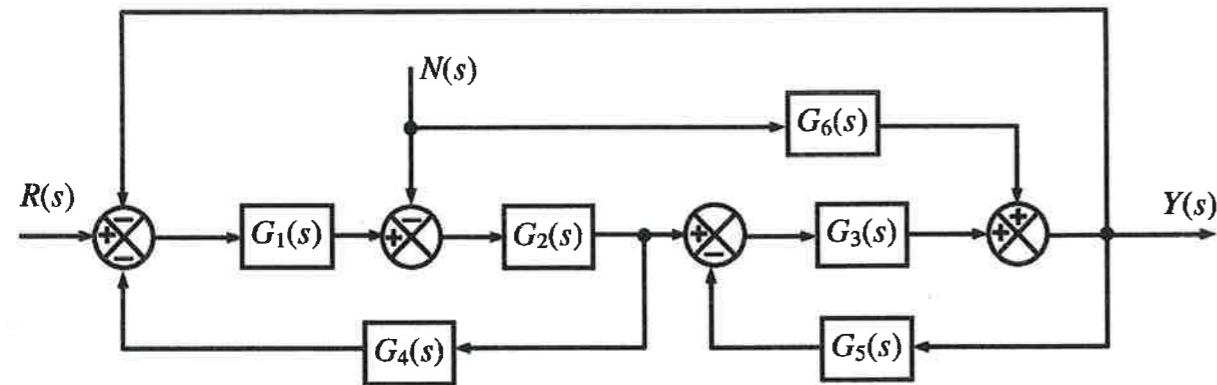
## 第一節 控制系統 試題 (選考)

第 1 頁 共 1 頁

### 注意事項：

1. 本試題共四題，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. Consider the following system:



10% (a) Find the equivalent transfer function  $Y(s)/R(s)$  when  $N(s) = 0$ .

10% (b) Find the equivalent transfer function  $Y(s)/N(s)$  when  $R(s) = 0$ .

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

10% (a) Sketch the root locus when  $K \geq 0$ .

10% (b) Find all of the breakaway and break-in points.

10% (c) Find the range of gain  $K$  such that the system is stable.

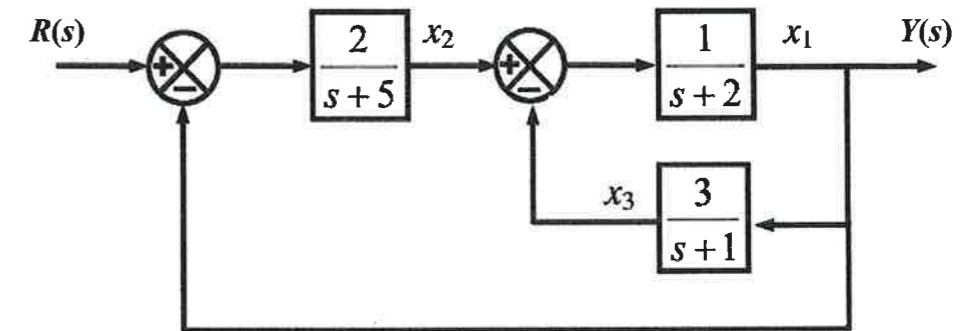
3. Given the negative feedback system with the plant  $\frac{6}{(s+1)(s+2)}$  and the feedback  $\frac{1}{s+p}$ .

10% (a) Draw the block diagram of this negative feedback system and find its equivalent transfer function.

10% (b) Sketch the root locus for this negative feedback system when  $p \geq 0$ .

10% (c) Find the range of gain  $p$  such that the system is stable.

4. Consider the following system:



10% (a) Find the transfer function from  $R(s)$  to  $Y(s)$ .

10% (b) Write state equations for the system using the state-space representation.

$$\text{i.e., } \dot{X}(t) = [x_1(t) \ x_2(t) \ x_3(t)]^T,$$

$$\dot{X}(t) = AX(t) + Br(t)$$

$$y(t) = CX(t) + Dr(t)$$