VIB : Dynamic response computation

Number of participants: 18

1. In order to compute the dynamic response of a structure, one needs to (put in the right order)

8 respondents

Most frequent combinations:

2 ✗

5	Identify geometry, material properties, boundary conditions and excitations	✓
1	Make a model of the structure	✓
4	Obtain the mass and stiffness matrices (and damping if available)	✓
8	Compute the eigenfrequencies and mode shapes	✓
2	Perform a truncation (keep only the important mode shapes)	✗
7	Project the equations of motion in the modal domain	✗
3	Solve the equations of motion for each mode separately	✓

1 ✗

1	Make a model of the structure	✗
5	Identify geometry, material properties, boundary conditions and excitations	✗
4	Obtain the mass and stiffness matrices (and damping if available)	✓
3	Solve the equations of motion for each mode separately (time or frequency domain)	✗
8	Compute the eigenfrequencies and mode shapes	✗
2	Perform a truncation (keep only the important mode shapes)	✓

1 ✗

5	Identify geometry, material properties, boundary conditions and excitations	✓
4	Obtain the mass and stiffness matrices (and damping if available)	✗
1	Make a model of the structure	✗
8	Compute the eigenfrequencies and mode shapes	✓
2	Perform a truncation (keep only the important mode shapes)	✗
7	Project the equations of motion in the modal domain	✗
6	Determine the response at specific dofs based	✗

(time or frequency domain)

6 Determine the response at specific dofs based on the modal responses ✓

7 Project the equations of motion in the modal domain ✗

6 Determine the response at specific dofs based on the modal responses ✓

on the modal responses

3 Solve the equations of motion for each mode separately (time or frequency domain) ✗

Correct answer

5	Identify geometry, material properties, boundary conditions and excitations	6
1	Make a model of the structure	5
4	Obtain the mass and stiffness matrices (and damping if available)	6
8	Compute the eigenfrequencies and mode shapes	4
7	Project the equations of motion in the modal domain	2
2	Perform a truncation (keep only the important mode shapes)	3
3	Solve the equations of motion for each mode separately (time or frequency domain)	3
6	Determine the response at specific dofs based on the modal responses	5

2. The modal response in the frequency domain is computed

6 correct answers
out of 13 respondents

	using a convolution between the impulse response and the modal force	54%	7 votes
✓	analytically as a function of the modal properties (mass, stiffness, damping) and the modal force	46%	6 votes
	using a numerical integration scheme	0%	0 votes

3. The modal response in the time domain is computed

0 correct answer
out of 11 respondents

✓	using a convolution between the impulse response and the modal force	100%	11 votes
	analytically as a function of the modal properties (mass, stiffness, damping) and the modal force	0%	0 votes
✓	using a numerical integration scheme	0%	0 votes

4. What are the ways to introduce damping in the model ?

0 correct answer
out of 9 respondents

- self excitation
- Rayleigh damping, loss factor, modal damping
- Rayleigh damping, loss factor,Hystertic
- Raleigh damping , hysteritic damping (loss factor), modal damping
- With external dampers
- Viscous damping
- Empirically
- Loss factor
- Rayleigh

Correct answer

based on loss factors at the material level

5. For a MDOF system, with damping modelled using a loss factor, after a certain time, the impulse response is dominated by

10 correct answers
out of 12 respondents

	the last mode	8%	1 vote
✓	the first mode	83%	10 votes
	a combination of all the modes	8%	1 vote

6. For base excitation problems (such as earthquakes), the modal force is given by

7 correct answers
out of 12 respondents

	the total mass of the structure multiplied by the ground acceleration	33%	4 votes
	the mass of the base of the structure multiplied by the ground acceleration	8%	1 vote
✓	the modal acceleration factor which is a function of the mass matrix and the mode shape considered multiplied with the ground acceleration	58%	7 votes