

### INFORMATION ON DOCTORAL THESIS

1. Full name: Do Nam
2. Sex: Male
3. Date of birth: March, 17<sup>th</sup> 1983
4. Place of birth: Phu Tho
5. Admission decision number: 1094/QĐ-CTSV    Dated: November, 23<sup>th</sup> 2016
6. Changes in academic process:
  - + Changed the name and structure of the thesis according to the conclusions of the junior board (on January, 2021).
  - + Edited according to comments, suggestions and requests of independent reviewers (on May, 2021).
7. Official thesis title: Vibration of cracked continuous FGM beam made of functionally graded material
8. Major: Engineering Mechanics
9. Code: 9520101.01
10. Supervisors: Engineering Mechanics
11. Summary of the **new findings** of the thesis:
  - The general solution for vibration shape of FGM beams with multiple cracks has been established on the base of Timosshenko beam theory, power law of maaterial grading, actual position of neutral plane in the beam and double spring model for crack.
  - The transfer matrix method was developed for continuous FGM beams with multiple cracks, allowing to simplify the calculation of eigenfrequencies of the beams (disregarding the calculation of reaction at the intermediate supports of the beams).
  - Natural frequencies of cracked homogeneous beam with intermediate supports have been thoroughly examined as a particular case of the FGM beam. It was revealed that the intermediate supports make significant effect on the frequency spectrum of the beam. Especially, presence of the intermediate supports makes the same natural frequencies appeared for beamss with different boundary conditions. Such the frequencies are called the support frequencies.
  - The effect of cracks and material properties as well as the beam slenderness ratio on the natural frequencies of the continuous beams has been comprehensively studied. In particular, it was pointed out that, likely to the single span beam, there exist positions on the continuous beam where crack appeared do not change a certain frequency. Such

positions are called frequency nodes. It has been shown that crack occurring at a support may not affect a certain frequency, but it makes significant change in other frequency. All of these observations are important information for detecting cracks in continuous FGM beams by natural frequencies.

12. Practical applicability, if any: .....

13. Further research directions, if any: .....

14. Thesis-related publications:

**(1)** (2016) *Vibration of continuous multispans Timoshenko beam made of functionally graded material*. Proceedings of 4<sup>th</sup> International Conference on Engineering Mechanics and Automation (ICEMA 4), Hanoi, August 25-26, 2016.

**(2)** (2017). *Free vibration of cracked multispans continuous beam*. Proceedings of X<sup>th</sup> National Conference on Mechanics, Hanoi, December 8-9, 2017, pp.303-311.

**(3)** (2018) *Effect of intermediate support location on natural frequencies of multiple cracked continuous beams*. Vietnam Journal of Mechanics, VAST, Vol. 40, No. 2 (2018), pp. 181 – 198.

**(4)** (2019) *An application of the dynamic stiffness approach to free vibration of continuous multispans beam with cracks*. Tuyển tập báo cáo Hội nghị Cơ học kỹ thuật toàn quốc kỷ niệm 40 năm Viện Cơ học, 9-4-2019.

**(5)** (2020) *Modal analysis of cracked continuous Timoshenko beam made of functionally graded material*. Mechanics Based Design of Structures and Machines 48(4) 459-479. DOI: 10.1080/15397734.2019.1639518.