

# 國立臺北科技大學 102 學年度碩士班招生考試

系所組別：1112 機電整合研究所甲組

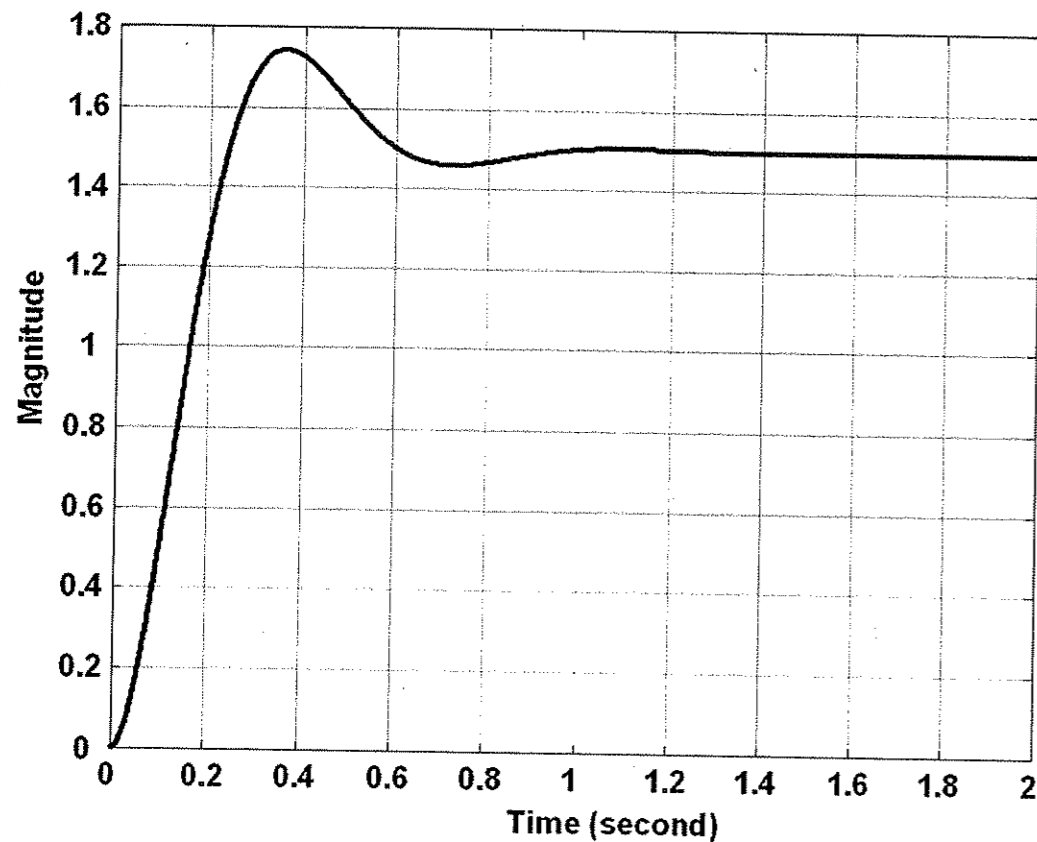
## 第二節 自動控制 試題 (選考)

第一頁，共一頁

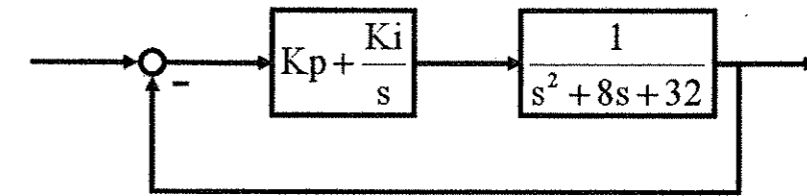
### 注意事項：

1. 本試題共 5 題，配分共 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。

1. (15%) Consider a control system that has the transfer function  $G(s) = \frac{C}{s^2 + As + B}$  and the unit-step response shown in the following figure. Determine the coefficients A, B, and C.



2. Consider the feedback control system shown in the following figure.  
 (a) (5%) Determine the conditions for which the feedback control system is BIBO stable.  
 (b) (20%) Sketch the root loci for when  $K_p = 0$  and  $K_i > 0$ .



3. Consider a feedback control system that has a loop transfer function with a DC gain of 10.0 and corner frequencies at 1.0 rad/sec and 10.0 rad/sec. For this system,  
 (a) (10%) Sketch the Bode plot of the loop transfer function.  
 (b) (10%) Determine its gain margin and phase margin.
4. (20%) For a given control system with transfer function  $G(s)$ , describe the reason why its frequency response can be obtained by setting  $s = j\omega$ , i.e., why its frequency response in magnitude and phase can be obtained by  $|G(j\omega)|$  and  $\angle G(j\omega)$ , respectively.
5. (20%) Consider a discrete-time SISO system with the difference equation
- $$x(k+1) = Ax(k) + bu(k), \text{ where } A = \begin{bmatrix} -2 & -4 & -1 \\ 1 & 2 & 0 \\ 2 & 1 & 0 \end{bmatrix} \text{ and } b = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}.$$
- Design the deadbeat control gain  $K$  using the state feedback control law  $u(k) = -Kx(k)$ .