所別：機械工程學系碩士班 丁組(系統)(一般生)　科目：自動控制　共 2 頁　第 1 頁
光機電工程研究所碩士班 甲組(機電系統控制)(一般生)
生物醫學工程研究所碩士班 不分組(一般生)

＊請在試卷答案卷（卡）內作答
＊本科考試可使用計算器，廠牌、功能不拘

1. A unity feedback system with open-loop transfer function $1/(s+4)$ is controlled by an integral controller of gain K_I. Please find the range of values of K_I for which system is underdamped. (20pts)
2. Please answer the following question according to Figure 1:
   (a) Qualitatively plot the root loci of a system having 3 stable poles with a zero at A, B, C, respectively (5 pts). What is your observation regarding to moving a zero from A, B to C ? (5 pts).

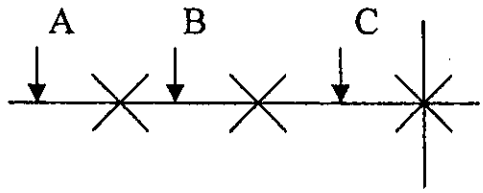

Figure 1

   (b) If the pole at the origin is a controller pole and its zero is located at C, what controller is this (5 pts)? What does the controller do (5 pts)?
3. Consider a unity feedback system, as shown in Figure 2, with a closed-loop transfer function being $C(s)/R(s)=(Ks+b)/(s^2+as+b)$. (a) Determine $E(s)/R(s)$ (5 pts). (b) Determine its open loop transfer function (10 pts). (c) Find static velocity error constant K_v (5 pts)

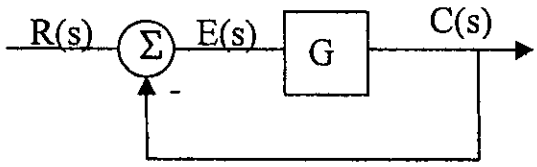

Figure 2

4. Consider the feedback system as shown in Figure 3 (in next page). If

$$G(s)=\frac{\sqrt{34}}{s(s+1)(s+4)},$$

please
   (a) draw the polar plot for *G(s)* as clear as possible (8pt) ,
   (b) find the gain margin (3pt) and phase margin (6pt) for *G(s)*, and
   (c) find the range for *K* to stabilize the overall system. (3pt)

參考用

注意：背面有試題

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5. Consider the feedback system as shown in Figure 3. If the Bode plot of *G(s)* is shown in Figure 4, please answer the following questions.

(a) Is the overall closed system stable or unstable? (4pt) Why? (3pt) (Please explain your reasons as clear as possible.)

(b) What is the order of the *G(s)* ? (3pt) Why? (3pt)

(c) For *K=1*, please find the steady state error for the system when the input is chosen as an unit step input (i.e. *R(s)=1/s*). (4pt) Why? (3pt)

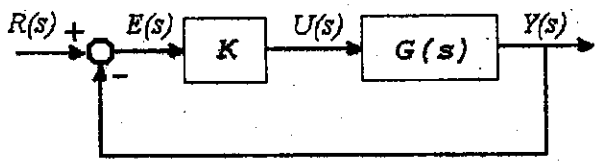

Figure 3

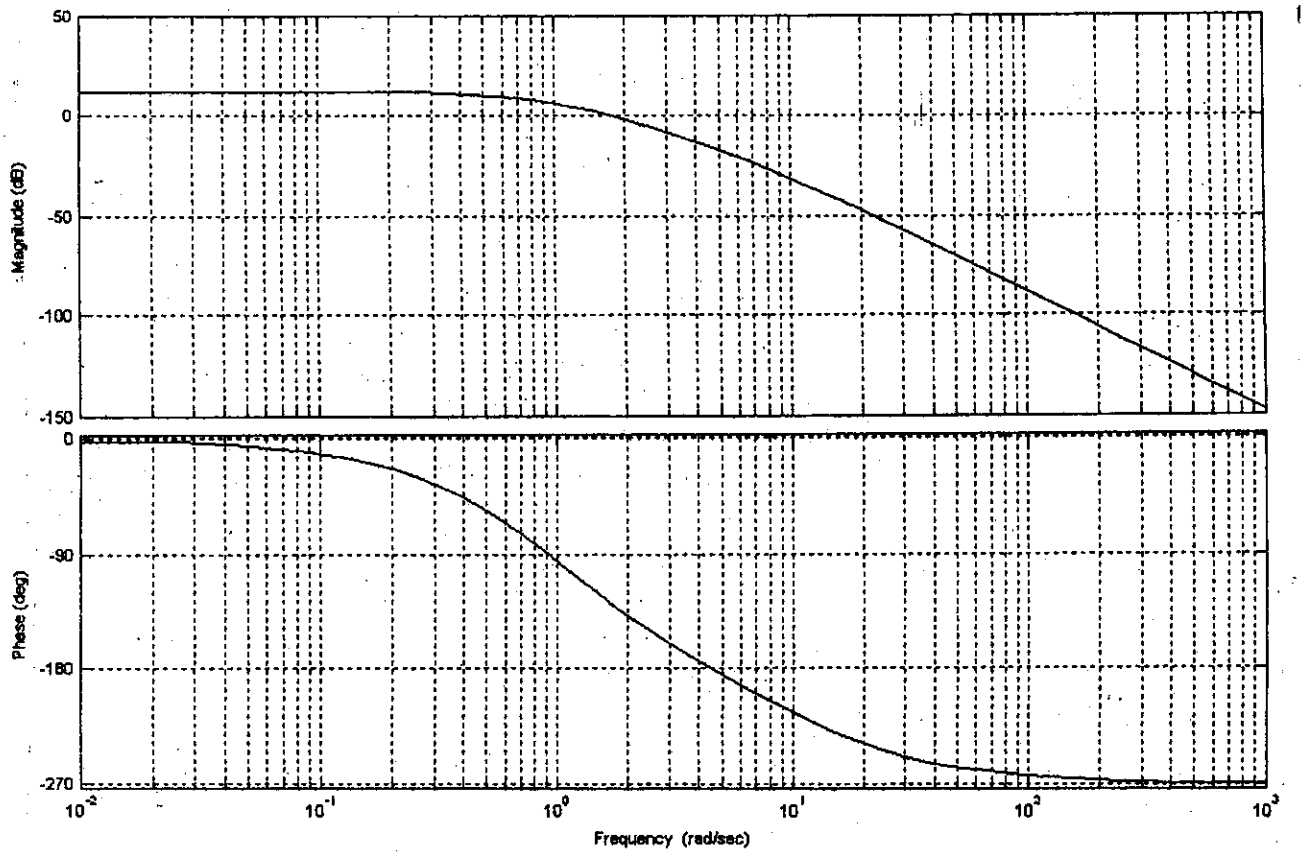

Figure 4

注意：背面有試題