國立中央大學103學年度碩士班考試入學試題卷

所別：電機工程學系碩士班 系統與生醫組(一般生) 科目：控制系統 共 1 頁 第 1 頁

本科考試禁用計算器 *請在試卷答案卷（卡）內作答

1. A system is given by

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

and assume that you are using feedback of the form u=-Kx+r, where r is a reference input signal.

(a) Show that (A, C) is observable. (10)

(b) Show that there exists a K such that (A-BK, C) is unobservable. (10)

2. A system shown in Fig. 1:

(a) Find the transfer function from U to Y. (10)

(b) Write the state equation for the system using the state-variables indicated. (10)

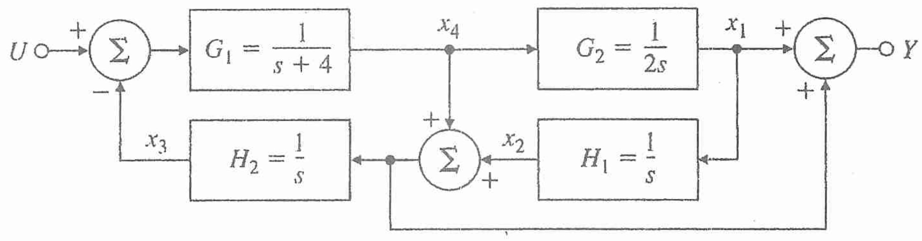

Fig. 1

3. What is the main advantage in control design of counting the encirclements of $-1/K$ of $D(j\omega)G(j\omega)$ rather than encirclements of -1 of $KD(j\omega)G(j\omega)$? (20)

4. For the system shown in Fig. 2, find the value of the gain K that results in dominant closed-loop poles with a damping ratio ξ=0.6. (20)

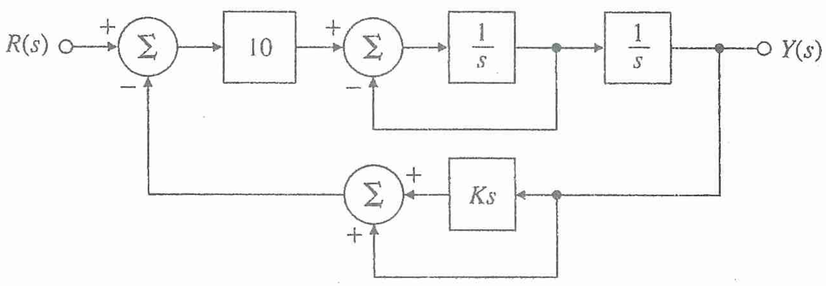

Fig. 2

5. A system given in Fig. 3.

(a) Find the transfer function from the reference input to the tracking error. (10)

(b) For inputs of the form $r(t)=t^n 1(t)$ (where n< q) with zero steady − state error, what constraint is placed on the open − loop poles $p_1, p_2, \ldots, p_q$? (10)

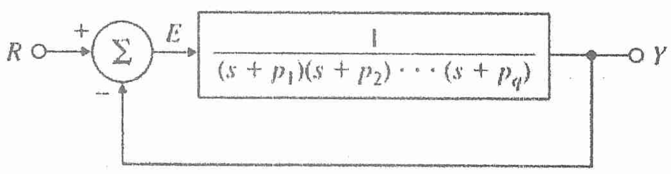

Fig. 3

參考用