[H6.応3] $G(s)=\frac{Y(s)}{U(s)}=\frac{4}{s^2+5s+4}$

(1)

解1より)

$Y(s)=\frac{X_2(s)}{s}$

$sX_2(s)=4U(s)-(5X_2(s)+4Y(s))$

$s^2Y(s)=4U(s)-5sY(s)-4Y(s)$

$(s^2+5s+4)Y(s)=4U(s)$

$\frac{Y(s)}{U(s)}=\frac{4}{s^2+5s+4}$ //

解2より)

$X_1(s)=\frac{U(s)}{s+1}$

$X_2(s)=\frac{U(s)}{s+4}$

$Y(s)=\frac{4}{3}(X_1(s)-X_2(s))$

$Y(s)=\frac{4}{3}\left(\frac{U(s)}{s+1}-\frac{U(s)}{s+4}\right)$

$=\frac{4}{3}\cdot\frac{3}{(s+1)(s+4)}U(s)$

$\frac{Y(s)}{U(s)}=\frac{4}{s^2+5s+4}$ //

(2) 解1. $X_1=y$ より)

$X_1(s)=\frac{X_2(s)}{s}\rightarrow sX_1(s)=X_2(s)$

$sX_2(s)=4U(s)-5X_2(s)-4X_1(s)$

$\dot{x}_1(t)=x_2(t)$

$\dot{x}_2(t)=-4x_1(t)-5x_2(t)+4u(t)$

$\frac{d}{dt}f(t)\leftrightarrow sF(s)-f(0)$

$\therefore\begin{bmatrix}\dot{x}_1(t)\\ \dot{x}_2(t)\end{bmatrix}=\begin{bmatrix}0&1\\-4&-5\end{bmatrix}\begin{bmatrix}x_1(t)\\x_2(t)\end{bmatrix}+\begin{bmatrix}0\\4\end{bmatrix}u(t)$

(A) (b)

$y=\begin{bmatrix}1&0\end{bmatrix}\begin{bmatrix}x_1(t)\\x_2(t)\end{bmatrix}$

(c) //

解2.

$sX_1(s)=-X_1(s)+U(s)\rightarrow\dot{x}_1(t)=-x_1(t)+u(t)$

$sX_2(s)=-4X_2(s)+U(s)\rightarrow\dot{x}_2(t)=-4x_2(t)+u(t)$

$(s+1)X_1(s)=U(s)$

$(s+4)X_2(s)=U(s)$

$\therefore\begin{bmatrix}\dot{x}_1(t)\\ \dot{x}_2(t)\end{bmatrix}=\begin{bmatrix}-1&0\\0&-4\end{bmatrix}\begin{bmatrix}x_1(t)\\x_2(t)\end{bmatrix}+\begin{bmatrix}1\\1\end{bmatrix}u(t)$

(A) (b)

$y(t)=\frac{4}{3}x_1(t)-\frac{4}{3}x_2(t)$

$\therefore y(t)=\begin{bmatrix}\frac{4}{3}&-\frac{4}{3}\end{bmatrix}\begin{bmatrix}x_1(t)\\x_2(t)\end{bmatrix}$ //

(c)