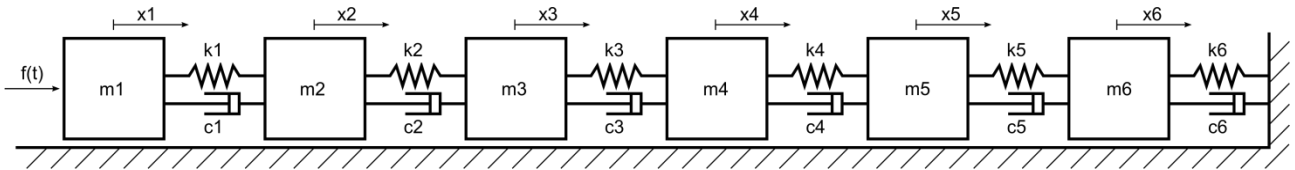




## Schwingerkette mit sechs Freiheitsgraden



Die Schwingerkette hat 6 Freiheitsgrade und wird durch die Bewegungsgleichung

$$\mathbf{M}\ddot{\mathbf{x}} + \mathbf{C}\dot{\mathbf{x}} + \mathbf{K}\mathbf{x} = \mathbf{F}(t)$$

mit

$$\mathbf{M} = \begin{bmatrix} m_1 & 0 & 0 & 0 & 0 & 0 \\ 0 & m_2 & 0 & 0 & 0 & 0 \\ 0 & 0 & m_3 & 0 & 0 & 0 \\ 0 & 0 & 0 & m_4 & 0 & 0 \\ 0 & 0 & 0 & 0 & m_5 & 0 \\ 0 & 0 & 0 & 0 & 0 & m_6 \end{bmatrix}, \quad \mathbf{C} = \begin{bmatrix} c_1 & -c_1 & 0 & 0 & 0 & 0 \\ -c_1 & c_1 + c_2 & -c_2 & 0 & 0 & 0 \\ 0 & -c_2 & c_2 + c_3 & -c_3 & 0 & 0 \\ 0 & 0 & -c_3 & c_3 + c_4 & -c_4 & 0 \\ 0 & 0 & 0 & -c_4 & c_4 + c_5 & -c_5 \\ 0 & 0 & 0 & 0 & -c_5 & c_5 + c_6 \end{bmatrix},$$

$$\mathbf{K} = \begin{bmatrix} k_1 & -k_1 & 0 & 0 & 0 & 0 \\ -k_1 & k_1 + k_2 & -k_2 & 0 & 0 & 0 \\ 0 & -k_2 & k_2 + k_3 & -k_3 & 0 & 0 \\ 0 & 0 & -k_3 & k_3 + k_4 & -k_4 & 0 \\ 0 & 0 & 0 & -k_4 & k_4 + k_5 & -k_5 \\ 0 & 0 & 0 & 0 & -k_5 & k_5 + k_6 \end{bmatrix}, \quad \mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{bmatrix}.$$

beschrieben. Es werden die folgenden Werte angenommen:

$$\begin{aligned} m_i &= 1 \text{ kg}, i = 1, \dots, 6 \\ k_i &= 10 \text{ N/m}, i = 1, \dots, 6 \\ c_i &= 0 \text{ Ns/m}, i = 1, \dots, 6. \end{aligned}$$

Es folgen die Eigenwerte und Eigenvektoren des ungedämpften Systems

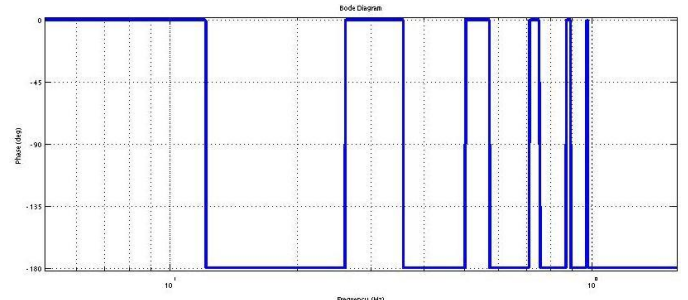
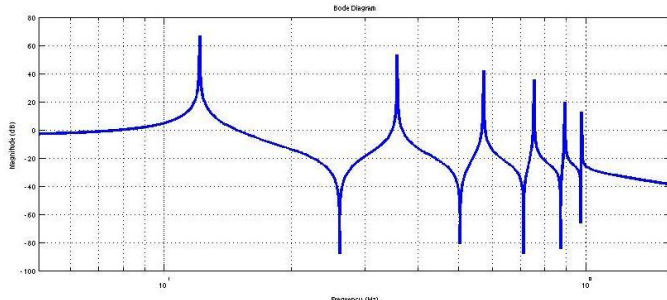
$$\Omega^2 = \begin{bmatrix} 0.5812 & 0 & 0 & 0 & 0 & 0 \\ 0 & 5.0298 & 0 & 0 & 0 & 0 \\ 0 & 0 & 12.9079 & 0 & 0 & 0 \\ 0 & 0 & 0 & 22.4107 & 0 & 0 \\ 0 & 0 & 0 & 0 & 31.3613 & 0 \\ 0 & 0 & 0 & 0 & 0 & 37.7091 \end{bmatrix}$$

$$\lambda_{i,2} = \begin{bmatrix} 0 \pm 0.7623i \\ 0 \pm 2.2427i \\ 0 \pm 3.5928i \\ 0 \pm 4.7340i \\ 0 \pm 5.6001i \\ 0 \pm 6.1408i \end{bmatrix}$$

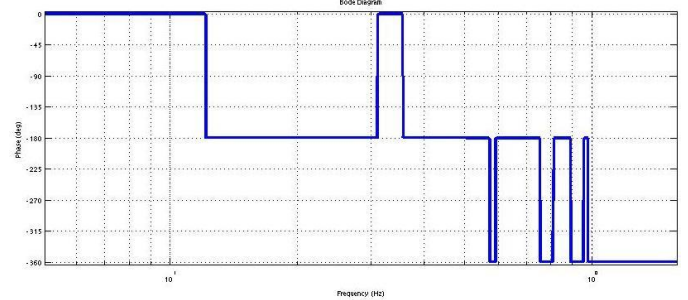
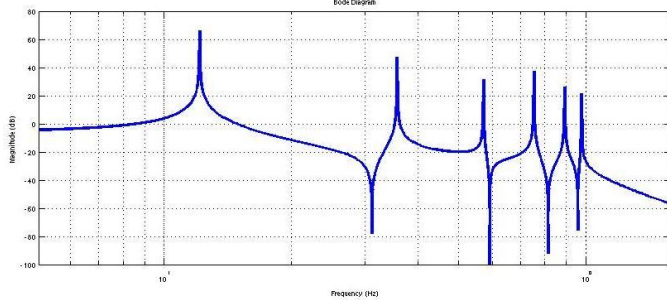
$$\Psi = \begin{bmatrix} +0.5507 & +0.5187 & -0.4565 & -0.3678 & +0.2578 & -0.1327 \\ +0.5187 & +0.2578 & +0.1327 & +0.4565 & -0.5507 & +0.3678 \\ +0.4565 & -0.1327 & +0.5507 & +0.2578 & +0.3678 & -0.5187 \\ +0.3678 & -0.4565 & +0.2578 & -0.5187 & +0.1327 & +0.5507 \\ +0.2578 & -0.5507 & -0.3678 & -0.1327 & -0.5187 & -0.4565 \\ +0.1327 & -0.3678 & -0.5187 & +0.5507 & +0.4565 & +0.2578 \end{bmatrix}.$$



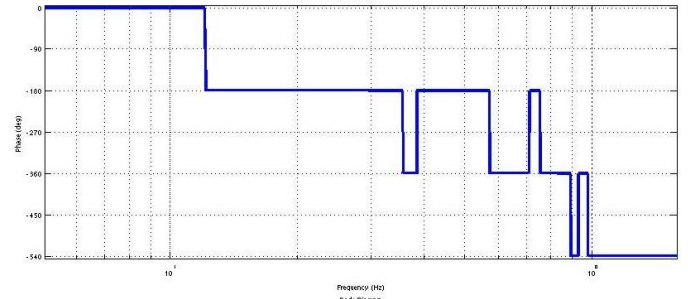
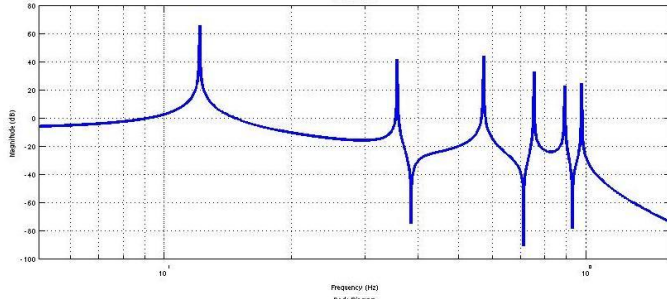
$\alpha_{11}$



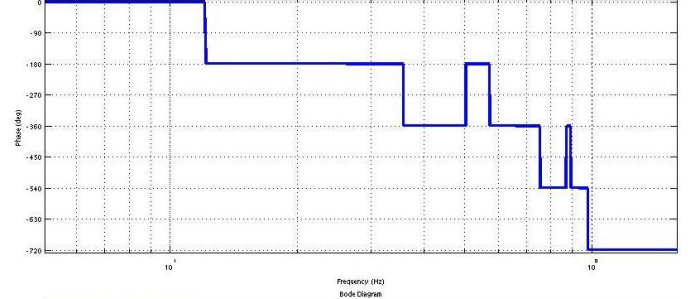
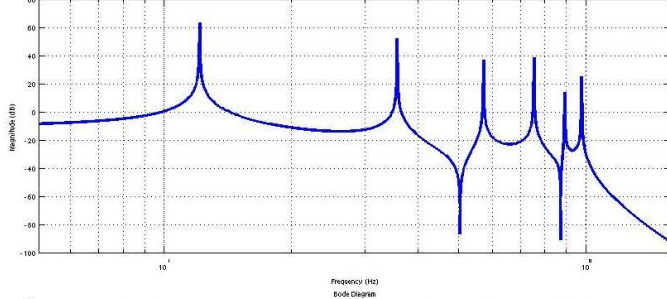
$\alpha_{21}$



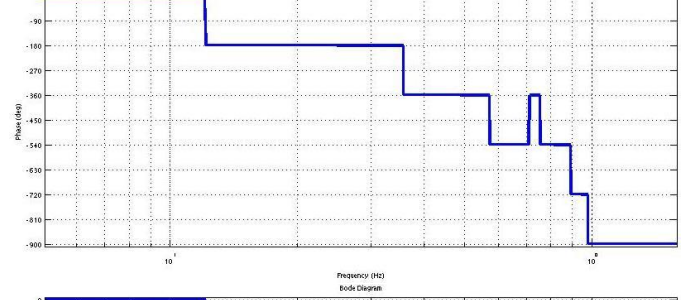
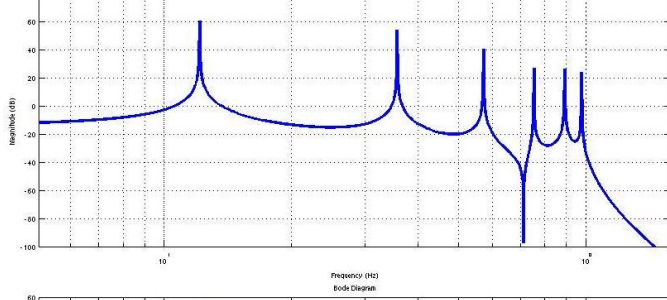
$\alpha_{31}$



$\alpha_{41}$



$\alpha_{51}$



$\alpha_{61}$

