

## Control Quiz [1] 2020/05/01

(1)  $u$  から  $x$  までの伝達関数  $P(s)$  を求めよ.

$$\begin{aligned}x &= \frac{1}{s+1}(u - fx) \\(s+1)x &= u - fx \\(s+1+f)x &= u\end{aligned}$$

よって,

$$\begin{aligned}P(s) &= \frac{x}{u} \\&= \frac{1}{s+1+f}\end{aligned}$$

(2)  $e$  から  $y$  までの伝達関数  $L(s)$  を求めよ.

$$\begin{aligned}y &= \frac{1}{s}P(s)ce \\&= \frac{c}{s(s+1+f)}e\end{aligned}$$

よって

$$\begin{aligned}L(s) &= \frac{y}{e} \\&= \frac{c}{s(s+1+f)}\end{aligned}$$

(3)  $r$  から  $y$  までの伝達関数  $W(s)$  を求めよ.

$$\begin{aligned}y &= L(s)e \\&= L(s)(r - y)\end{aligned}$$

これを  $y$  について解き,

$$\begin{aligned}y &= \frac{L(s)}{1+L(s)}r \\&= \frac{\frac{c}{s(s+1+f)}}{1+\frac{c}{s(s+1+f)}}r\end{aligned}$$

$$= \frac{c}{s^2 + (1 + f)s + c} r$$

よって

$$\begin{aligned} W(s) &= \frac{y}{r} \\ &= \frac{c}{s^2 + (1 + f)s + c} \end{aligned}$$