

① Str. 7.

$$\frac{d^2 y(t)}{dt^2} + 3 \frac{dy(t)}{dt} + 2y(t) = 5e^{-4t},$$

u z uclove $y(0)=1$ i $\frac{dy}{dt}(0)=-2$, za $t \in [0, 25]$

$$y'' + 3y' + 2y = 5e^{-4t} \rightarrow y'' = 5e^{-4t} - 3y' - 2y$$

$$s^2 Y(s) - sy(0) - y'(0) + 3sY(s) - 3y(0) + 2Y(s) = 5 \frac{1}{s+4}$$

$$s^2 Y(s) - s + 2 + 3sY(s) - 3 + 2Y(s) = \frac{5}{s+4}$$

$$s^2 Y(s) + 3sY(s) + 2Y(s) = \frac{5}{s+4} + s - 2 + 3$$

$$Y(s)(s^2 + 3s + 2) = \frac{5 + s^2 + 4s + s + 4}{s+4}$$

$$Y(s) = \frac{s^2 + 5s + 9}{(s+4)(s^2 + 3s + 2)} = \frac{s^2 + 5s + 9}{(s+4)(s+1)(s+2)}$$

$$\begin{aligned} s^2 + 3s + 2 &= 0 \\ b_{1,2} &= \frac{-3 \pm \sqrt{9-8}}{2} \\ a_{1,2} &= \frac{-3 \pm 1}{2} \\ a_1 &= -1 \quad b_2 = -2 \end{aligned}$$

$$\frac{s^2 + 5s + 9}{(s+4)(s+1)(s+2)} = \frac{A}{s+4} + \frac{B}{s+1} + \frac{C}{s+2} \quad \bigg/ (s+4)(s+1)(s+2)$$

$$s^2 + 5s + 9 = A(s+1)(s+2) + B(s+4)(s+2) + C(s+4)(s+1)$$

$$s^2 + 5s + 9 = A(s^2 + 3s + 2) + B(s^2 + 6s + 8) + C(s^2 + 5s + 4)$$

$$s^2 + 5s + 9 = As^2 + 3As + 2A + Bs^2 + 6Bs + 8B + Cs^2 + 5Cs + 4C$$

$$s^2 + 5s + 9 = s^2(A+B+C) + s(3A+6B+5C) + 2A+8B+4C$$

$$A+B+C=1$$

$$3A+6B+5C=5$$

$$2A+8B+4C=9$$

$$A=1-B-C$$

$$3-3B-3C+6B+5C=5$$

$$2-2B-2C+8B+4C=9$$

$$A=1-\frac{5}{3}+\frac{3}{2}$$

$$3B+2C=2$$

$$6B+2C=7$$

$$A=\frac{5}{6}$$

$$3B+7-6B=2$$

$$2C=7-6B$$

$$-3B=-5$$

$$C=\frac{7}{2}-3B$$

$$C=\frac{7}{2}-5$$

$$B=\frac{5}{3}$$

$$C=-\frac{3}{2}$$

$$\frac{s^2 + 5s + 9}{(s+4)(s+1)(s+2)} = \frac{5}{6} \frac{1}{s+4} + \frac{5}{3} \frac{1}{s+1} - \frac{3}{2} \frac{1}{s+2}$$

$$Y(t) = \frac{5}{6} e^{-4t} + \frac{5}{3} e^{-t} - \frac{3}{2} e^{-2t}$$

✓