

國立高雄應用科技大學
九十七學年度碩士班招生考試
機械與精密工程研究所（乙組）

准考證號碼 （考生必須填寫）

自動控制

試題 共 3 頁，第 1 頁

- 注意：a. 本試題共 5 題，每題 20 分，共 100 分。
b. 作答時不必抄題。
c. 考生作答前請詳閱答案卷之考生注意事項。

1. Consider the following block diagram of a system, find the closed-loop transfer function $C(s)/R(s)$. (20%)

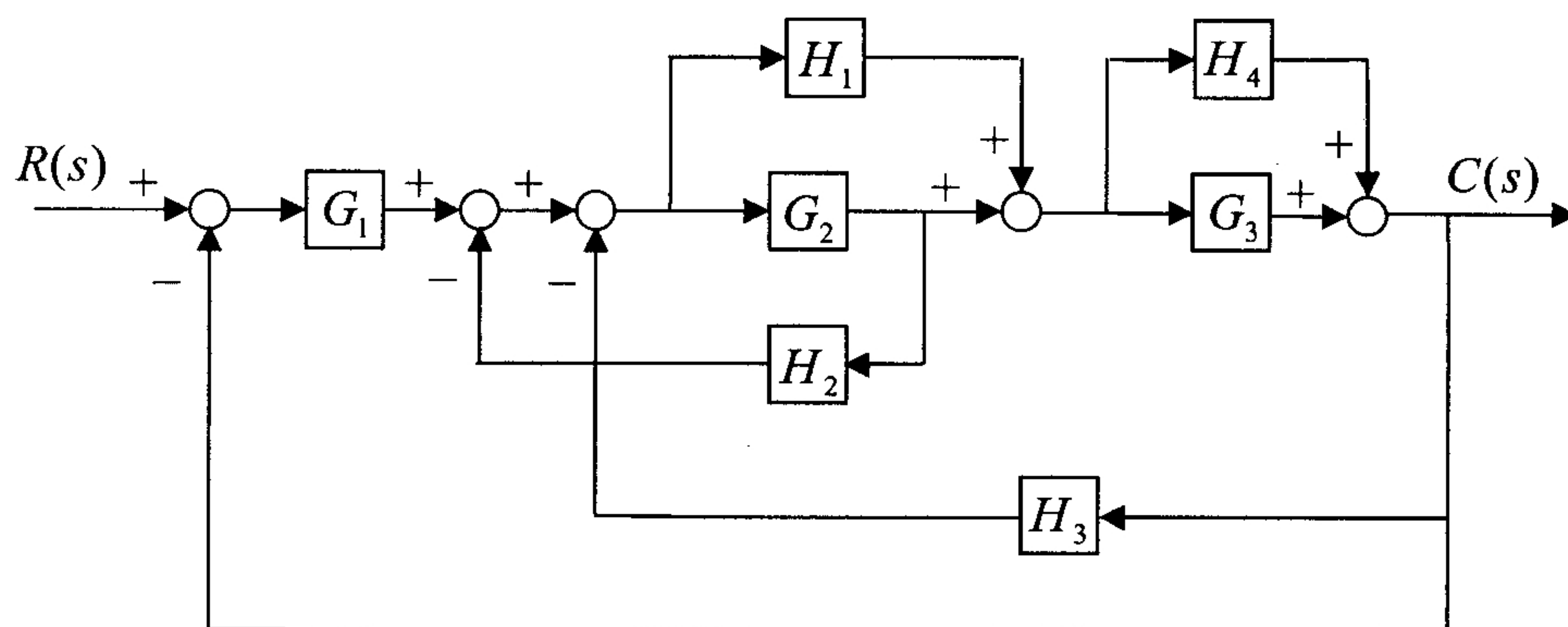


Fig. 1

2. Consider the electric network shown in Fig. 2, which contains a nonlinear resistor whose voltage-current relationship is defined by $i_r(t) = 5e^{0.2v_r(t)}$, where $i_r(t)$ and $v_r(t)$ are the resistor current and voltage, respectively.
- (1) Calculate the resistor current at the equilibrium state (as $v(t) = 0$). (5%)
 - (2) Find the transfer function, $V_L(s)/V(s)$, for the electric network system. (15%)

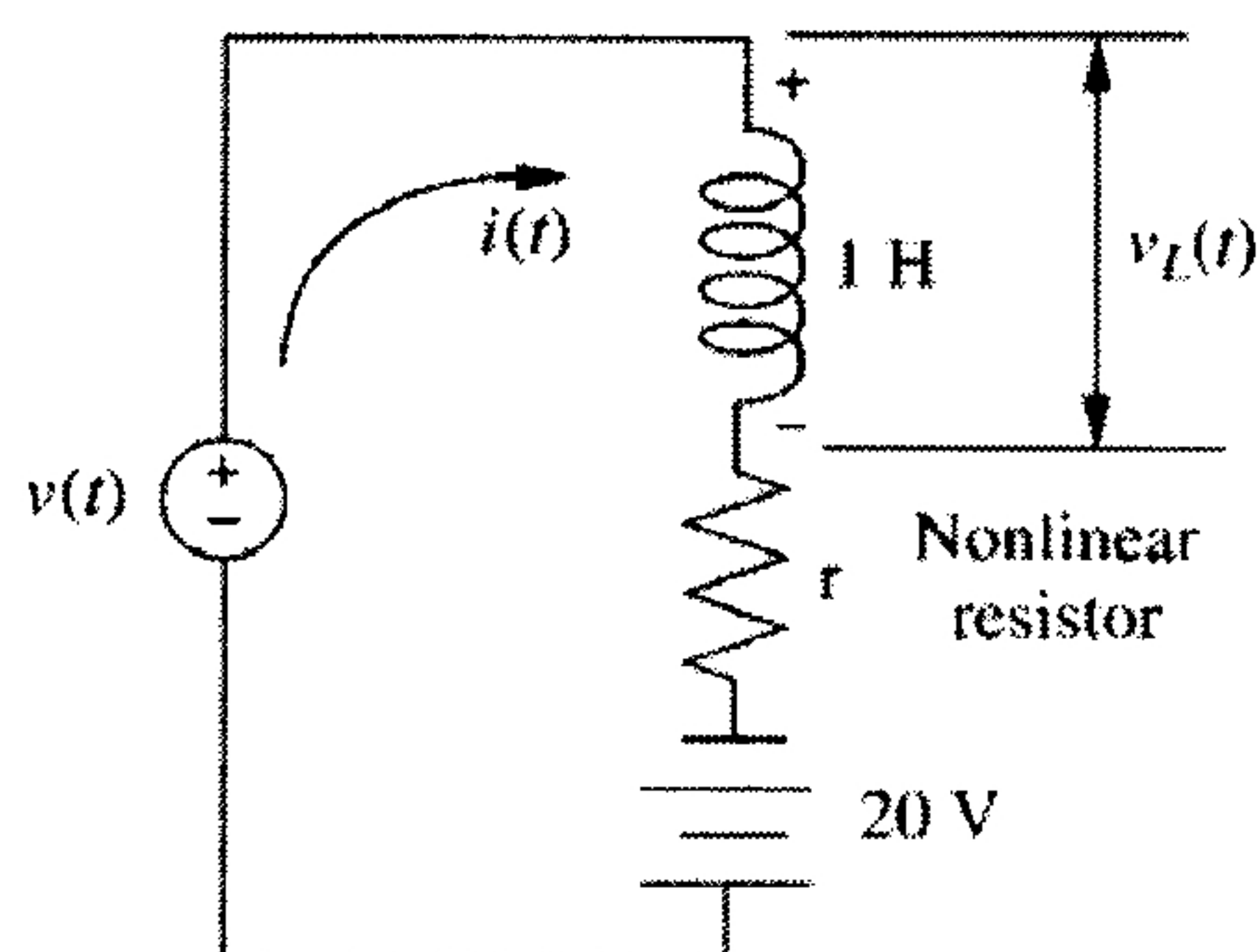


Fig. 2

3. Fig. 3 shows a mechanical vibratory system. When 2 lb force (step input) is applied to the system. In the Fig. 3, m , b , and k are mass, viscous friction coefficient, and spring constant, respectively. Determine m , b , and k of the system such that the system has maximum overshoot 0.01 at time 2sec and the steady-state displacement $x(\infty)$ equals to 0.2. (20%)

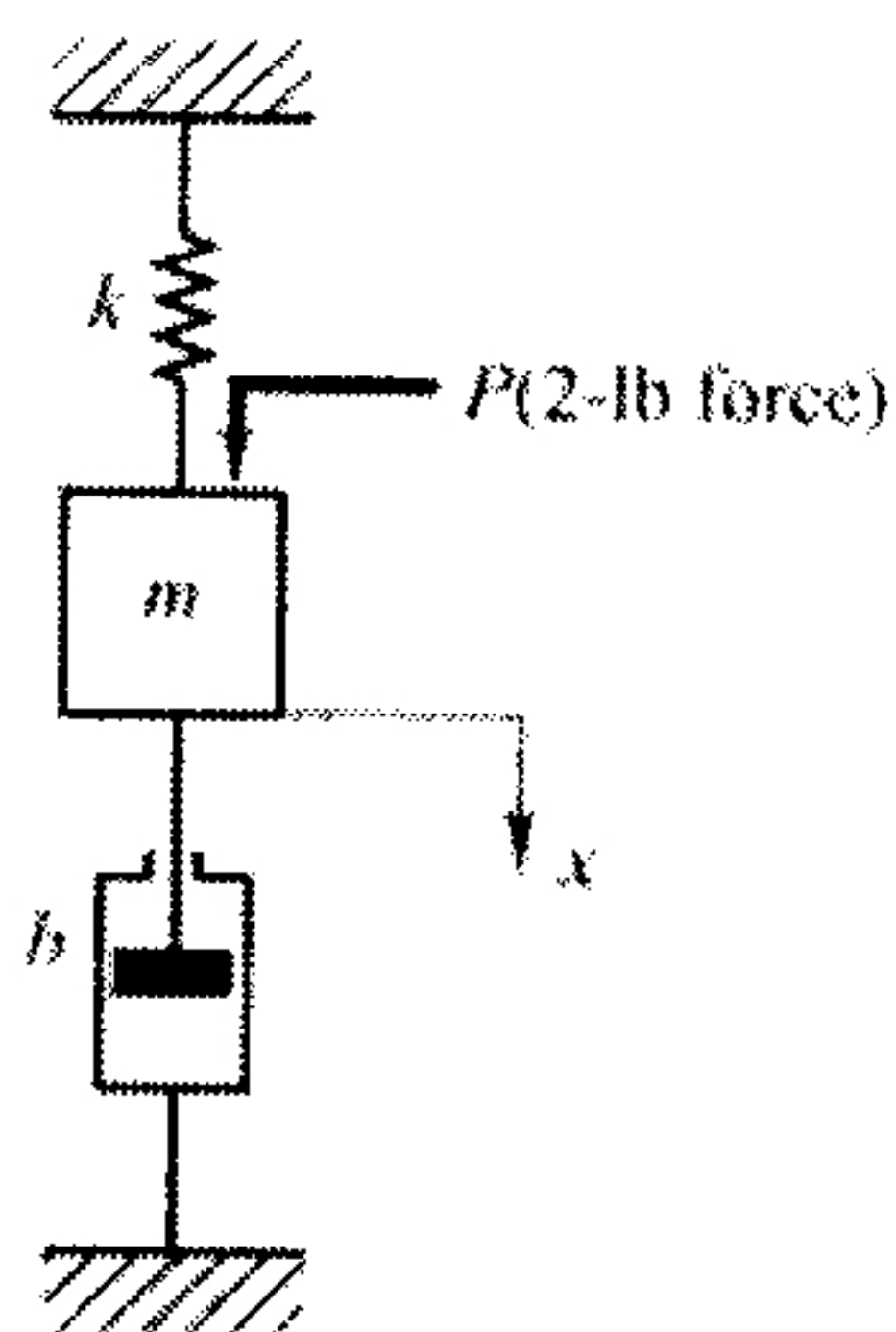


Fig. 3

4. Consider a system, as shown in Fig. 4(a).
 (1) Derive the transfer function $C(s)/R(s)$. (8%)
 (2) Find the range of K for which the system is stable. (6%)
 (3) Find the value of K that will place the closed-loop poles as shown in Fig. 4(b). (6%)

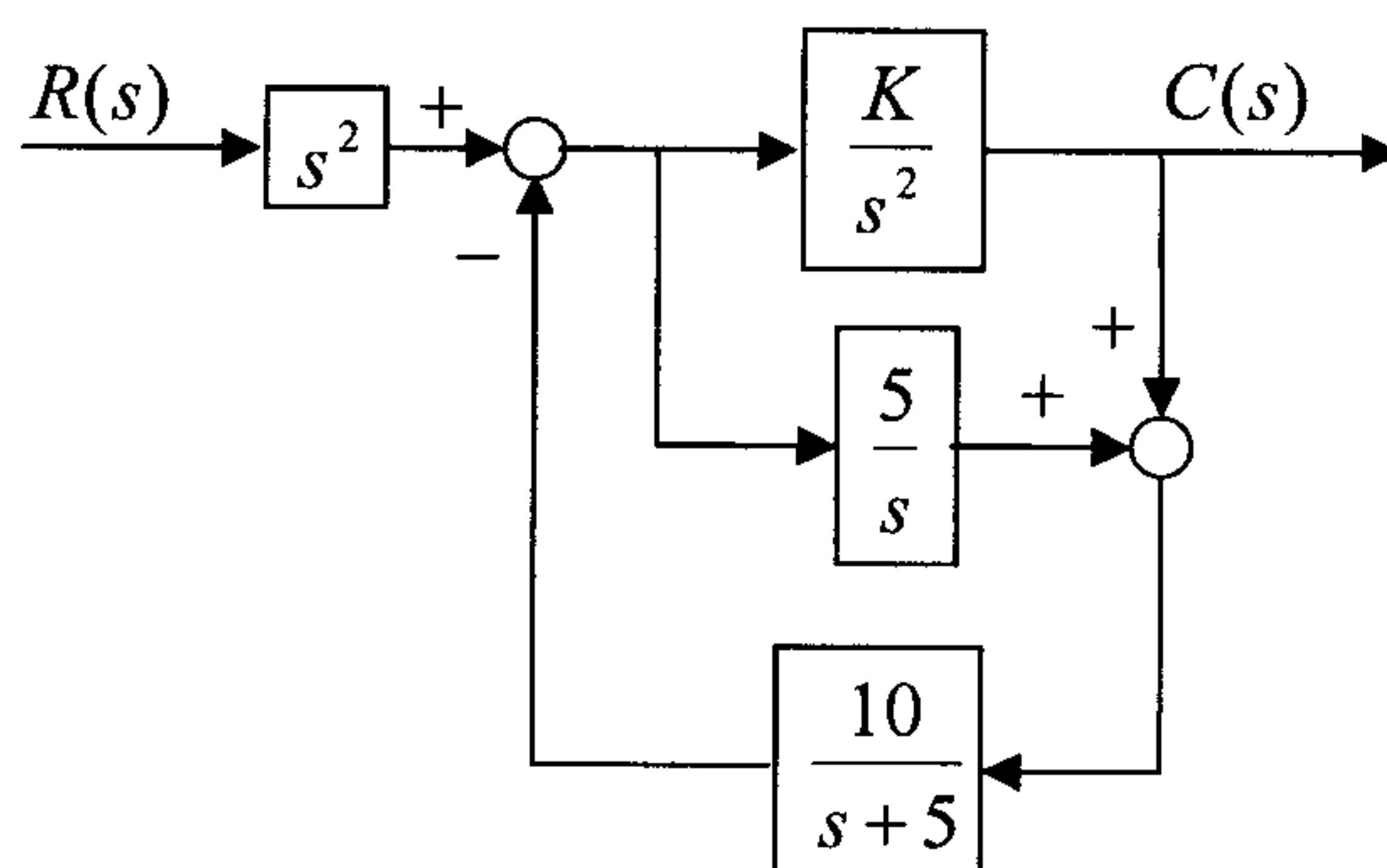


Fig. 4(a)

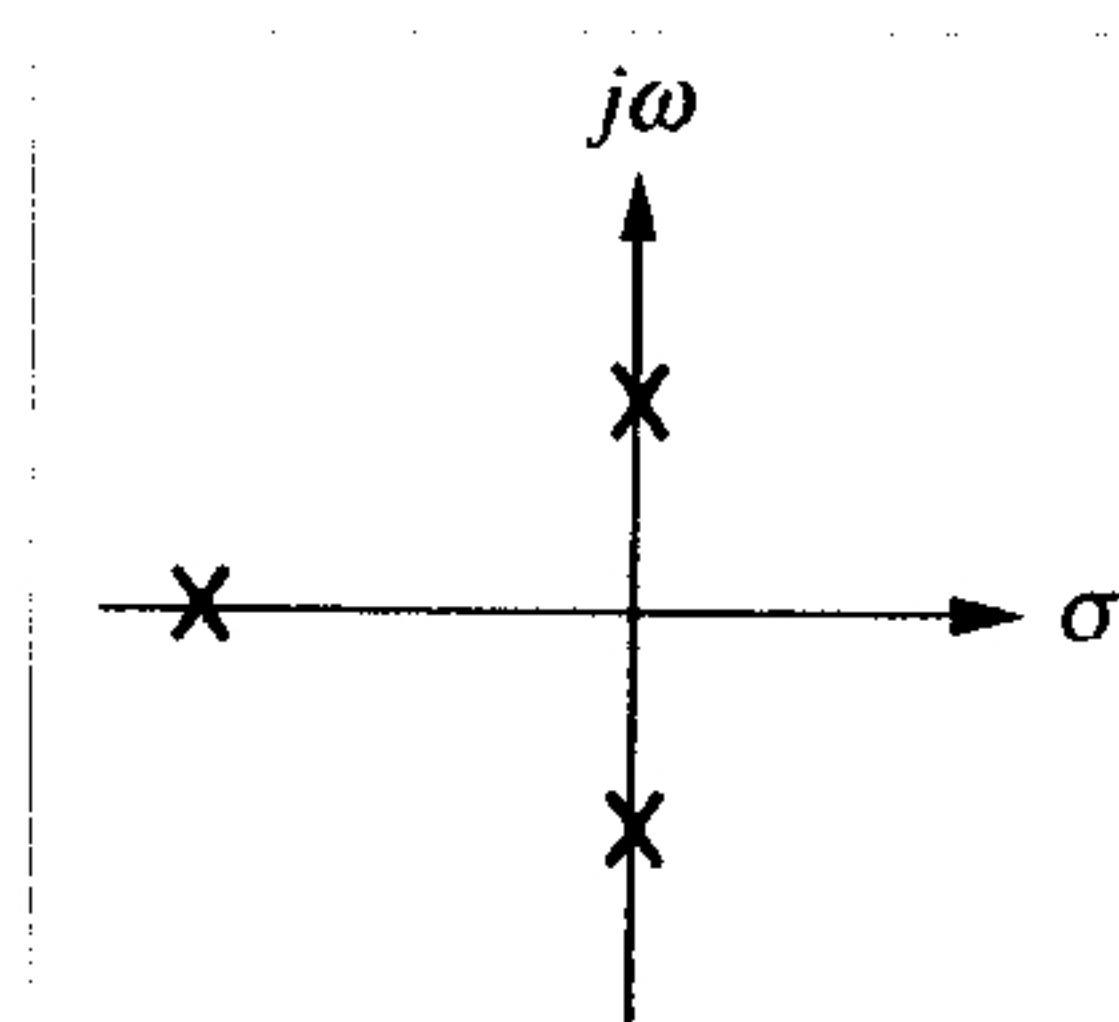


Fig. 4(b)

5. Consider the system of Fig. 5. Design the value of K so that for a ramp input of $20t$, there will be a 0.02 error in the steady state. (20%)

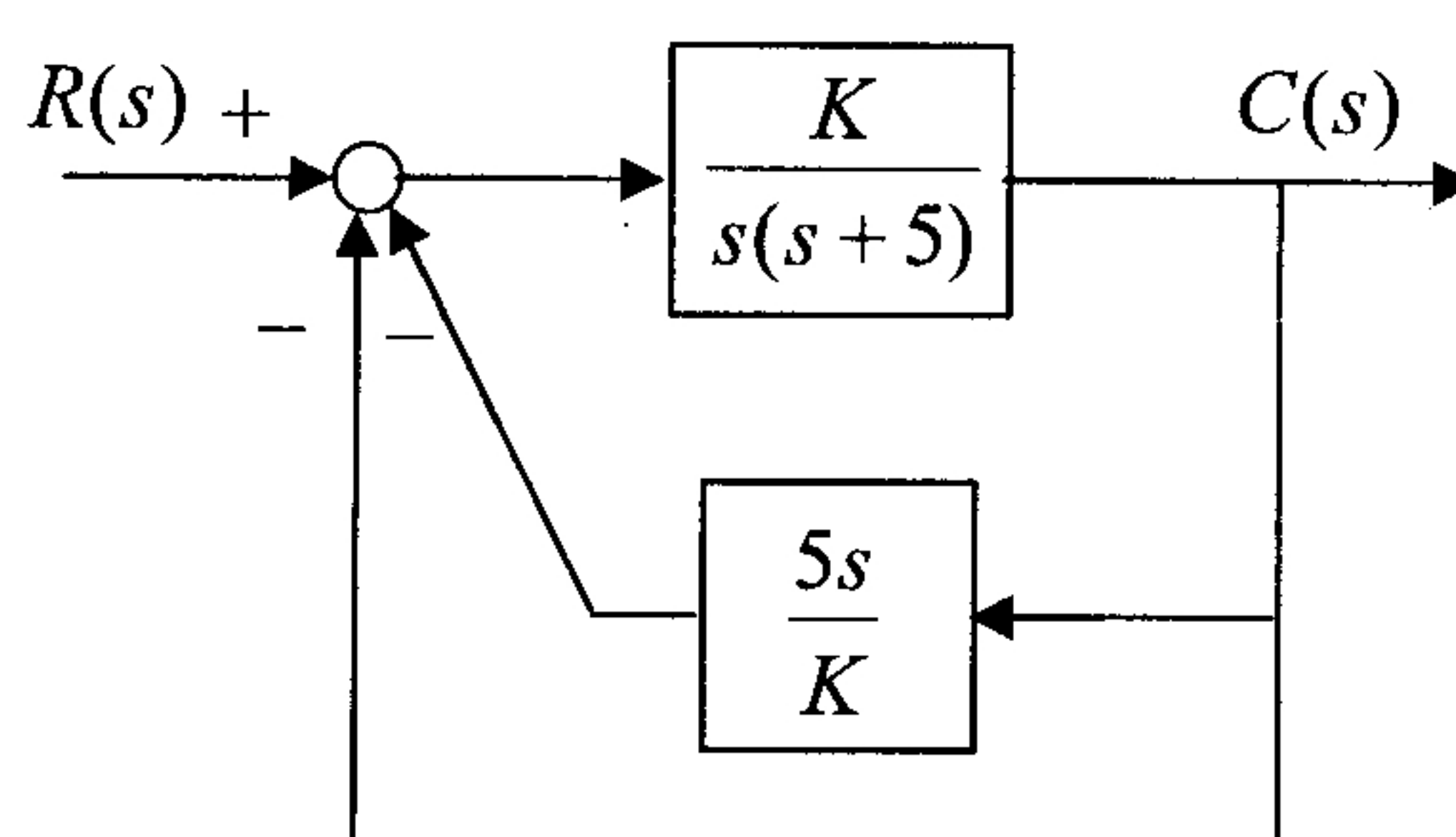


Fig. 5