# Aufgabe 20

a.) ohne Tilger

$$m_1 \ddot{x}_1 + b_1 \dot{x}_1 + c_1 x_1 = F_1 \cos \Omega t$$

$$\ddot{x}_1 = \frac{1}{m_1}\left( F_1 \cos \Omega t - b_1 \dot{x}_1 - c_1 x_1 \right)$$

$$y = \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{pmatrix} x_1 \\ \dot{x}_1 \end{pmatrix} = \begin{pmatrix} x \\ v \end{pmatrix}$$

$$\dot{y} = \begin{pmatrix} \dot{x}_1 \\ \ddot{x}_1 \end{pmatrix} = \begin{pmatrix} y_2 \\ \underbrace{\frac{1}{m_1}\left( F_1 \cos \Omega t - b_1 y_2 - c_1 y_1 \right)}_{f_{1d}(t,y)} \end{pmatrix}$$

$$\Rightarrow \dot{y} = \underbrace{\begin{pmatrix} v \\ \frac{1}{m}\left( F_1 \cos \Omega t - b_1 v - c_1 x \right) \end{pmatrix}}_{f(t,y)}$$

b.) mit Tilger

$M\ddot{x} + B\dot{x} + Cx = F(t)$ $\qquad x = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$ $\qquad F(t) = \underbrace{\begin{pmatrix} F_1 \\ 0 \end{pmatrix}}_{\hat{F}} \cos \Omega t$

$M\ddot{x} = \hat{F} \cos \Omega t - B\dot{x} - Cx \quad | \, M^{-1} \cdot$

$\ddot{x} = M^{-1} ( \hat{F} \cos \Omega t - B\dot{x} - Cx )$

$$y = \begin{pmatrix} y_1 \\ y_2 \\ \hline y_3 \\ y_4 \end{pmatrix} = \begin{pmatrix} x_1 \\ x_2 \\ \hline \dot{x}_1 \\ \dot{x}_2 \end{pmatrix} = \begin{pmatrix} x \\ \hline v \end{pmatrix}$$

$$\dot{y} = \underbrace{\begin{pmatrix} v \\ M^{-1} ( \hat{F} \cos \Omega t - Bv - Cx ) \end{pmatrix}}_{f(t,y)}$$