VIBRATION ANALYSIS
AND VIBROACOUSTICS

VIBRATION ANALYSIS

Assignment 3 - A.Y. 2023/24

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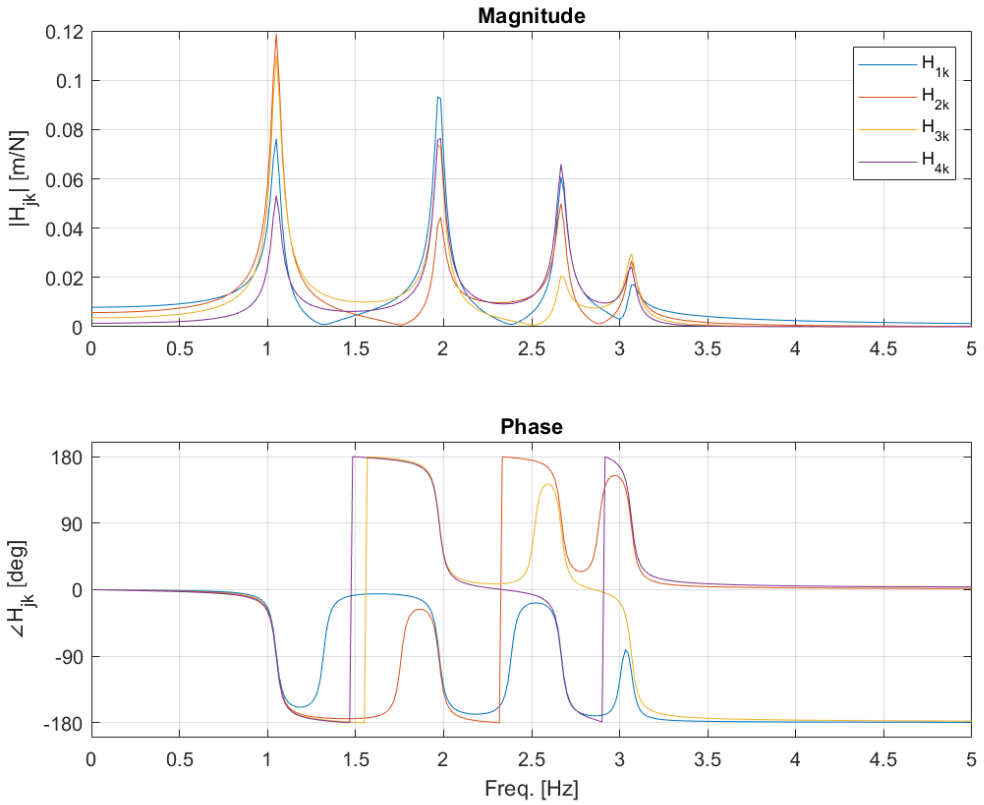
1 Experimental FRFs

In order to identify the modal parameters of a mechanical system, an approach consists in exciting the system with an external force (i.e. impulsive force) and measuring the resulting displacements. The definition of a FRF (Frequency Response Function), for a force $F_k(t)$ applied at the point k and a displacement $x_j(t)$ for the body j, is given by:

$$H_{j,k}^{(\exp)}(\Omega_l) = |H_{j,k}(\Omega_l)|\, e^{j\angle H_{j,k}(\Omega_l)} = \frac{|X_{j_0}(\Omega_l)|}{|F_{k_0}(\Omega_l)|} e^{j\left(\varphi_{x_j}(\Omega_l) - \varphi_{F_k}(\Omega_l)\right)}$$

The amplitude components $|X_{j_0}(\Omega_l)|$ and $|F_{k_0}(\Omega_l)|$,in addition to the phase components $\varphi_{x_j}(\Omega_l)$ and $\varphi_{F_k}(\Omega_l)$, are the result of the DFT (Discrete Fourier Transform) applied to both force and displacement. This procedure can be extended to all displacements $x_j(t)$.
The plots for magnitude and phase of the FRFs $H_{j,k}^{(\exp)}$ are given:



2 Question 2

3 Question 3

4 Question 4

5 Question 5