DOS : Dynamic response computation

Number of participants: 14

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

11 respondents

Most frequent combinations:

1 respondent ✗

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

1 respondent ✗

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

1 respondent ✗

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

structure	the important mode shapes)	the important mode shapes)
8 Identify geometry, material properties, boundary conditions and excitations ✗	1 Determine the response at specific dofs based on the modal responses ✓	1 Determine the response at specific dofs based on the modal responses ✓

Correct answer

8	Identify geometry, material properties, boundary conditions and excitations	5
7	Make a model of the structure	5
3	Obtain the mass and stiffness matrices (and damping if available)	10
6	Compute the eigenfrequencies and mode shapes	4
4	Project the equations of motion in the modal domain	2
5	Perform a truncation (keep only the important mode shapes)	0
2	Solve the equations of motion for each mode separately (time or frequency domain)	1
1	Determine the response at specific dofs based on the modal responses	4

2. The modal response in the frequency domain is computed

3 correct answers
out of 11 respondents

Answer	Correct	Result	Votes
using a convolution between the impulse response and the modal force		64%	7 votes
analytically as a function of the modal properties (mass, stiffness, damping) and the modal force	✓	27%	3 votes
using a numerical integration scheme		9%	1 vote

3. The modal response in the time domain can be computed

0 correct answer
out of 11 respondents

Answer	Correct	Result	Votes
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 ?

3 respondents

We can introduire it in different ways : Based on the mass and stiffness (to decouple the equation) Rayleigh

Rayleigh

C matrix

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

8 correct answers out of 11 respondents

the last mode	9%	1 vote
✓ the first mode	73%	8 votes
a combination of all the modes	18%	2 votes

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

9 correct answers
out of 10 respondents

Answer	Result	Votes
the total mass of the structure multiplied by the ground acceleration	10%	1 vote
the mass of the base of the structure multiplied by the ground acceleration	0%	0 votes
✓ the modal acceleration factor which is a function of the mass matrix and the mode shape considered multiplied with the ground acceleration	90%	9 votes