

VIB : Equivalent SDOF system

Number of participants: 19

1. In order to compute an equivalent stiffness, one needs to

9 correct answers
out of 14 respondents

✓	Apply a static force at the location where the mass is attached and in the direction of the motion of the mass	64%	9 votes
	Apply an harmonic force at the location where the mass is attached and in the direction of the motion of the mass	21%	3 votes
	Compute the first 5 modes shapes of the flexible element	14%	2 votes

2. The equivalent stiffness is then given by

9 correct answers
out of 15 respondents

✓	$k=F/x$ where x is the displacement in the direction of motion at the location of the applied force	60%	9 votes
	$k=F/x$ where x is the average displacement computed on the	20%	3 votes

flexible element

$k = F/x$ where x is the displacement in the direction of motion at the location of the applied force

20%

3 votes

For a bar in traction with section A, 3. young's modulus E and length L, the equivalent stiffness is given by

14 correct answers
out of 18 respondents

$k = E A L$

0%

0 votes

✓ $k = EA/L$

78%

14 votes

$k = E/(A*L)$

22%

4 votes

$k = 1/(EAL)$

0%

0 votes

4. Consider a cantilever beam with a mass attached at the tip. If the length of the beam is doubled, the first natural frequency is

4 correct answers
out of 12 respondents

	multiplied by 2	8%	1 vote
	divided by 2	25%	3 votes
✓	divided by 2 sqrt(2)	33%	4 votes
	divided by 4	33%	4 votes

**To compute the equivalent mass of a
5. flexible element simplified by a
spring element, one needs to**

14 correct answers
out of 17 respondents

	use the principle of d'Alembert	6%	1 vote
	compute the total mass of the flexible element and divided it by 3	12%	2 votes
	equate the kinetic		

- ✓ energy of the flexible element with the one of the additional mass located at the tip of the spring 82% 14 votes

6. When replacing a flexible element by a spring, the approximation is

11 correct answers
out of 16 respondents

- always valid 13% 2 votes
- valid only above the first natural frequency of the flexible element 19% 3 votes
- ✓ valid in a limited frequency band where the element's natural frequencies are not excited 69% 11 votes

7. A complex structure can be represented by an equivalent mass-spring model using

0 correct answer
out of 14 respondents

- ✓ the principles of equivalent mass and spring if the structure is made of a large mass attached to a flexible element 14% 2 votes

✓	a single mode approximation if the eigenfrequencies are well separated	21%	3 votes
	A division of the structure using single finite elements	79%	11 votes

8. When using single mode approximation, the equivalent mass and stiffness of the SDOF system depend on

0 correct answer
out of 12 respondents

✓	The value of the eigen frequency of the mode	58%	7 votes
	The average value of the modeshape considered	0%	0 votes
✓	The value of the modeshape considered at the position and in the direction of the applied force	42%	5 votes