國立臺北科技大學

九十三學年度車輛工程系碩士班入學考試

自動控制試題

填准考證號碼

注意事項：

1. 本試題共六題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. A transfer function of the control process is described as
   (a)Write a state-space dynamic equation of the controllability canonical form. (5%)
   (b)If the system has a feedback control law as , determine the matrix K such that the closed-loop system poles located at . (5%)
   (c)Determine the gain matrix L of the state observer, which satisfy poles of the estimation error to locate at . (5%)
   (d)Find the controller's transfer function . (5%)

2. A block diagram of the control system is shown in Fig. 1. If the system input is a ramp function $r(t)=at$, $t\geq 0$. Please find parameters K_a and K_b such that the system's damping ration is 0.5 and the system stead-state error is zero. (15%)

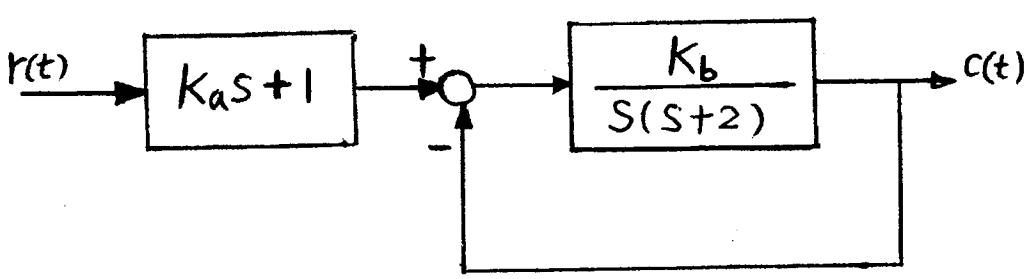

Fig. 1

3. A *RLC* circuit diagram is shown in Fig. 2.

(a) Plot the block diagram of the system. (10%)

(b) Determine the transfer functions $\frac{E_o(s)}{E_i(s)}$ and $\frac{E_o(s)}{E_n(s)}$. (10%)

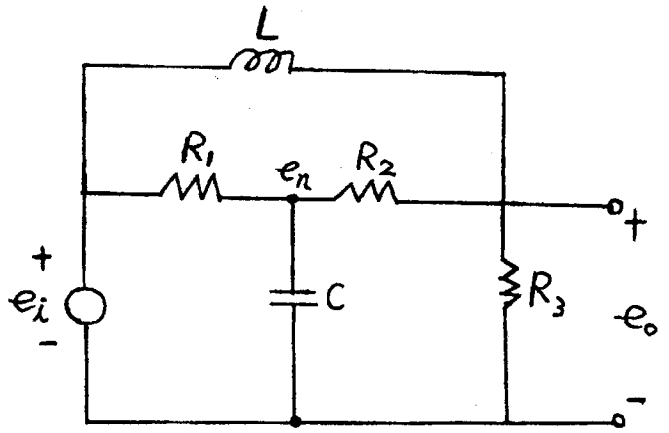

Fig. 2

4. A mechanical vibration system consists of a mass *M*, a spring *K* and a damper *B*, which is shown in Fig. 3(a). When 2 N of force *f* (step input) is applied to the system, the mass vibration response curve of the system is plotted in Fig. 3(b). Determine the parameters *M*, *B* and *K* from this response curve. (15%)

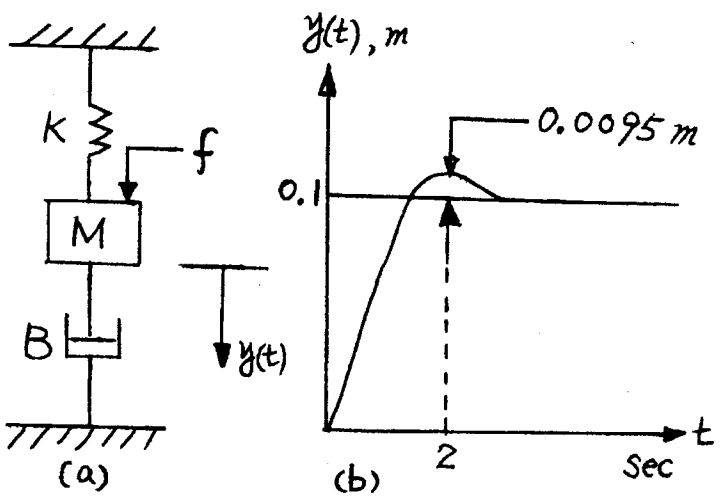

Fig. 3

注意：背面尚有試題

5. Consider a feedback control system is shown in Fig. 4(a). The open-loop transfer function $G(s)$ is asymptotically stable, which Nyquist plot is shown in Fig. 4(b).

(a) What is the type of $G(s)$? Explain your reason. (5%)

(b) What is the stable range of parameter K for the closed-loop system? (5%)

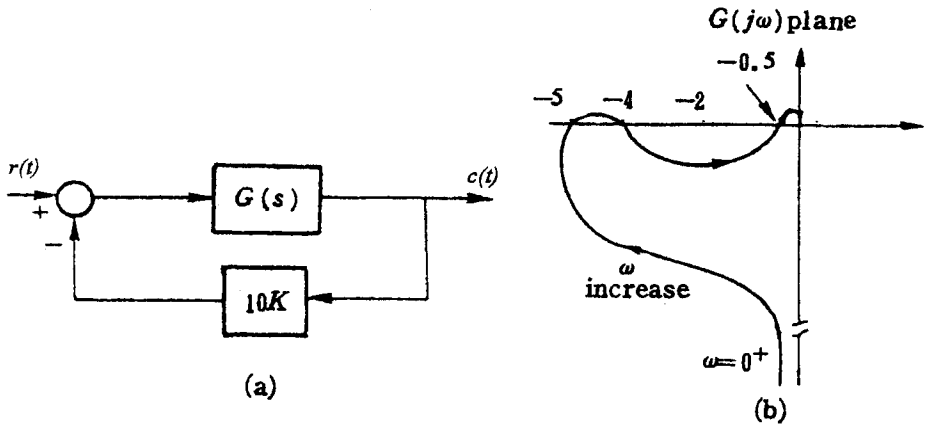

Fig. 4

6. A block diagram of the control system is shown in Fig. 5. Please add a cascade compensator $H(s)$, a controller's gain A, and the feedback coefficients k_1, k_2 and k_3 such that the transfer function of the closed-loop system become of $\frac{Y(s)}{R(s)}=\frac{4(s+2)}{(s+2)^2+4}$.

(20%)

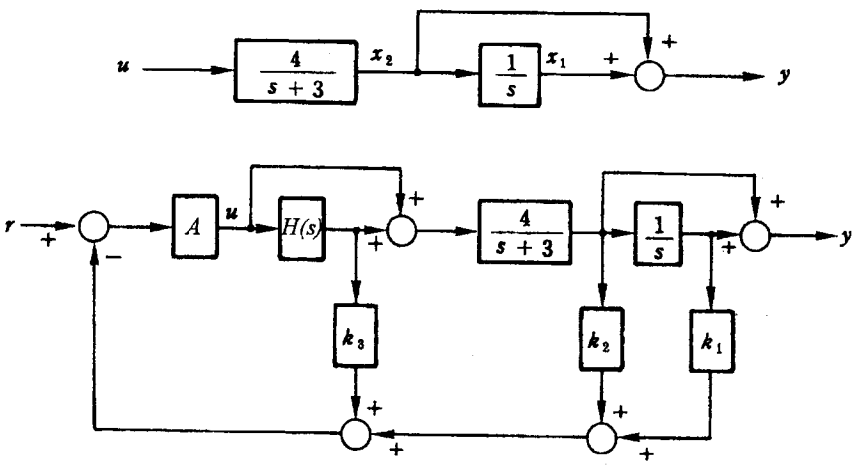

Fig. 5