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Free vibration analysis of FGM shell with complex planform in thermal environments

Jan Awrejcewicz, Lidiya Kurpa, Tetyana Shmatko

Abstract: Summary. In the present study free vibrations of FGM shallow shells of an arbitrary planform in thermal environment are investigated via R-functions method (RFM). First-order shear deformation theory of shallow shells is employed. Material properties are assumed to be temperature-dependent and expressed as nonlinear functions of temperature. The generic material properties are not only functions of temperature, but also functions of thickness direction. It is supposed that material properties vary through thickness according to a power-law distribution of the constituent's volume fraction. The developed method is based on the combined applications of the R-functions theory, variational Ritz's method. A comparison of the obtained results with available ones is carried out for rectangular plates and shallow shells. Vibration of shell panels with complex planform and different boundary conditions including mixed ones are studied. Solution structures and related admissible functions for shells with complex planform have been constructed by the R-functions theory. The effect of the temperature rise, geometry of the shell, material properties and constituent volume fraction index is examined. Keywords: R–functions theory, FGM shallow shells, free vibrations, thermal environment.

[1)] Jan Awrejcewicz, Professor: 3 Department of Automation, Biomechanics and Mechatronics, Lodz University of Technology, Lodz, Poland, 1/15 Stefanowski Street (building A22), 90-924 Łódź, Poland 1/15 Stefanowski Street, 90-924 Łódź, Poland, Poland (PL), jan.awrejcewicz@p.lodz.pl.

[2)] Lidiya Kurpa, Professor: National Technical University , Kyrpychova, 2, Kharkiv, Ukraine, 61002, Ukraine (UA), kurpalidia@gmail.com.

[3)] Tetyana Shmatko, Associate Professor: National Technical University "Kharkiv Polytechnic Institute", Kyrpychova, 2, Kharkiv, Ukraine, 61002, Ukraine (UA), ktv_ua@yahoo.com, the author presented this contribution at the conference in the special session "Modeling and experiments of complex continuous systems" organized by F. Pellicano and A. Zippo