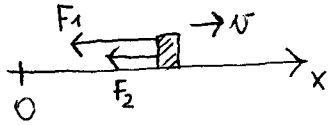
16.) $m = 10\,kg$ $D = 250\frac{N}{m}$ $b = 60\frac{Ns}{m}$ $x_0 = 8m$ $x(t) = ?$

$F_1 = -Dx$ $F_2 = -bv_x$ $v_0 = 0$



$\vec{a} = \frac{\vec{F}e}{m}$

$x(t) = Ae^{-\alpha t}\cos(\gamma t + \delta)$

$m\ddot{x} = -Dx - b\dot{x}$

$\ddot{x} + \frac{b}{m}\dot{x} + \frac{D}{m}x = 0$ $\alpha = \frac{b}{2m}$ $\omega^2 = \frac{D}{m}$

Megoldás: $x(t) = e^{\lambda t}$ $\ddot{x} + 2\alpha\dot{x} + \omega^2 x = 0$ $\alpha = 3\frac{1}{s}$ $\omega = 5\frac{1}{s}$

$\lambda^2 e^{\lambda t} + 2\alpha\lambda e^{\lambda t} + \omega^2 e^{\lambda t} = 0$ $/ : e^{\lambda t}$

$\lambda^2 + 2\alpha\lambda + \omega^2 = 0$

$\lambda_{1,2} = \frac{-2\alpha \pm \sqrt{4\alpha^2 - 4\omega^2}}{2} = -\alpha \pm i\sqrt{\omega^2 - \alpha^2} = -\alpha \pm i\gamma$ $\gamma = 4\frac{1}{s}$

$x(t) = Ae^{-\alpha t}\cos(\gamma t + \delta) \rightarrow x(0) = A\cos\delta = x_0 \rightarrow A = \frac{x_0}{\cos\delta}$

$\dot{x}(t) = -A\alpha e^{-\alpha t}\cos(\gamma t + \delta) - \gamma A e^{-\alpha t}\sin(\gamma t + \delta) \rightarrow \dot{x}(0) = 0 = -A(\alpha\cos\delta + \gamma\sin\delta)$

$-\alpha\cos\delta = \gamma\sin\delta$

$-\frac{\alpha}{\gamma} = \tan\delta = -\frac{3}{4}$

$\delta = -36,87° = -0,6435\,rad$

$\cos\delta = \cos(-36,87°) = 0,8$

$A = \frac{x_0}{\cos\delta} = \frac{8m}{0,8} = 10m$

$x(t) = 10e^{-3t}\cos(4t - 0,6435)$