

國立高雄應用科技大學
九十七學年度碩士班招生考試
電機工程系（乙組）

准考證號碼 （考生必須填寫）

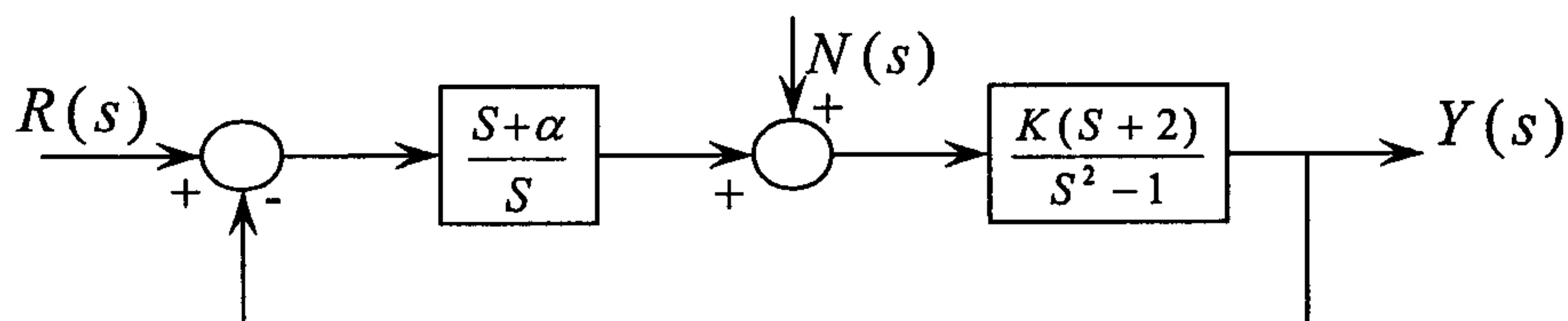
控制系統

試題 共 2 頁，第 1 頁

- 注意：a. 本試題共 5 題，每題 20 分，共 100 分。
b. 作答時不必抄題。
c. 考生作答前請詳閱答案卷之考生注意事項。

(1). For the system shown as below:

- (a). Find the region in the k versus α plane for system to be asymptotically stable
(b). Let $\alpha=3$, $k=2$, and $N(s)=1/s$, $r(t)=0$, find steady-state value of $y(t)$



- (2). Sketch the Nyquist plot of the above system at $\alpha=3$ and $k=2$, then use Nyquist stability criterion to explain why the system is stable
- (3). A system has the loop gain transfer function: $G(s)H(s) = \frac{50}{(s+1)^3}$, find the phase crossover frequency ω_{pc} and the gain margin GM.

(4). For the system represented by:

$$\dot{x}(t) = Ax(t) + Bu(t) \quad y(t) = Cx(t)$$

where $A = \begin{bmatrix} -2 & 1 \\ 1 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ $C = [1 \quad 2]$

- (a) Prove that the system is controllable and observable.
- (b) Using state feedback $u(t) = -kx(t) + r$, where $k = [k_1 \ k_2] = [1 \ k_2]$ is the feedback gain, r is the reference input, find k_2 to put the new poles at $P = [-1 \ -2]$
- (c). Show that the new system is unobservable, explain the possible reason to cause it becoming unobservable.
- (5). A sampled-data system with sampling period T and zero order hold is shown as below:
- (a) Find its closed-loop z -transfer function $Y(z)/R(z)$
- (b) Find the maximum value of T for which the system is stable.

