Program – October, 2018.

Tuesday, October 09, 2018, at 17h, room 301f

Dušan Zorica, Mathematical Institute of SASA, Belgrade, Serbia; Faculty of Sciences, University of Novi Sad, Novi Sad, Serbia
NON-LOCAL AND MEMORY EFFECTS IN THE DYNAMIC STABILITY ANALYSIS OF RODS

Lateral vibrations of a simply rod loaded by an axial force of constant intensity and positioned on a foundation are the subject of analysis. The main goal in dynamic stability analysis is to determine the conditions that guarantee stability, i.e., conditions under which the rod will vibrate with constant or decreasing amplitude.

First, Bernoulli-Euler moment-curvature constitutive equation, describing elastic material the rod is made of, is assumed. The rod-foundation interaction is modeled by the complex-order fractional Kelvin-Voigt model of the viscoelastic body, with the restrictions on model parameters following from the Second law of thermodynamics.

Second, Eringen's type moment-curvature constitutive equation, describing the material of the rod that shows non-local effects, is assumed. This type of non-locality is usually associated with nano-rods. The foundation shows Pasternak and viscoelastic type properties. Thus, rod-foundation interaction is modeled through rotational elastic springs, describing the foundation ability to influence the curvature of the rod and through general rheological model of the viscoelastic body corresponding to the distributed-order constitutive equation.

The solutions to problems are obtained by the separation of variables method. The critical value of axial force, guaranteeing stability, is determined. The influence of various model parameters on the value of critical axial load is examined.

This talk aims to review and summarize the dynamic stability problems analyzed in the cooperation with T. Atanacković, M. Janev, S. Konjik, B. Novaković, S. Pilipović and Z. Vrcelj.

REFERENCES

[1] D. Zorica, T. M. Atanackovic, Z. Vrcelj, B. N. Novakovic, Dynamic stability of an axially loaded non-local rod on a generalized Pasternak foundation, Journal of Engineering Mechanics. ASCE, 143 (2017) D4016003–1–10.

[2] T. M. Atanackovic, M. Janev, S. Konjik, S. Pilipovic, D. Zorica, Vibrations of an elastic rod on a viscoelastic foundation of complex fractional Kelvin-Voigt type, Meccanica, 50 (2015) 1679–1692.

Tuesday, October 16, 2018, at 17h, room 301f

Andjelka N. Hedrih, Mathematical Institute of SASA, Belgrade, Serbia
MODELING COUPLED OSCILLATORY MECHANISM WITH PHASE-DELAY

Coupling oscillators are present in industry, engineer and biological systems. Way of their coupling, strength of coupling will affect their dynamics and stability. We model a complex structure that consists of four coupled oscillators with viscoelastic properties and phase-delay. Visco-elastic properties of coupled oscillators were modeled using differential equations with fractional derivatives. We investigated how different phase-delay of this coupled mechanical system is related with phenomenon of dynamical absorption and resonance and stability of the system.

REFERENCES

[1]   Hedrih (Stevanović) K., *Dynamics of coupled systems.* Nonlinear Analysis: Hybrid Systems, Vol 2, 310-334, 2008.

[2]   Hedrih (Stevanović) K., Machado T. *Discrete fractional order system vibrations.* International Journal Non-Linear Mechanics, 73(2015)2–11, 2013. DOI: 10.1016/j.ijnonlinmec.

[3]   Hedrih, A (Stevanovic) Hedrih, K. (2018) Kinetic energy of homologue chromosome pairs in biomechanical oscillatory model of mitotic spindle. in Book of Abstracts [Elektronski izvor] / Sixth International Conference on Radiation and Applications in Various Fields of Research, RAD 2018, 18.06 - 22.06. 2018, Ohrid, Macedonia ; [editor Goran Ristić]. - Niš: RAD Association, 2018 (Niš : RAD Association). - 1 elektronski optički disk (CDROM); 12 cm.pp. 431. ISBN 978-86-80300-03-0. COBISS.SR-ID 266468620. http://www.rad-conference.org/books.php

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Tuesday, October 30, 2018, at 17h, room 301f
Aleksandar Obradović, Faculty of Mechanical Engineering in Belgrade, Serbia
FREE VIBRATION ANALYSIS OF AXIALLY FUNCTIONALLY GRADED TAPERED, STEPPED, AND CONTINUOUSLY SEGMENTED RODS AND BEAMS

This article [1] is a continuation of research in papers [2] and [3]. In this paper a new non-iterative computational technique referred to as the symbolic-numeric method of initial parameters (SNMIP) is proposed. The SNMIP represents a modification of the iterative numeric method of initial parameters in differential form known in the literature. The SNMIP is applied to study free vibrations of Euler-Bernoulli axially functionally graded tapered, stepped, and continuously segmented rods and beams with elastically restrained end with attached masses. Both the longitudinal vibration of rods and transverse vibration of beams are considered. The influence of the attached masses and springs on the natural frequencies of vibration of axially functionally graded rods and beams is examined. The validity and accuracy of the method are proven through the comparison with the known results in the available literature. The subject of this research in the following articles will be applied to Timoshenko's beams as well as to cases of longitudinal and transverse oscillations coupled across boundary conditions.

REFERENCES

[1] Šalinić S., Obradović A., Tomović A.,Free vibration analysis of axially functionally graded tapered, stepped, and continuously segmented rods and beams, Composites Part B, ISSN:1359-8368, Vol. 150, pp. 135 - 143, 2018.

[2] Obradović A., Šalinić S., Trifković D., Zorić N., Stokić Z, Free vibration of structures composed of rigid bodies and elastic beam segments,Journal of Sond and Vibration,ISSN: 0022-460X, Vol. 347, pp. 126–138, 2015.

[3] Tomović A., A Novel Approach to the Free Axial-Bending Vibration Problem of Inhomogeneous Elastic Beams With Variable Cross-Sectional Profiles, S3c, Proceedings of the 6th International Congress of Serbian Society of Mechanics, Tara, 2017.

September 17, 2018

The chair
Prof. dr Katica R. (Stevanović) Hedrih

The co-chair
dr Ivana Atanasovska,
Associate Research Professor

The Mathematical Institute of the Serbian Academy of Sciences and Arts was founded in 1946 as the first institute of the Academy. At the time of its founding in a country devastated by the war, the Institute had to start practically from zero, but there was a historical background on which to build. Scientific research in mathematics began in Serbia near the end of the Nineteenth century.Â At their disposal they had a rich collection of materials in the Mathematics Seminar of the Belgrade University, established in 1895. By 1946, however, all this was gone. In 1944, just two days before the liberation, the library was burned together with all the written records of the Club's activities. For the tenth time Mathematical Institute of the Serbian Academy of Sciences and Arts and Center for the Promotion of Science are organizing May Month of Mathematics (M3). It is the largest national event for the promotion of science. Due to the epidemic, M3 will be realized as a hybrid festival mixing live and virtual events. Ranking of scientific journals published in Serbia for 2020. 2020. Ministry of education, science and technological development has published the annual national journal ranking report for 2020. The bibliometric reports can be found at bibliometrija.Âmi.Âsanu.Âac.Ârs. RE Mathematical Institute, Serbian Academy of Science and Arts, Kneza Mihaila 36 (P.O. Box 367), 11001 Belgrade, Serbia. December 2017Discrete Mathematics, Volume 340, Issue 12https://doi.org/10.1016/j.disc.2017.07.005. research-article.Â University of Banjaluka, Faculty of Mathematics and Natural Sciences, Mladena Stojanovica 2, 78000 Banjaluka, Bosnia and Herzegovina. , Jozef Kratica. Mathematical Institute, Serbian Academy of Sciences and Arts, Kneza Mihaila 36/III, 11000 Belgrade, Serbia. , Z. Maksimovic. Military Academy, University of Defence, Generala Pavla Juriica turma 33, 11000 Belgrade, Serbia. November 2017Computers and Industrial Engineering, Volume 113, Issue Chttps://doi.org/10.1016/j.cie.2017.09.029. View Publication Archive. Mission : The mission of the Mathematical Institute of the Serbian Academy of Sciences and Arts consists of: Maintaining the highest level of scientific research in the filed of mathematics, mechanics and computer science. Mobilizing mathematical resources in Serbia, offering research infrastructure and improving communication between groups having similar scientific interest. Discovering ways of applying scientific results. Solving problems posed by sciences and industry. Organizing all sorts of scientific and expert training and participating in organization delivery of doctoral studies. Org