VIB : MDOF systems

Number of participants: 29

1. Did you watch the video on MDOF systems?

0 correct answer
out of 22 respondents

Yes	45%	10 votes
Yes, but at 1.5x speed	41%	9 votes
No	18%	4 votes

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

16 correct answers
out of 22 respondents

Answer	%	Votes
Calculating the eigenvalues of the stiffness matrix K of the system	18%	4 votes
✓ solving a generalized eigenvalue problem of the type (K-w^2M) {Phi} = 0	73%	16 votes
Calculating the eigenvalues of the mass matrix M of the system	5%	1 vote
Calulating w=K/M	5%	1 vote

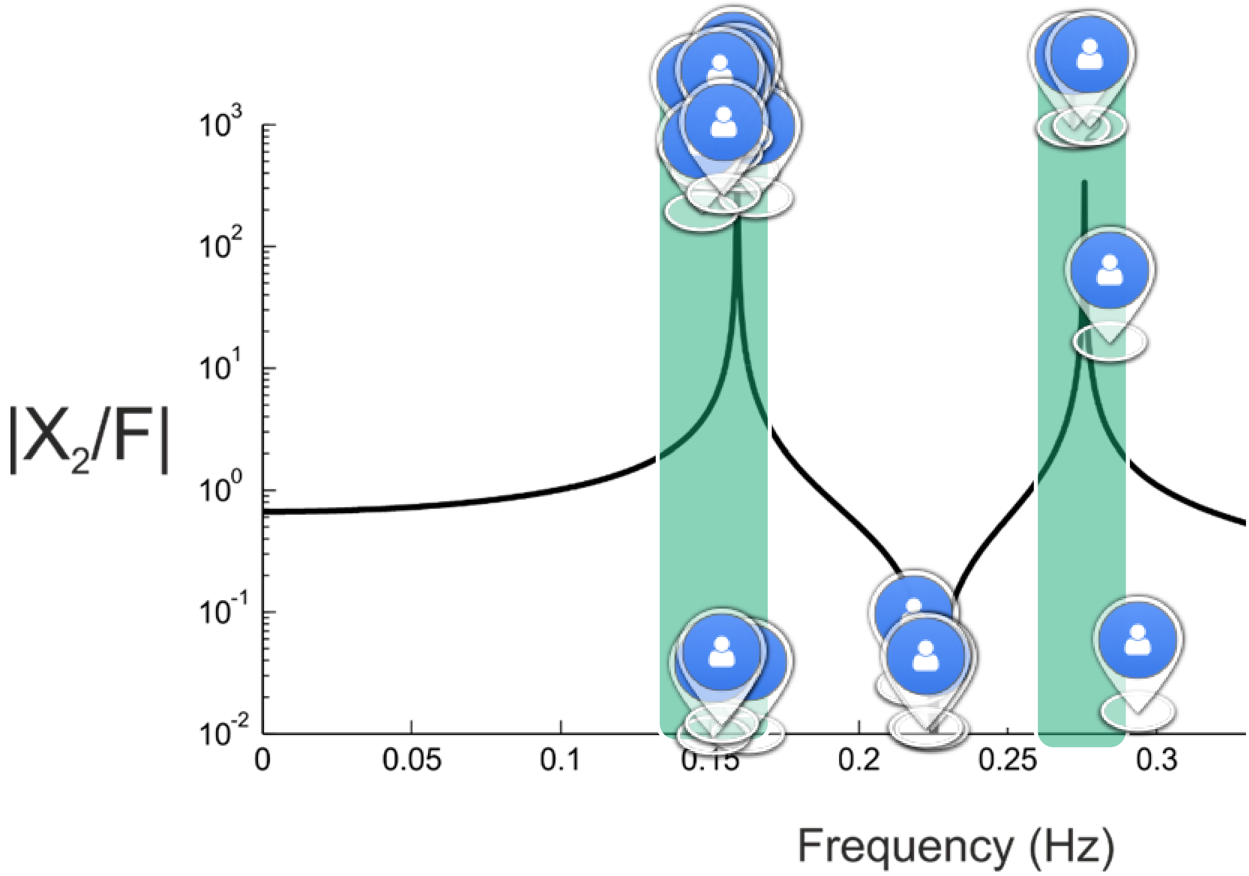
3. If a system has n degrees of freedom, it has

18 correct answers
out of 21 respondents

Answer	%	Votes
2n natural frequencies	5%	1 vote
✓ n natural frequencies	86%	18 votes
(n + the number of excitations) natural frequencies	10%	2 votes
it depends on the type of system	0%	0 votes

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

20 respondents



5. The mode shapes are orthogonal with respect to the

3 correct answers out of 18 respondents

stiffness matrix	✓	39%	7 votes
mass matrix	✓	56%	10 votes
damping matrix		22%	4 votes

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

12 correct answers
out of 16 respondents

	reduce the number of equations to solve	19%	3 votes
✓	decouple the equations of motion and facilitate solving them	75%	12 votes
	work with physical quantities for a better understanding of the system's behavior	6%	1 vote

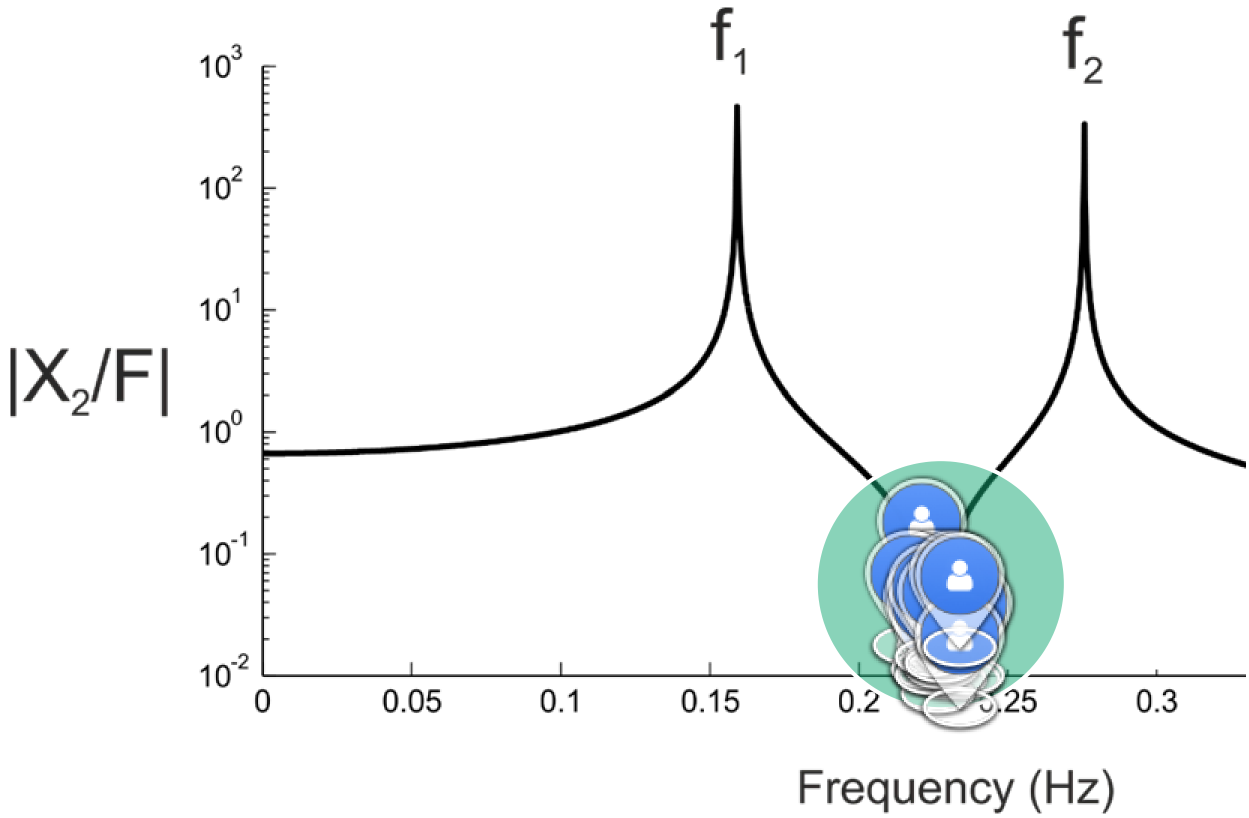
7. Which of these quantities is a global quantity for a given structure

4 correct answers
out of 18 respondents

✓	the eigenfrequency	61%	11 votes
	the anti-resonance frequency	17%	3 votes
✓	the damping coefficient	50%	9 votes

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

18 respondents



9. An anti-resonance happens when

13 correct answers
out of 16 respondents

Answer	Correct	Percentage	Votes
The contribution to the response of the two close modes as equal amplitude and equal phase		0%	0 votes
The contribution to the response of the two close modes has equal amplitude and opposite phase	✓	81%	13 votes
The displacement is zero for the two closest modes		19%	3 votes

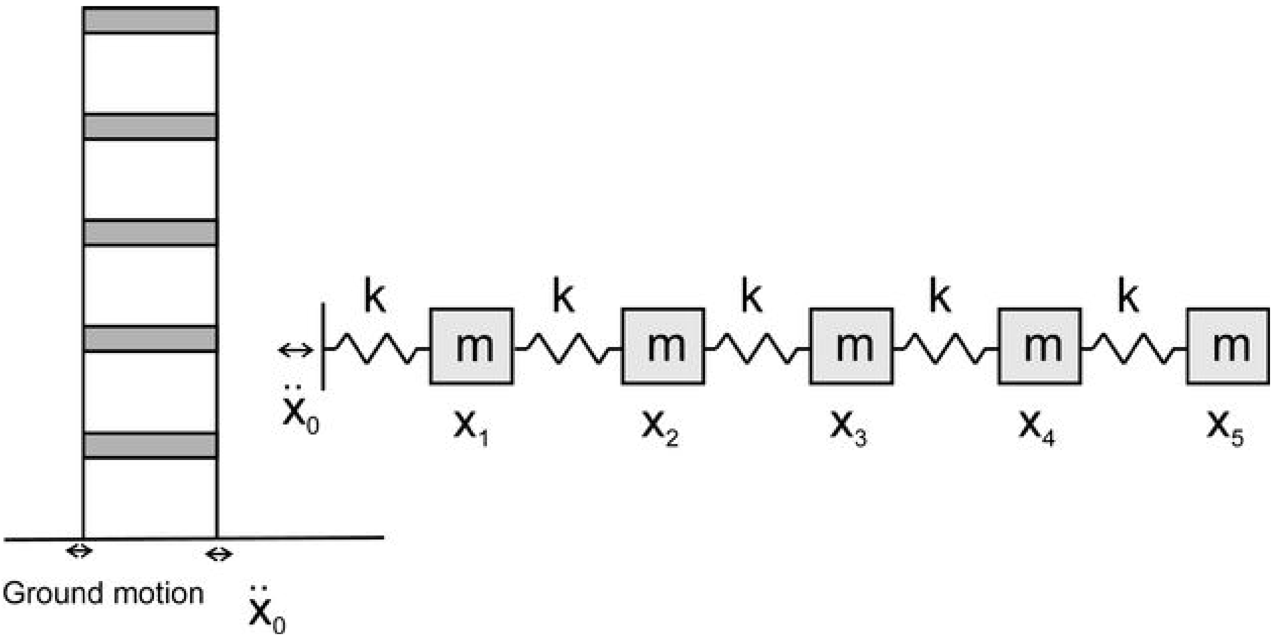
10. What kind of hypothesis can be made on the damping matrix to decouple the equations of motion in the modal domain ?

4 correct answers
out of 17 respondents

Answer	Correct	Percentage	Votes
Rayleigh Damping	✓	65%	11 votes
Lagrange Damping		12%	2 votes
Modal damping	✓	47%	8 votes
Friction damping		0%	0 votes

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

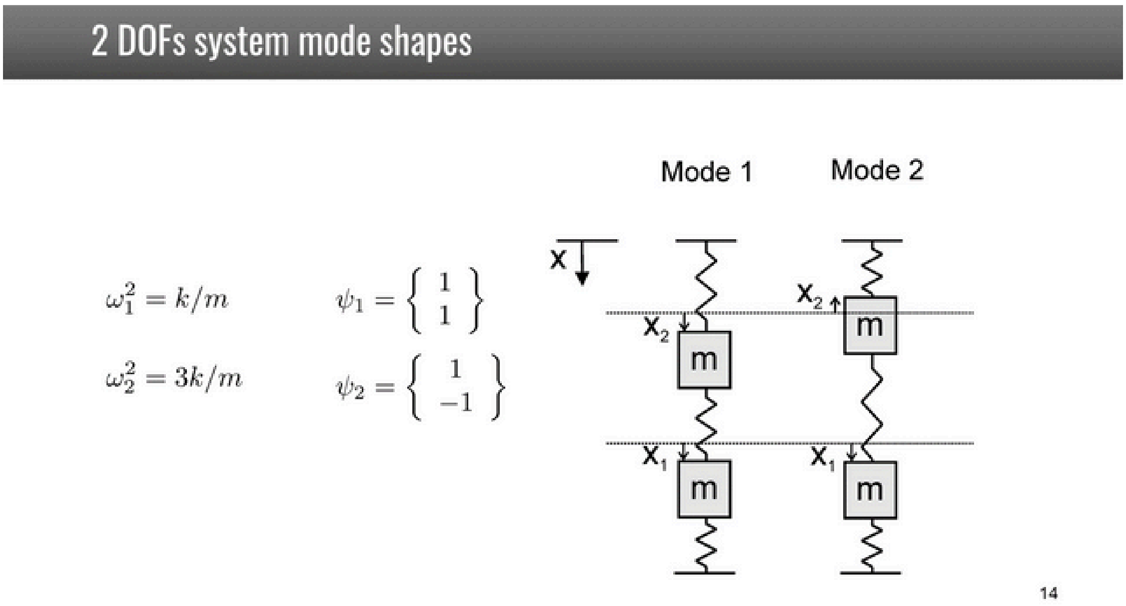
18 correct answers
out of 19 respondents



one	0%	0 votes
three	5%	1 vote
✓ five	95%	18 votes
an infinity	0%	0 votes

12. 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

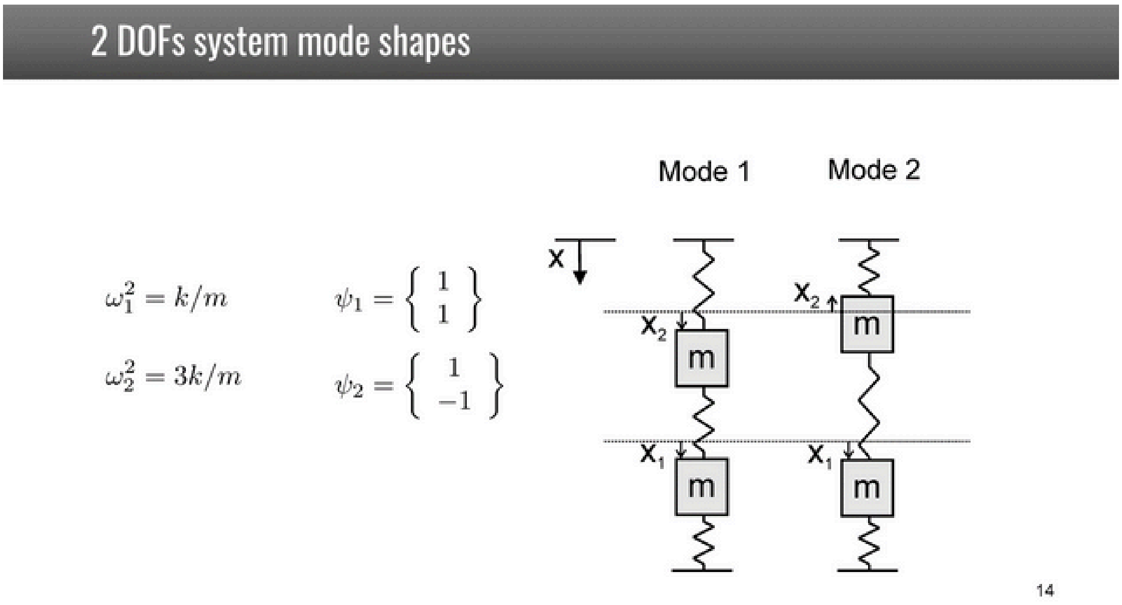
12 correct answers
out of 17 respondents



✓ The first mode shape where the two masses move in phase	71%	12 votes
The second mode shape where the two masses move out of phase	0%	0 votes
A combination of the two modeshapes	29%	5 votes

13. 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

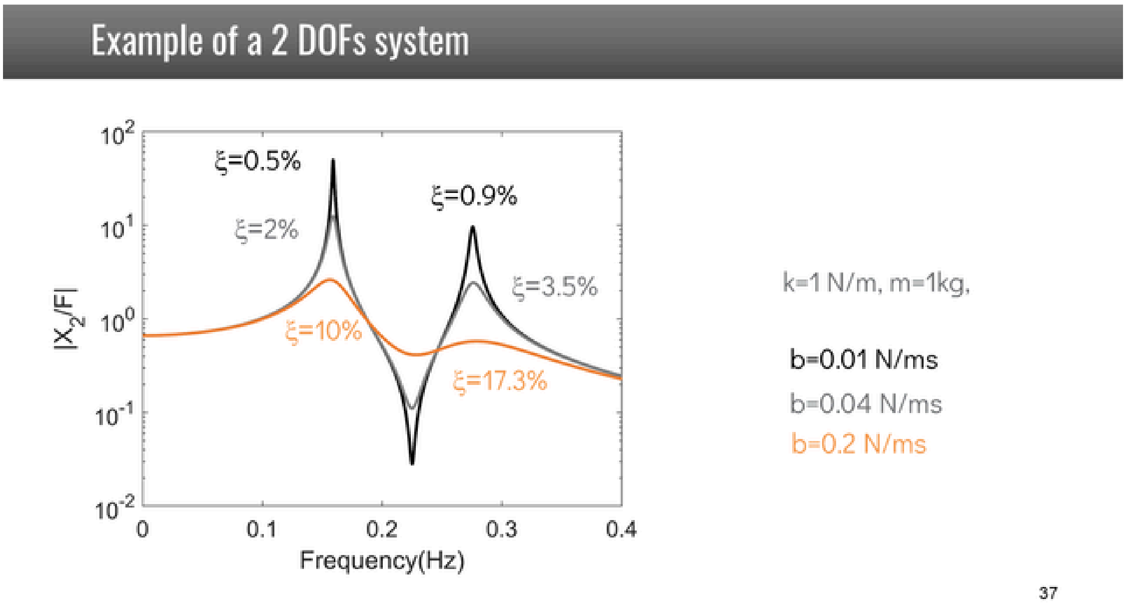
12 correct answers
out of 19 respondents



Answer	%	Votes
The first mode shape where the two masses move in phase	5%	1 vote
The second mode shape where the two masses move out of phase	32%	6 votes
✓ A combination of the two mode shapes	63%	12 votes

14. 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 ?

8 respondents



It has to do with the energy dissipated in the springs

By the second mode, the masses move out of phase

I don't know

energy of spring between masses, is zero when same phase

anti-resonance effect

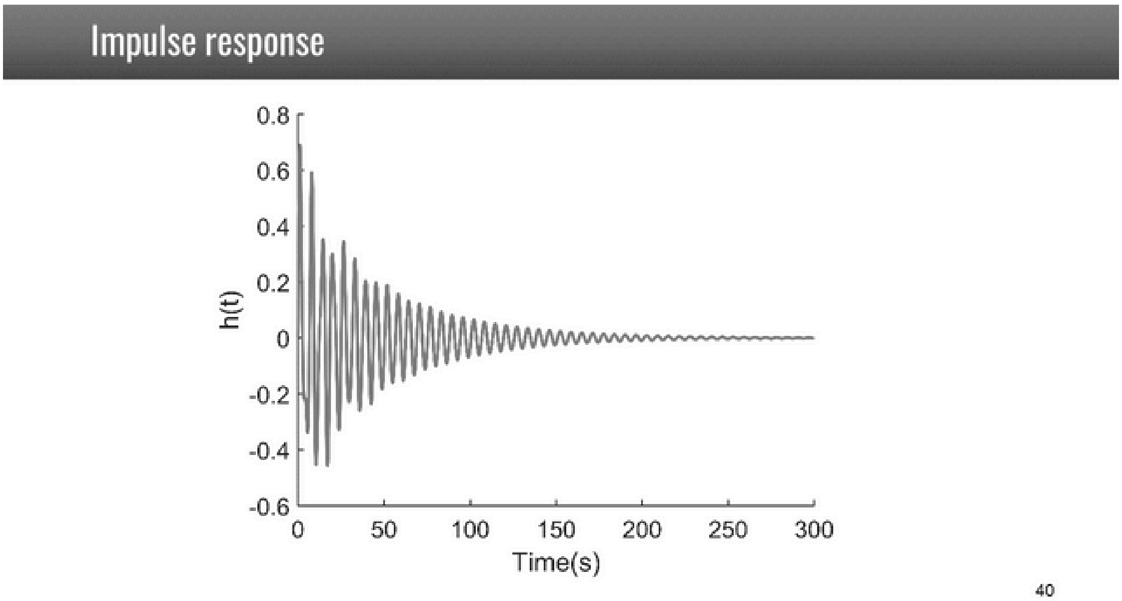
In the second mode the dashpot will be compressed and elongated so more damping

Because of the phase

Because in the first mode the middle damper is not used

15. 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 ?

14 correct answers
out of 16 respondents



✓ Yes	88%	14 votes
No	13%	2 votes

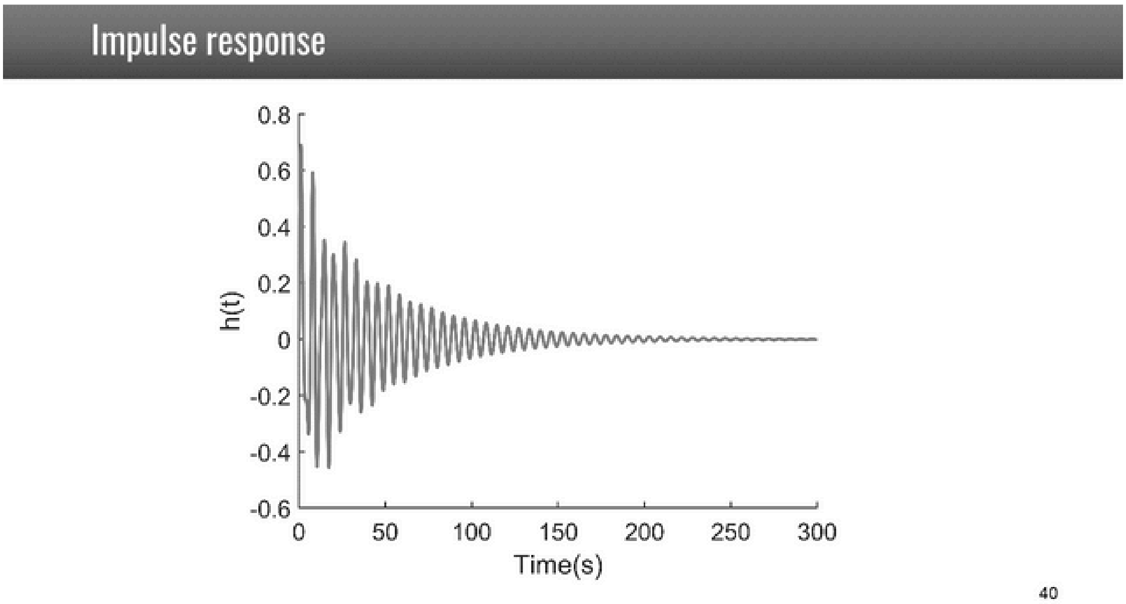
16. How would you extract the first natural frequency from the impulse response ?

6 respondents

- peak picking
- Convolution with the response
- Via Father Fourier
- Looking after the transient by counting the time periods
- taking the time of first peak and f=1/T
- Measure time between two peaks

17. 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 ?

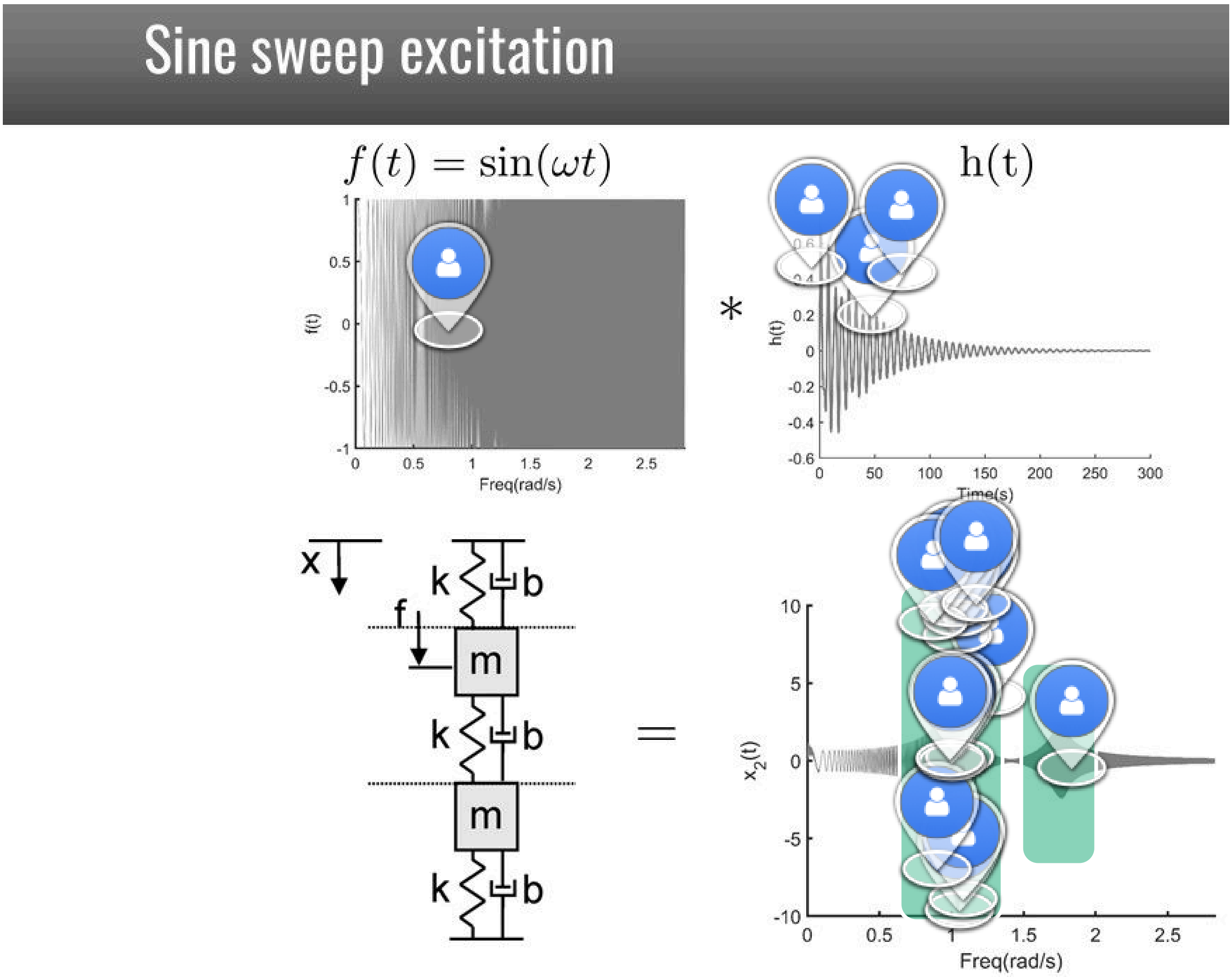
10 correct answers
out of 16 respondents



Yes, you can see the response of the second mode very clearly.	13%	2 votes
✓ Yes, while you might not see it well, all information on the second mode is also contained in this response	63%	10 votes
No, impulse responses show only the response from one mode at a time	25%	4 votes

18. **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 ?**

18 respondents



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

9 correct answers
out of 16 respondents

as relative displacement between the neighbouring DOFS	38%	6 votes
✓ as relative displacement between the base and each DOF.	56%	9 votes
in mm instead of m	6%	1 vote

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

11 correct answers
out of 16 respondents

✓ proportional to the applied acceleration	69%	11 votes
inversely proportional to the applied acceleration	13%	2 votes
proportional to the applied displacement	19%	3 votes