VIB : MDOF systems

Number of participants: 34

1. Would you to skip the break and end a bit earlier

0 correct answer
out of 18 respondents

Answer	%	Votes
No, I still prefer a 10minute break at 15:00	17%	3 votes
Yes, I prefer to end a bit earlier	83%	15 votes

2. (Exercises) Type your name if you are still not able to login on Canvas.

2 respondents

SALLEYRETTE Mathieu

Léon

3. Who watched the video on MDOF systems?

0 correct answer
out of 20 respondents

Answer	%	Votes
Yes	50%	10 votes
Yes, but at 1.5x speed	40%	8 votes
No	10%	2 votes

4. The mode shapes and eigenfrequencies of a system are determined by (K and M are the stiffness and mass matrices)

17 correct answers
out of 21 respondents

Answer	Correct	Percentage	Votes
Calculating the eigenvalues of the stiffness matrix K of the system		10%	2 votes
solving a generalized eigenvalue problem of the type (K-w^2M) {Phi} = 0	✓	81%	17 votes
Calculating the eigenvalues of the mass matrix M of the system		5%	1 vote
Calulating w=K/M		5%	1 vote

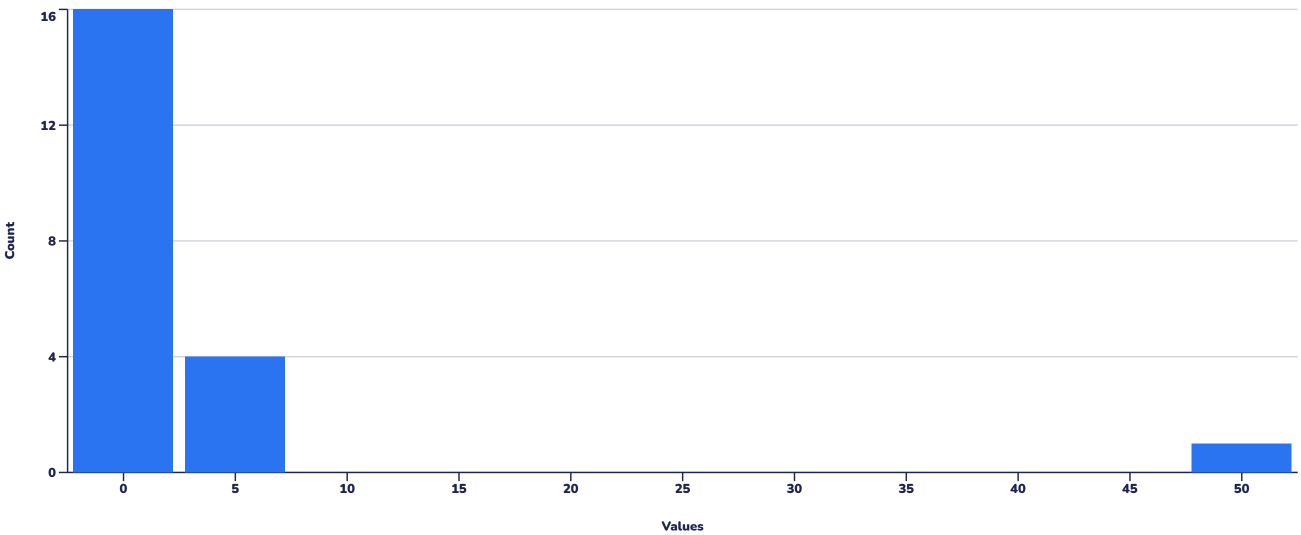
5. If a system has n degrees of freedom, it has

18 correct answers
out of 23 respondents

Answer	Correct	Percentage	Votes
2n natural frequencies		9%	2 votes
n natural frequencies	✓	78%	18 votes
(n + the number of excitations) natural frequencies		9%	2 votes
it depends on the type of system		4%	1 vote

6. How many Degrees of freedom would this real world structure have?

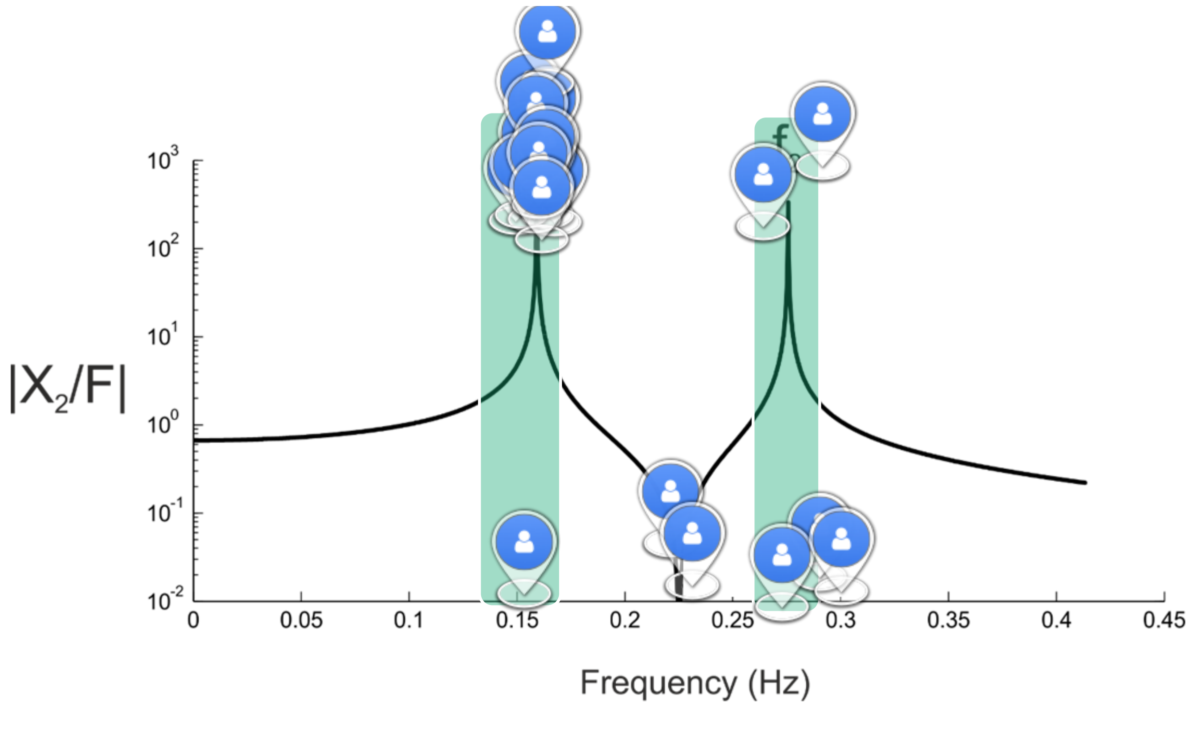
21 respondents



1	5.1	50	2	10.28	105.61
Minimum	Mean	Maximum	Median	Standard deviation	Variance

7. Where are the resonant frequencies of the 2 DOFs system on this graph ?

24 respondents



8. The mode shapes are orthogonal with respect to the

12 correct answers
out of 28 respondents

Answer	Correct	Percentage	Votes
stiffness matrix	✓	82%	23 votes
mass matrix	✓	54%	15 votes
damping matrix		14%	4 votes

9. The interest of projecting the equations of motion in the modal domain is to:

19 correct answers
out of 25 respondents

Answer	Correct	Percentage	Votes
reduce the number of equations to solve		12%	3 votes
decouple the equations of motion and facilitate solving them	✓	76%	19 votes
work with physical quantities for a better understanding of the system's behavior		12%	3 votes

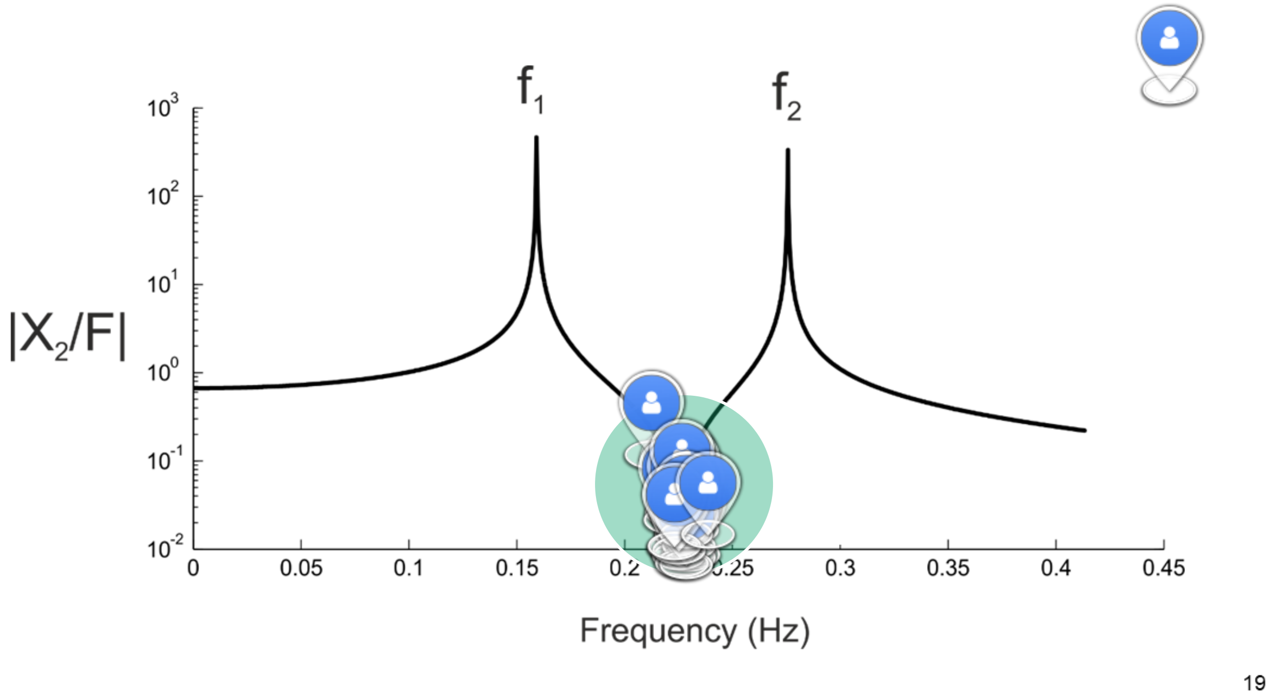
10. Which of these quantities is a global quantity for a given structure

2 correct answers out of 21 respondents

✓	the eigenfrequency	71%	15 votes
	the anti-resonance frequency	43%	9 votes
✓	the damping coefficient	19%	4 votes

11. Where is the anti-resonance of the 2 DOFs system on this graph ?

26 respondents



12. An anti-resonance happens when

20 correct answers out of 27 respondents

	The contribution to the response of the two close modes as equal amplitude and equal phase	15%	4 votes
✓	The contribution to the response of the two close modes has equal amplitude and opposite phase	74%	20 votes
	The displacement is zero for the two closest modes	11%	3 votes

13. Complete following statement about anti-resonances for a 2DOF system (X1,X2)?

5 respondents

When X2 has an anti-resonance at frequency f_0 it will not displace when excited by a(n) **harmonic** (4) force with a frequency **equal to f_0** (0) and X1 **will** (4) displace.

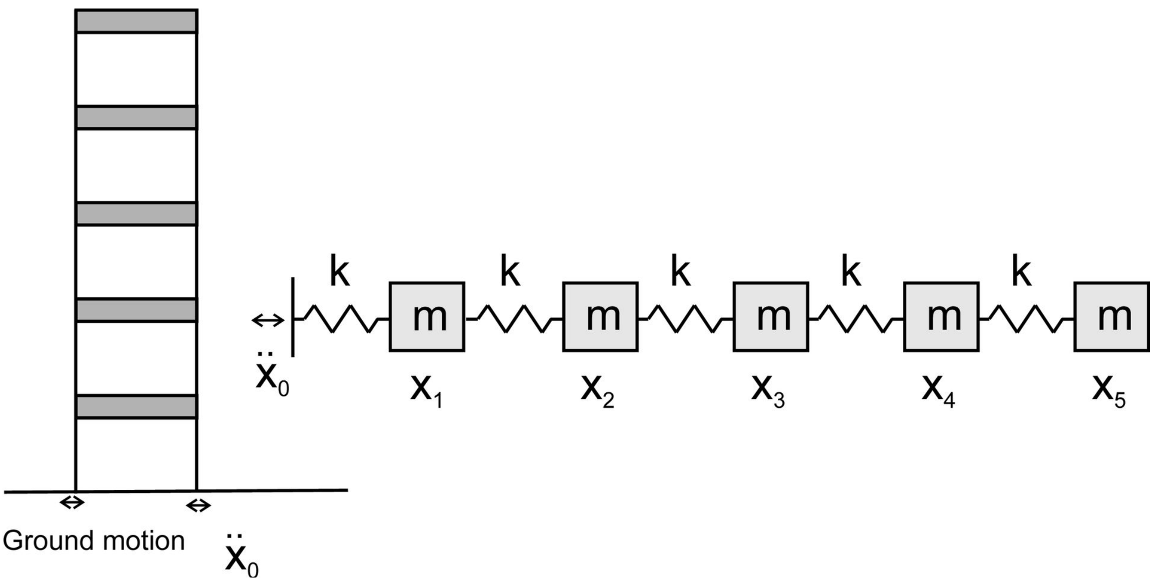
14. What kind of hypothesis can be made on the damping matrix to decouple the equations of motion in the modal domain ?

8 correct answers out of 21 respondents

Answer	%	Votes
✓ Rayleigh Damping	71%	15 votes
Lagrange Damping	19%	4 votes
✓ Modal damping	43%	9 votes
Viscous damping	5%	1 vote

15. How many mode shapes and eigenfrequencies does this building simplified model have ?

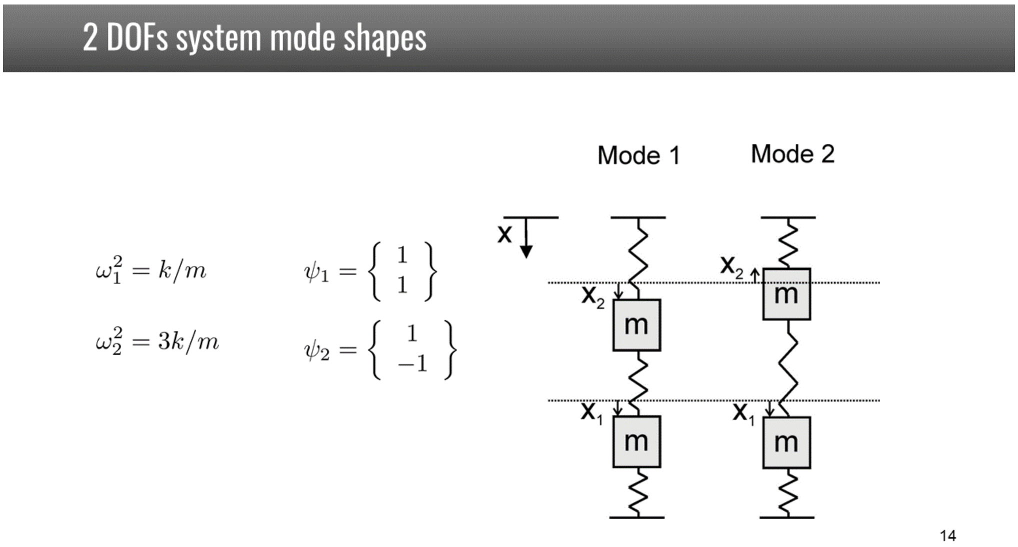
13 correct answers out of 15 respondents



Answer	%	Votes
one	0%	0 votes
three	0%	0 votes
✓ five	87%	13 votes
an infinity	13%	2 votes

16. If this system is excited with an harmonic force applied to the bottom mass, whose frequency is close to the first natural frequency, the motion will correspond to

8 correct answers
out of 21 respondents



Answer	Result	Votes
✔ The first mode shape where the two masses move in phase	38%	8 votes
The second mode shape where the two masses move out of phase	10%	2 votes
A combination of the two modeshapes	52%	11 votes

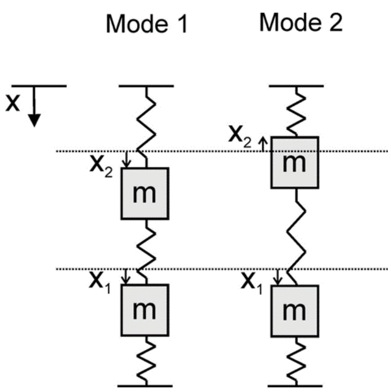
17. If this system is excited with an harmonic force applied to the bottom mass, whose frequency is the average of the first and second natural frequencies of the system, the motion will correspond to

22 correct answers
out of 26 respondents

2 DOFs system mode shapes

$$\omega_1^2 = k/m \qquad \psi_1 = \begin{Bmatrix} 1 \\ 1 \end{Bmatrix}$$

$$\omega_2^2 = 3k/m \qquad \psi_2 = \begin{Bmatrix} 1 \\ -1 \end{Bmatrix}$$

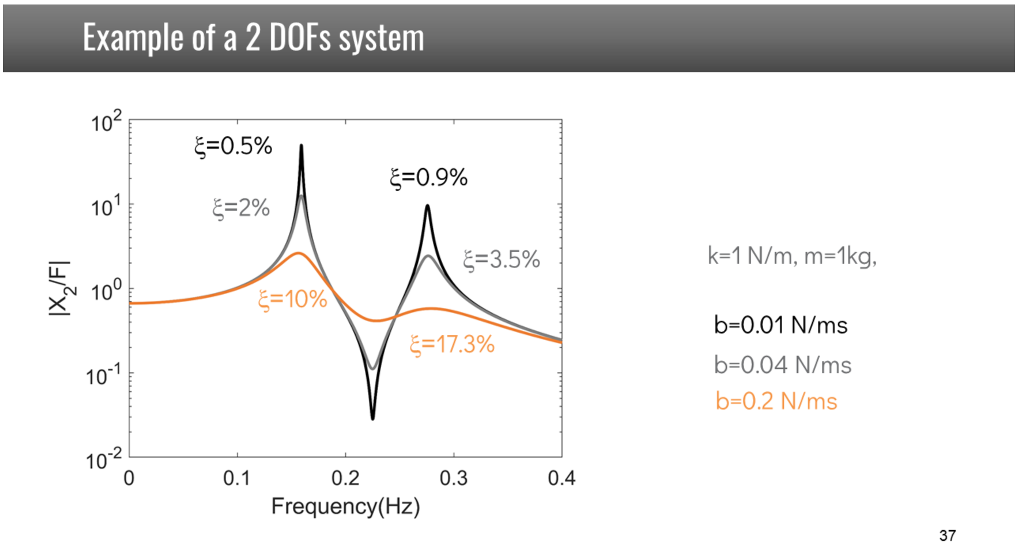


14

The first mode shape where the two masses move in phase	0%	0 votes
The second mode shape where the two masses move out of phase	15%	4 votes
✓ A combination of the two mode shapes	85%	22 votes

18. Why is the damping coefficient higher for the second mode than for the first mode for the damped two dofs system treated in the examples of the course ?

4 respondents



The x2 value in the wn2 frecuency is lower than in wn1

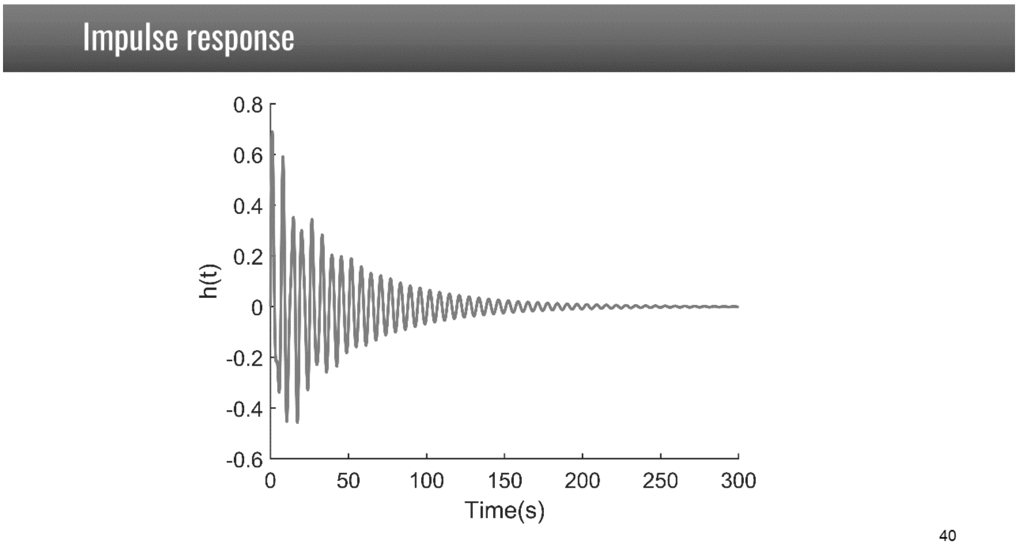
Sqrt3

Because √3

There are more damping points affecting the second mode

19. This is the impulse response of a damped two dofs system. Is it possible to extract the information on the first natural frequency and damping from this curve in a simple way ?

12 correct answers
out of 23 respondents



Answer	%	Votes
✓ Yes	52%	12 votes
No	48%	11 votes

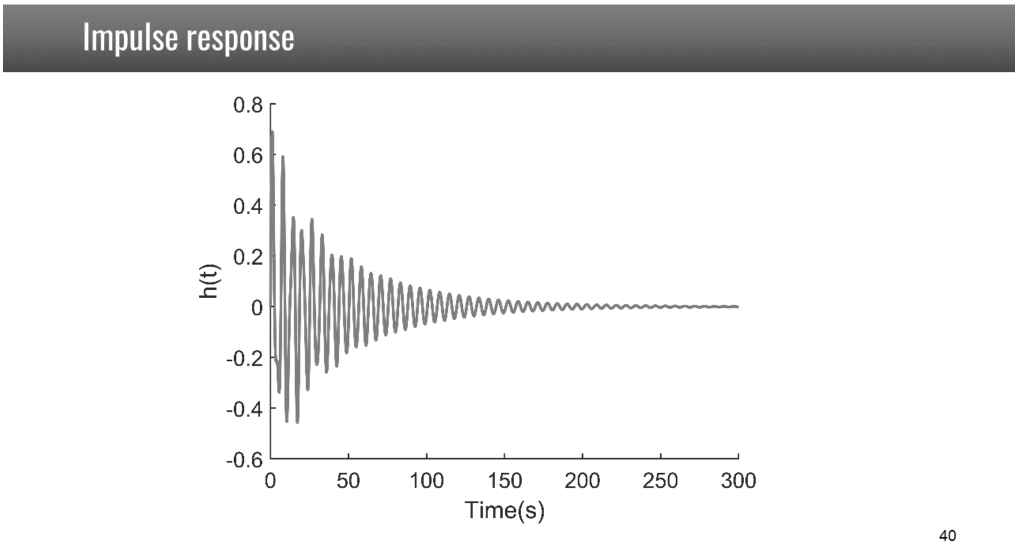
20. How would you extract the first natural frequency from the impulse response ?

0 respondent

No answers in this question

21. This is the impulse response of a damped two dofs system. Is it possible to extract the information on the second natural frequency and damping from this curve ?

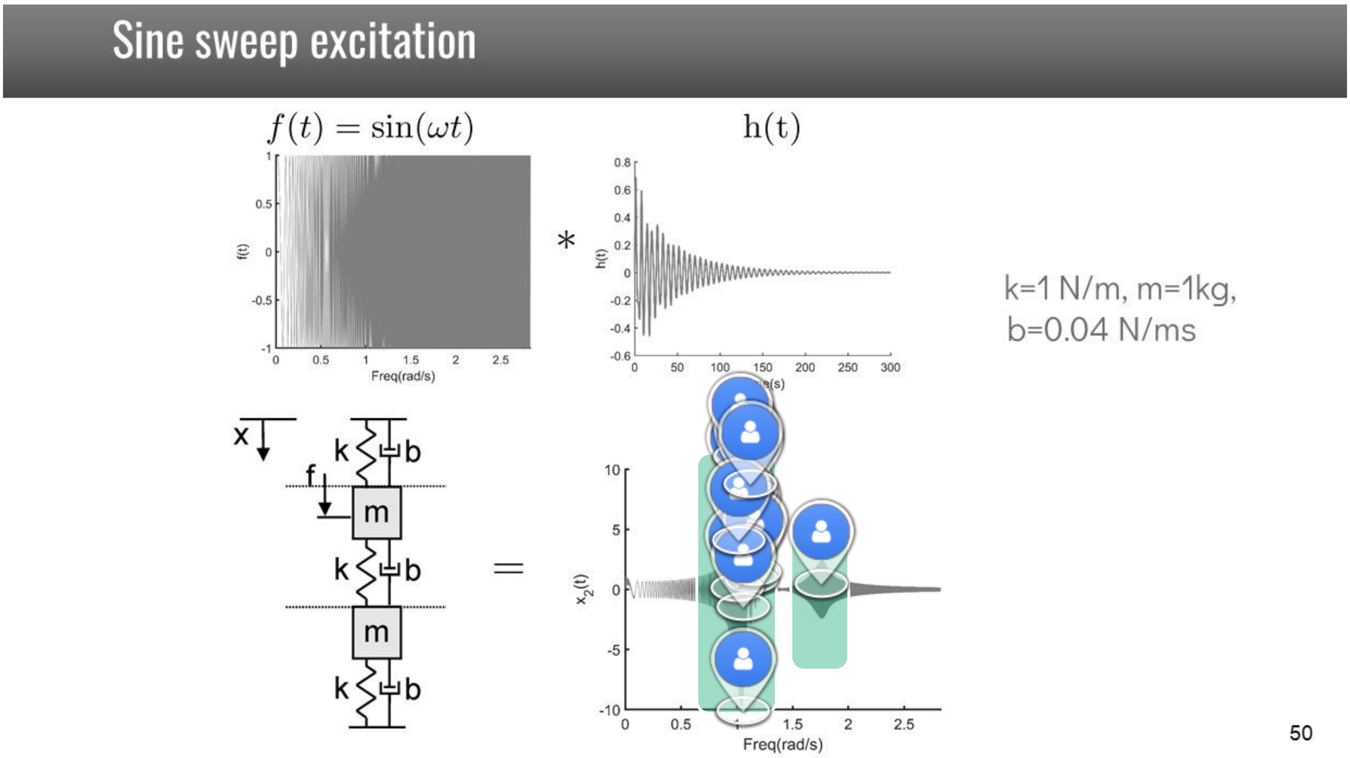
22 correct answers
out of 23 respondents



Answer	Percentage	Votes
Yes, you can see the response of the second mode very clearly.	0%	0 votes
✓ Yes, while you might not see it well, all information on the second mode is also contained in this response	96%	22 votes
No, impulse responses show only the response from one mode at a time	4%	1 vote

22. This is the time domain response of a damped 2 DOFs system under sine sweep excitation. Where do you see the resonances on the time domain response ?

15 respondents



23. When a system is excited by its base, it is easier to write the unknown displacements

12 correct answers out of 24 respondents

Answer	%	Votes
as relative displacement between the neighbouring DOFS	42%	10 votes
✓ as relative displacement between the base and each DOF.	50%	12 votes
in mm instead of m	8%	2 votes

24. When doing so, the equation of motion is equivalent to the case of an applied force which is

12 correct answers out of 19 respondents

Answer	%	Votes
✓ proportional to the applied acceleration	63%	12 votes
inversely proportional to the applied acceleration	16%	3 votes
proportional to the applied displacement	21%	4 votes