國　立　清　華　大　學　命　題　紙

95 學年度 電機領域聯合招生 系（所） 組碩士班入學考試

科目 控制系統 科目代碼 9910 共 2 頁第 1 頁 *請在【答案卷卡】內作答

1. Consider the following linear dynamical system

$\dot{X} = AX + BU$

$Y = CX$

(i) Please state the separation principle for this system.

(ii) Under what conditions, the separation principle will be true for a general dynamical system. (25%)

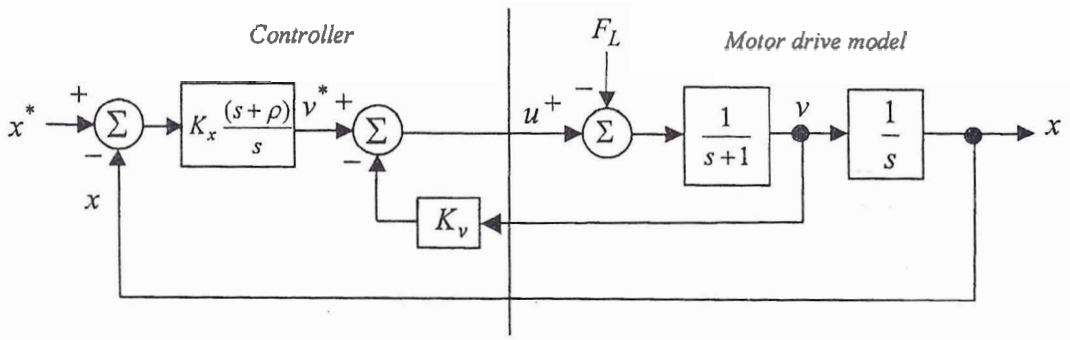
2. For the servo control system as shown: (25%)

(1) Derive the closed-loop tracking transfer function $H_{dr}(s) \overset{\Delta}{=} \left.\dfrac{x(s)}{x^*(s)}\right|_{F_L(s)=0}$.

(2) If it is desired to assign the closed-loop poles at $-10 \pm j10$ and -10, find the controller parameters K_v, K_x and ρ.

(3) Find the zero of the closed-loop tracking transfer function.

(4) Find the steady-state value of output x due to: (a) unit-step load force disturbance change; (b) unit-ramp load force disturbance change.



3. Consider the following system (25%)

$$x(k+1)=\begin{bmatrix}0.5 & 1\\ 0 & -0.5\end{bmatrix}x(k)+\begin{bmatrix}0\\ 1\end{bmatrix}u(k)$$

$$y=[1 \quad 0]x(k)$$

(a) Is this system stable ?

(b) How to control the system by state feedback with all system poles at 0 ?

(c) How to control the system by state-estimation-based output feedback with all system poles at 0 ?

4. Consider the following polar plots in which (a) and (b) are minimum-phase system and (c) is nonminimum-phase system. Write the possible corresponding transfer function and the root locus.

(a) (b) (c)

(25%)