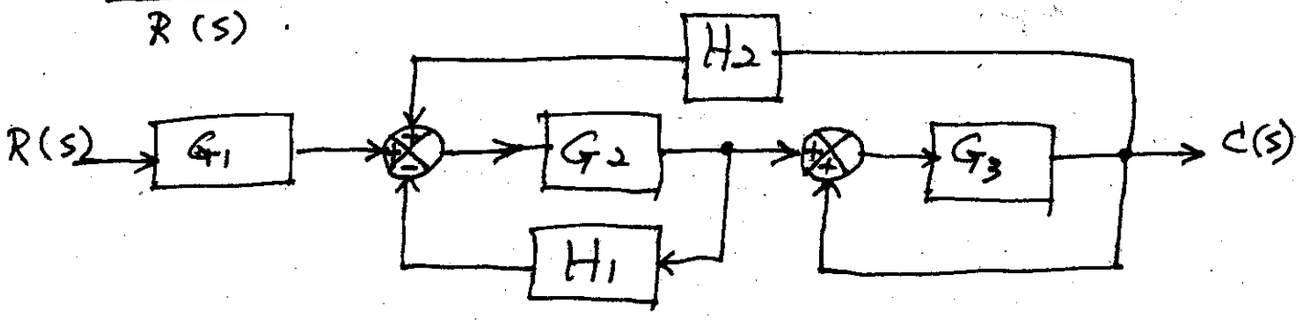
本試題是否可以使用計算機：☑可使用，□不可使用　（請命題老師勾選）

1. Find the inverse Laplace transform of [20%]

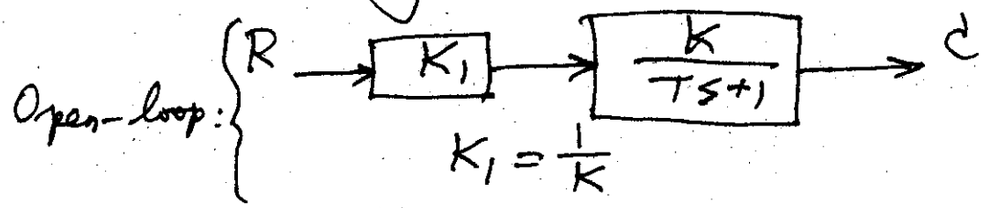
$$G(s)=\frac{s^3+8s^2+20s+17}{s^2+4s+3}$$

2. From the block diagram find the transfer function [20%] $\frac{C(s)}{R(s)}$.



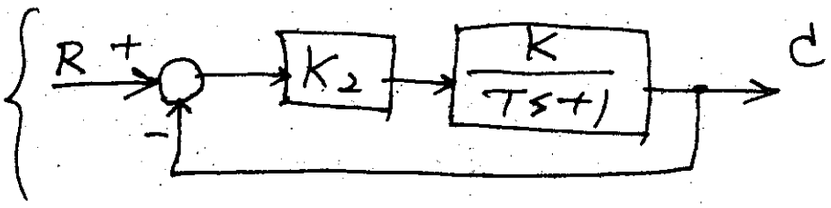
3. The open-loop and closed-loop control systems [20%] are shown below. Assume that $K_2 \cdot K >> 1$. Compare the steady-state errors for these control systems assuming a unit-step input.

Open-loop:



$K_1 = \frac{1}{K}$

Closed-loop:



（背面仍有題目，請繼續作答）

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4. The system is given by

[20%]
$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}2&0&0\\0&2&0\\0&3&1\end{bmatrix}\begin{bmatrix}x_1\\x_2\\x_3\end{bmatrix}$$

the output is $y=\begin{bmatrix}1&1&1\end{bmatrix}\begin{bmatrix}x_1\\x_2\\x_3\end{bmatrix}$.

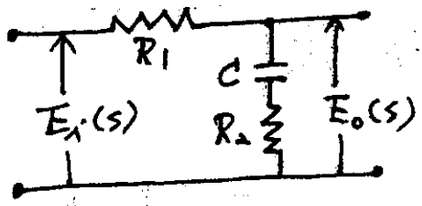
a) Show that the system is not completely observable.

b) Show that the system is completely observable if the output is given by

$$\begin{bmatrix}y_1\\y_2\end{bmatrix}=\begin{bmatrix}1&1&1\\1&2&3\end{bmatrix}\begin{bmatrix}x_1\\x_2\\x_3\end{bmatrix}.$$

5. For the lag network shown below, derive the transfer function $(E_o(s)/E_i(s))$.

[10%]



6. Find the forward transfer function of the lead network shown below. $(E_o(s)/E_i(s))$.

[10%]