工

自動控制: Date: March 28, 2005

1. If the type of feedback controller (i.e., PID controller) has been selected, we still have the problem of deciding what values to use for its adjusted parameters. This is known as the controller tuning problem. Please describe the general approaches that we can use for tuning a controller from classical and intelligent control theory plus the advantages and disadvantages of these two approaches. ***(10 %)***

2. (a) Please describe how to model a second-order system. A second-order linear differential equation is as follows. (b) How it responds to a unit step change *(20%)*

$$a_2 \frac{d^2 y}{dt^2} + a_1 \frac{dy}{dt} + a_o y = bf(t)\text{, where } a_2, a_1, a_o, and\ b \text{ are all constants}$$

3. If the closed-loop system of Fig. 2 is stable, please decide what kind range of K_c in the following two questions. *(20 %)*

(a) $G_p = \frac{5}{s-1}$, $G_c = K_c$

(b) $G_p = \frac{1}{s^2 + 2s + 2}$, $G_c = K_c(1 + \frac{1}{\tau_I s})$, where $\tau_I = 0.5$

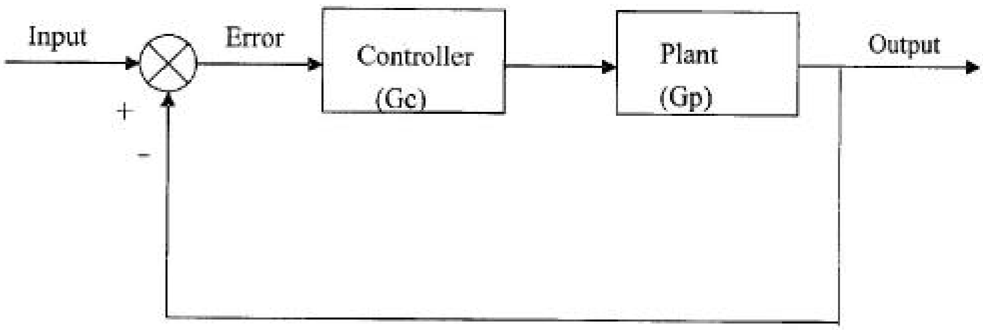

Figure 2 Block diagram of the closed-loop system

根據下列的連續系統

$$\frac{d}{dt}\begin{Bmatrix} x \\ v \end{Bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & -4 \end{bmatrix}\begin{Bmatrix} x \\ v \end{Bmatrix} + \begin{Bmatrix} 0 \\ 1 \end{Bmatrix} u(t)$$
$$y = \{1 \quad 0\}\begin{Bmatrix} x \\ v \end{Bmatrix} \tag{1}$$

計算

1. Transfer function model Y(s)/U(s);(5%)
2. 求出其離散系統的 poles 與 zeros.(5%)
3. 在取樣率 h=0.2 秒下，其 zero-order-hold 離散系統的數學模型;(5%)
4. 根據項目 3 的模型，設計一項 state feedback dead-beat controller;(15%)
5. 根據離散系統的 transfer function model 設計一項 pole-placement 控制器,使閉路系統的極點具有ζ=0.8 的阻尼比與ω_n=8 的極點,而且具有積分控制的作用 (15%)
6. 加入 feedforward transfer function 使閉路系統的 steady state gain 為 1 (5%)