

國立臺北科技大學 107 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

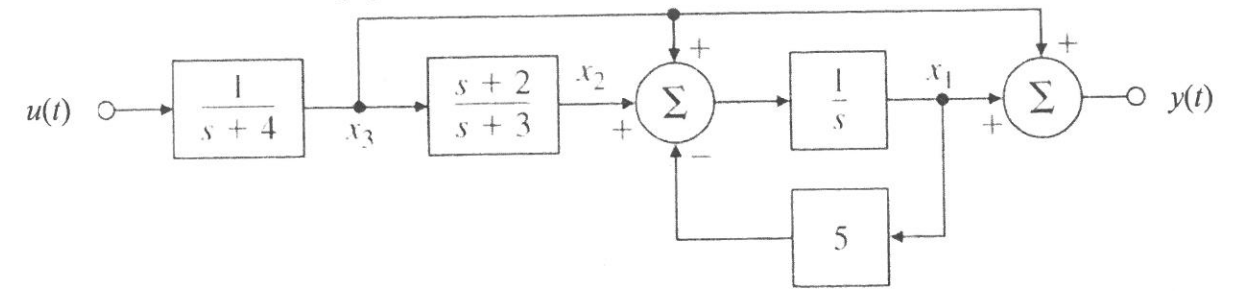
第一節 控制系統 試題 (選考)

第一頁 共一頁

注意事項：

1. 本試題共四題，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。

4. Consider the following system:



15% (a) Find the transfer function from $U(s)$ to $Y(s)$.

15% (b) Write state equations for the system using the state-space representation.

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

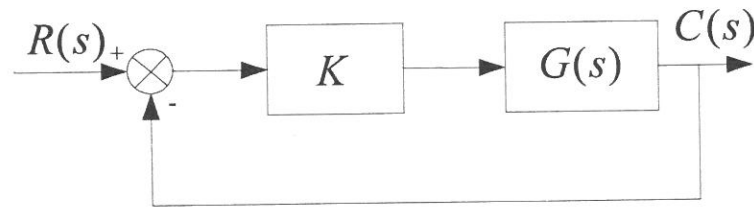
$$\dot{X}(t) = AX(t) + Bu(t)$$

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

1. Find peak time, settling time, and percent overshoot for the following step response $c(t)$, which can be approximated as a second-order response (15%):

$$c(t) = 0.009804 - 0.0001857e^{-10t} - 0.009990e^{-2t} \cos(10t) - 0.001942e^{-2t} \sin(10t)$$

2. Considering the following system, where $G(s) = \frac{K}{(s+1)(s+2)(s+3)(s+4)}$.



10% (a) Sketch the root locus.

10% (b) Find the asymptotes and the breakaway points.

10% (c) Find the range of gain K for system stability.

3. Given the unity feedback system with the plant $G(s) = \frac{K}{s(s+5)(s+7)}$.

15% (a) Sketch the Nyquist diagram for the system with $K = 1$.

10% (b) Find the range of gain K for stability, instability, marginal stability.