

國立臺北科技大學 102 學年度碩士班招生考試

系所組別：1512 自動化科技研究所甲組

第二節 自動控制 試題 (選考)

第一頁 共二頁

注意事項：

1. 本試題共五題，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。

一、Consider the system shown in Fig. 1.

1. Find the steady-state error e_{ss} for a unit-ramp input $r(t) = t$. Note that the error $e(t)$ is given by $r(t) - c(t)$. (10%)

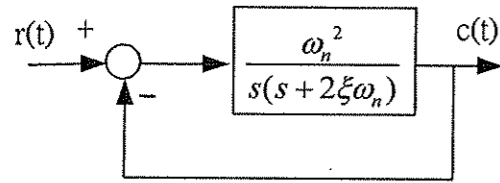


Fig. 1

2. Show that the steady-state error may be eliminated if the input is introduced to the system through a proportional-plus-derivative filter, as shown in Fig. 2. Please find the value of k so that $e_{ss} = 0$. (10%)

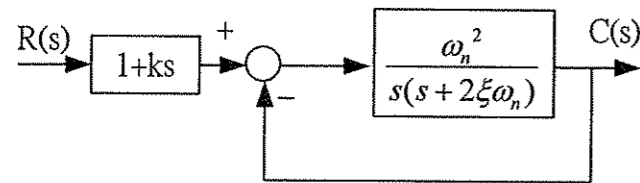


Fig. 2

二、Consider the system shown in Fig. 3.

1. Obtain the error signal when both the reference input $R(s)$ and disturbance input $D(s)$ are present. (10%)

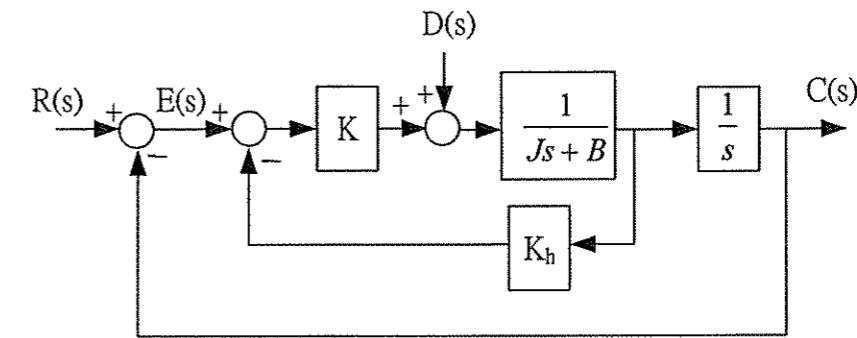


Fig. 3

2. Obtain the steady-state error when the system is subjected to a reference input $r(t) = t$ (unit ramp input) and disturbance input $d(t) = d$ (step input of magnitude d). (10%)

三、1. Sketch the root loci of the control system shown in Fig. 4. (10%)

2. Determine the range of gain K for stability. (10%)

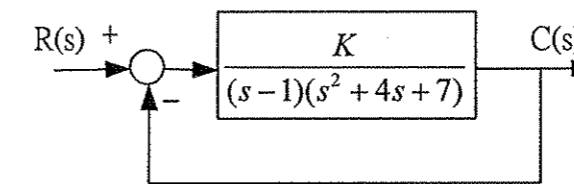


Fig. 4

注意：背面尚有試題

四、Obtain the transfer function of the mechanical system as shown in Fig. 5. Assume that the displacement x_i is input and the displacement x_o is the output. (20%)

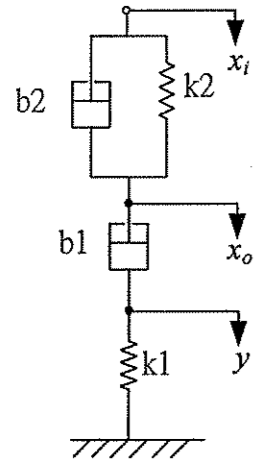


Fig. 5

五、Consider the control system as shown in Figure 6. Design a lag compensator $G_c(s)$ such that the static velocity error constant $K_v=50$ without appreciably changing the location of the original closed-loop poles, which are $s = -2 \pm j\sqrt{6}$.

(20%)

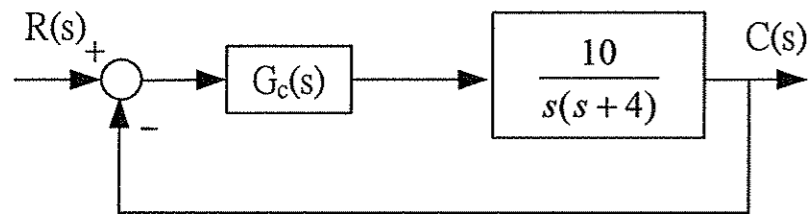


Fig. 6