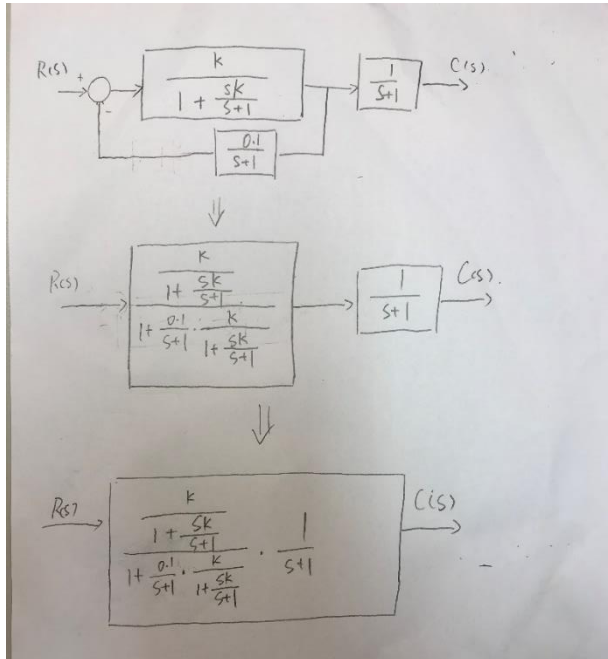


2-1

Solution1 :

After Simplification :

$$\frac{C(s)}{R(s)} = \frac{K}{(K+1)s + 0.1K + 1}$$

Solution2 :

$$R(s) - 0.1(s+1) \frac{1}{s+1} C(s) - s(s+1) \frac{1}{s+1} C(s) = \frac{s+1}{K} C(s)$$

So

$$\frac{C(s)}{R(s)} = \frac{K}{(K+1)s + 0.1K + 1}$$

Marking criteria :

1. Include the process of simplifying diagram (for solution1)
2. The transfer function should be simplified completely (2-5')
3. The result should be right.

You can take the tutorial and lecture example for reference

2-2

$$Y(s) = \frac{1}{s} H(s) = \frac{2s+1}{s^3 + 2s^2 + 5s}$$

inverse Laplace transfer:

$$y(\infty) = \lim_{s \rightarrow 0} sY(s) = \frac{1}{5}$$

$$y(0^+) = \lim_{s \rightarrow \infty} sY(s) = \lim_{s \rightarrow \infty} \frac{\frac{2}{s} + \frac{1}{s^2}}{1 + \frac{2}{s} + \frac{5}{s^2}} = 0$$

Marking criteria :

The process and the result should be right

You can take the tutorial and lecture example for reference

2-3

Zero: -1

Poles: -1, -1+3j, -1-3j

$$\begin{aligned} \frac{Y(s)}{U(s)} &= \frac{k(s+1)}{(s+1)(s-(-1+3j))(s-(-1-3j))} \\ &= \frac{k(s+1)}{(s+1)(s^2+2s+10)} \\ &= \frac{k(s+1)}{s^3+3s^2+12s+10} \end{aligned}$$

$$(s^3 + 3s^2 + 12s + 10)Y(s) = k(s+1)U(s)$$

$$\frac{d^3 y}{dt^3} + 3\frac{d^2 y}{dt^2} + 12\frac{dy}{dt} + 10y = k\frac{du}{dt} + ku$$

Marking criteria :

1.clarify the zero and poles

2.show the right transfer function and necessary simplification process

a. k cannot be eliminated;(5')

b. (s+1) cannot be canceled; if so, the system has been changed (10')

3.show the right result of inverse Laplace transform

You can take the tutorial and lecture example for reference