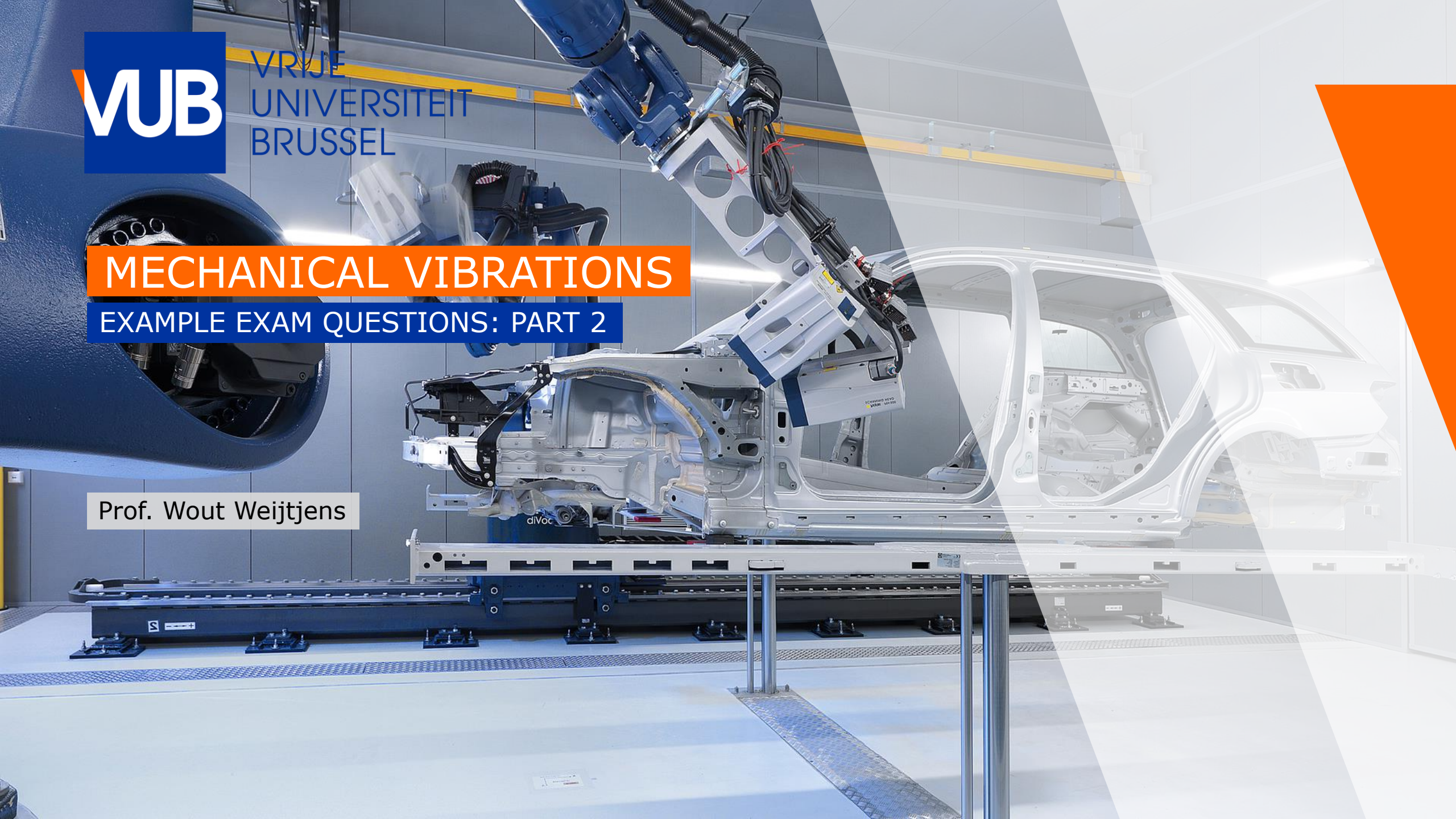


VRIJE UNIVERSITEIT BRUSSEL

MECHANICAL VIBRATIONS

EXAMPLE EXAM QUESTIONS: PART 2

Prof. Wout Weijtjens

PHASE 2 OF THE EXAM

For the second part of the examination **you will be asked up to 4 questions without preparation** that cover the entire course. After you've finished the case study with Prof. Deraemaeker you will move directly to the room of Prof. Weijtjens where you'll be randomly assigned (up to) 4 questions from a predefined list of exam questions. Each question will be presented individually, using a slide, and you will respond verbally to it without dedicated preparation.

As the oral examination itself will only take **15 minutes** the questions are suitable for answering without preparation. You will not be asked to write down equations, perform derivations or write proofs.

The current document serves as a list of example questions.

Should you have any further questions regarding the examination, please send a mail to wout.weijtjens@vub.be

EXAMPLE QUESTIONS

These example questions refer only to **the second part** of the Mechanical Vibrations oral examination with Prof. Weijtjens. For more information on the first part with Prof. Deraemaeker we refer to the resources shared by him.

The example questions provided:

- Are representative of the style of questions that can be expected during the oral examination
- Do not represent the full list of possible exam questions (i.e. you will likely get a question that is **not** in this list of examples)
- May or not be part of the final list of exam questions

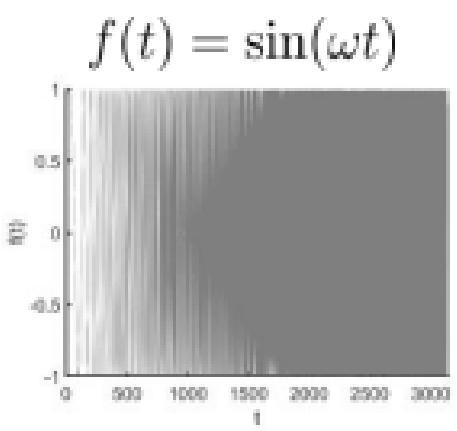
In essence the questions you are looking at now are just **illustrations of the type of questions you can expect!**

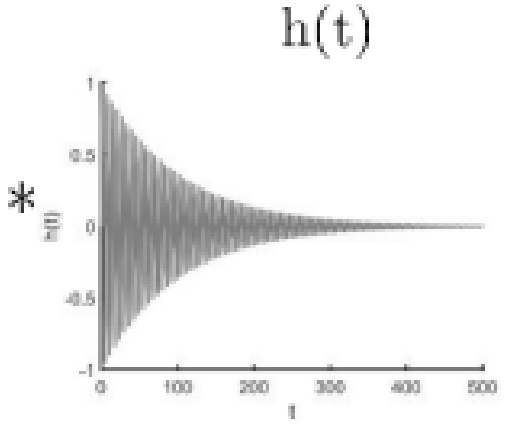
EXAM MECHANICAL VIBRATIONS

EXAMPLE QUESTIONS

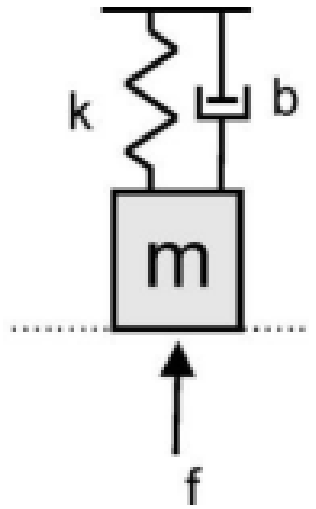
Explain following slide from SDOF systems

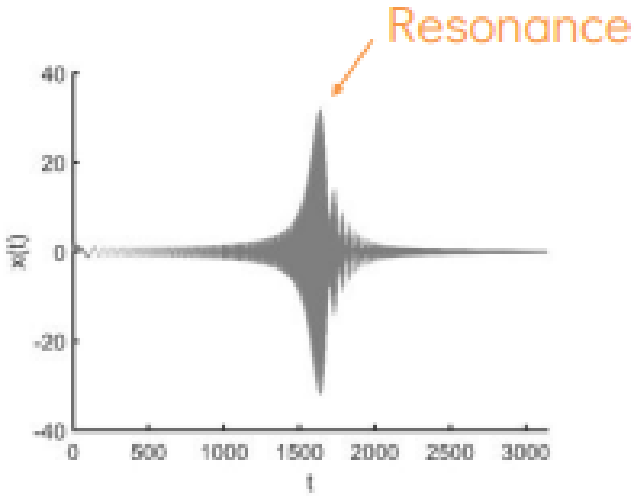
- What is f(t), h(t) and x(t)?
- What is ξ ?
- Can you explain what is happening in x(t)?





$\omega_n = 1, \xi = 0.01$





Take this slide from the course about MDOF systems

- What are K, M and F? What is Ψ?
- What is being done here?
- Because of what property of mode shapes can we do step A?

$$M\ddot{x} + Kx = F$$

Projection in the modal basis

$$x(t) = \sum_{i=1}^{n} z_i(t)\psi_i \longrightarrow x = \Psi z$$

A

$$M\Psi\ddot{z} + K\Psi z = F$$
$$\Psi^T M\Psi\ddot{z} + \Psi^T K\Psi z = \Psi^T F$$
$$diag(\mu_i)\ddot{z} + diag(\mu_i\omega_i^2)z = \Psi^T F$$

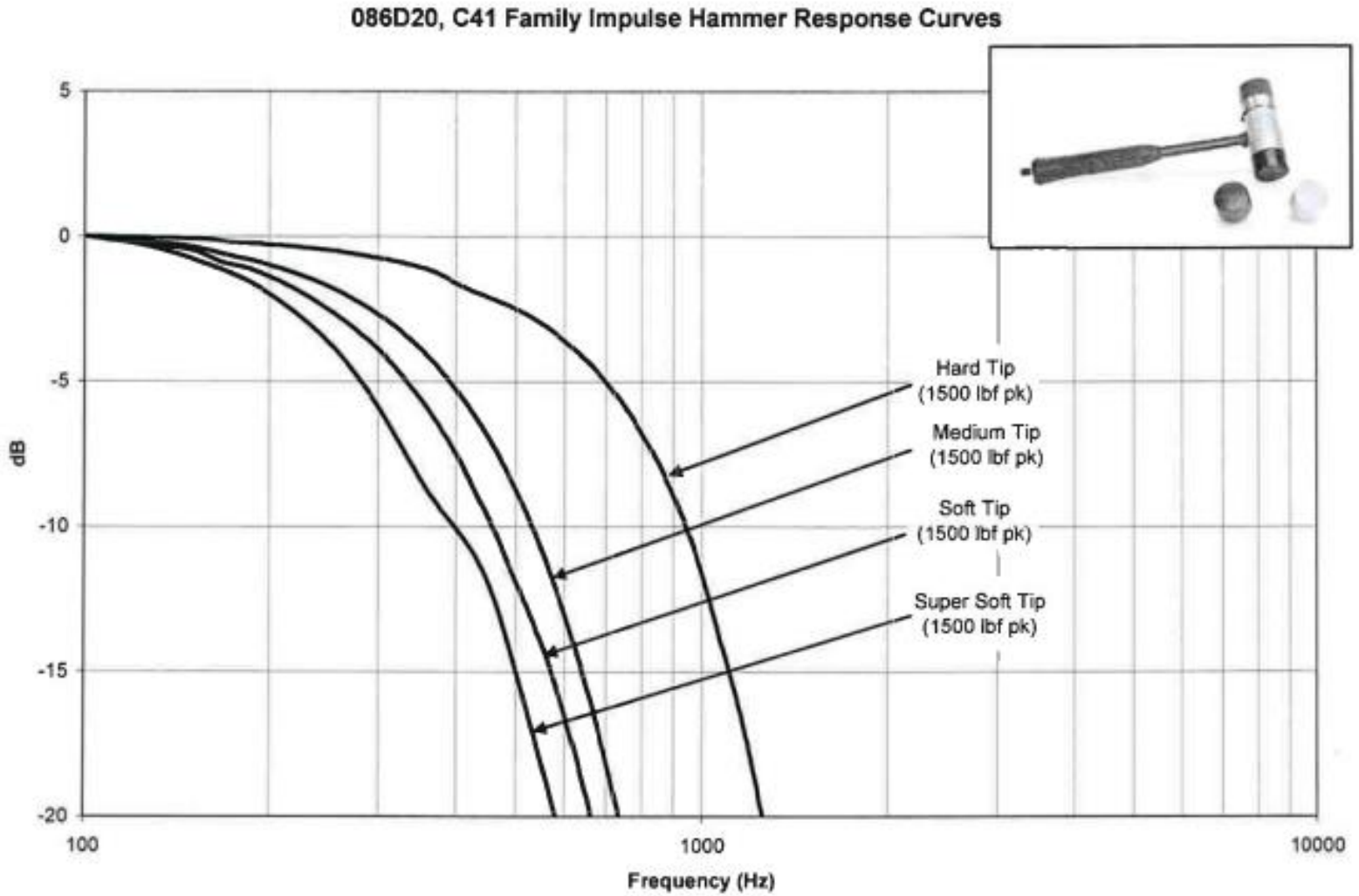
n independent equations of the type

$$\mu_i\ddot{z}_i + \mu_i\omega_i^2 z_i = F_i$$

EXPLAIN FOLLOWING STATEMENT ON STRUCTURAL TESTING: "**Due to reprocity of a linear mechanical system it is equivalent to perform a roving input test or to perform a single input test using multiple output sensors**"

Explain following diagram from Structural Testing

- What is shown?
- What causes the differences between graphs.
- Which decisions could be made based on this graph?



QUESTION ON FLOW INDUCED VIBRATIONS: "**What types of vibrations can be induced by a CONSTANT FLOW**"

Explain following diagram from Tuned Vibration absorbers

- What is A?
- What changes in the system's transfer function when adding A?
- What is the impact of different values of b?