

Exercício 22/10
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1) $2\ddot{x} + 7\dot{x} + 3x = 0$

$\therefore 2 \mathcal{L}\{\ddot{x}\} + 7 \mathcal{L}\{\dot{x}\} + 3 \mathcal{L}\{x\} = 0$

$\Rightarrow 2(s^2 X - 2\dot{x}(0) - x(0)) + 7(sX - \dot{x}(0)) + 3X = 0$

$\therefore (2s^2 + 7s + 3)X = (2s + 7)x_0 \Rightarrow$

$X = \frac{x_0(2s+7)}{2(s+3)(s+1/2)}$

$X = \frac{x_0(2s+7)}{(s+3)(2s+1)} = \frac{A}{s+3} + \frac{B}{2s+1} = \frac{s(2A+B) + (A+3B)}{(s+3)(2s+1)}$

$\begin{cases} 2A+B = 2x_0 \\ A+3B = 7x_0 \end{cases} \quad B = \frac{12x_0}{5} \quad A = -\frac{1}{5}x_0$

$\Rightarrow X(s) = -\frac{x_0}{5(s+3)} + \frac{12x_0}{5(2s+1)}$

$x(t) = -\frac{x_0}{5} \mathcal{L}^{-1}\left\{\frac{1}{s+3}\right\} + \frac{6x_0}{5} \mathcal{L}^{-1}\left\{\frac{1}{s+1/2}\right\}$

$x(t) = -\frac{x_0}{5} e^{-3t} + \frac{6x_0}{5} e^{-t/2}$

2) $\ddot{x} + 2\dot{x} + 7x = 0 + 7U + 5\delta$; $\dot{x}(0) = 2 / x(0) = 1 / \dot{x}(0) = 9$
 $\dot{v}(0) = 0 \quad v(0) = 0$

$s^3 + X - 2 - s - 9s^2 + 2s^2 X - 2 - 18s + 7sX - 63 =$
 $s^2 U + 7s U + 5U$

$X = \frac{9s^3 + 20s^2 + 74s + 5}{s^2(s^2 + 2s + 7)} = \frac{508}{49s} + \frac{5}{7s^2} - \frac{(67s + 71)}{49(s+1)^2 + 6}$