1　次の伝達関数を持つシステムの単位インパルス応答と
単位ステップ応答を求めよ。

$$\frac{6}{s^2 + 5s + 6}$$

$$G(s) = \frac{6}{s^2+5s+6}$$

$$\frac{A}{s+2} + \frac{B}{s+3} = \frac{(A+B)s+3A+2B}{(s+2)(s+3)}$$

$3A-2A=6$

$$\begin{cases} A+B=0 \\ 3A+2B=6 \end{cases} \rightarrow \begin{matrix} A=6 \\ B=-6 \end{matrix}$$

○単位インパルス応答

$$y(t) = \mathcal{L}^{-1}[G(s)U(s)]$$

$$= \mathcal{L}^{-1}\left[\frac{6}{s^2+5s+6}\right] = \mathcal{L}^{-1}\left[\frac{6}{(s+2)(s+3)}\right] = \mathcal{L}^{-1}\left[\frac{6}{s+2} - \frac{6}{s+3}\right]$$

$$= 6e^{-2t} - 6e^{-3t}$$

$$= 6e^{-3t}(e^t - 1) \quad //$$

○単位ステップ応答

$$y(t) = \mathcal{L}^{-1}[G(s)U(s)]$$

$$= \mathcal{L}^{-1}\left[\frac{6}{s^2+5s+6} \cdot \frac{1}{s}\right] = \mathcal{L}^{-1}\left[\frac{6}{s(s+2)(s+3)}\right]$$

$$\frac{6}{s(s+2)(s+3)} = \frac{A}{s} + \frac{B}{s+2} + \frac{C}{s+3}$$

$$A = \frac{6}{(s+2)(s+3)}\Big|_{s=0} = \frac{6}{2\cdot 3} = 1$$

$$B = \frac{6}{s(s+3)}\Big|_{s=-2} = \frac{6}{-2} = -3$$

$$C = \frac{6}{s(s+2)}\Big|_{s=-3} = \frac{6}{3} = 2$$

$$\therefore y(t) = \mathcal{L}^{-1}\left[\frac{1}{s} - \frac{3}{s+2} + \frac{2}{s+3}\right] = 1 - 3e^{-2t} + 2e^{-3t} \quad //$$