PME 3380 - Aula 22/10

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1) $2\ddot{x} + 7\dot{x} + 3x = 0$

$$2\ddot{x} = 2\left[s^2 X - s\, x(0)\ \cancel{\dot{x}(0)}^{0}\right] = 2s^2 X(s) - s\, x_0$$

$$7\dot{x} = 7 s X(s) - x_0$$

$$3x = 3X(s)$$

$$X(s) = \frac{(2s+7)\, x_0}{(2s^2+7s+3)} \quad ; \qquad FT = 0$$

Pólos $\rightarrow 2s^2 + 7s + 3$

$s_1 = -0{,}5$ e $s_2 = -3$

Δ Escrevendo em funções parciais:

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

Inversa:

$$x(t) = \frac{-x_0}{5}\, \mathcal{L}^{-1}\left(1/s+3\right) + \frac{12}{5}\, \mathcal{L}^{-1}\left(\frac{1}{s+1/2}\right) = \frac{-x_0}{5} e^{-3t} + \frac{12}{5} e^{-t/2}$$

2) $\dddot{x} + 2\ddot{x} + 7\dot{x} = \ddot{u} + 7\dot{u} + 5u$

$\ddot{x}(0) = 2 ;\ \dot{x}(0) = 1 ,\ x(0) = 9$

$$s^3 X(s) - \ddot{x}(0) - s\dot{x}(0) - s^2(x_0) + 2\left[s^2 X(s) - \dot{x}(0) - s\, x(0)\right] + 7\left[s X(s) - X(0)\right] = s^2 U(s) - \cancel{\dot{u}(0)} - \cancel{s u(0)} + 7\left[s U(s) - \cancel{u(0)}\right] + 5U(s)$$

$$X(s) = \frac{(s^2+7s+5)\, U(s)}{(s^3+2s^2+7s)} + \frac{(9s^2+18s+60)}{(s^3+2s^2+7s)}$$

$$G(s) = \frac{s^2+7s+5}{s^3+2s^2+7s}$$

pólos de $[s^3 + 2s^2 + 7s] \longrightarrow s''' = 0 ;\ s'' = -1 - i\sqrt{6} ;\ s' = -1 + \sqrt{6}\, i$

$u(t) = 1;$

Δ Inversa

$$X(s) = \frac{s^2 + 7s + 5 + 9s^2 + 18s^2 + 60s}{s^2(s^2+2s+7)}$$

$$= a1/s + a2/s^2 + \frac{a3 s + a4}{s^2 + 2s + 7}$$