15th INTERNATIONAL CONFERENCE
Dynamical Systems — Theory and Applications
December 2-5, 2019. Lodz, POLAND.

DSTA 2019

paper id: STA45

Primary and combined multi-frequency parametric resonances of a rotating thin-walled composite beam under harmonic base excitation

Jarosław Latalski, Jerzy Warmiński

Abstract: This study considers the stability of vibration of a rotating structure consisting of a rigid hub and a flexible thin-walled laminated composite beam under harmonic base excitation. The partial differential equations of motion representing a complex elastic deformation of the blade including bending, shear and twisting effects have been derived by the Hamilton's least action principle. Next, these equations have been transformed to a dimensionless ordinary differential form by adopting the Galerkin method. It is shown the final equation of motion includes time-varying coefficients that depend on the system angular velocity as well as on the base excitation frequency. Due to the doubly periodic external excitation terms this form of the governing equation is different from the typical Mathieu-Hill's equation. Two numerical examples are presented to illustrate the influence of selected model parameters on the dynamic stability of the system.

[1)] Jarosław Latalski, Associate Professor: Lublin University of Technology, Nadbystrzycka 36, Lublin, Poland (PL), j.latalski@pollub.pl, the author presented this contribution at the conference in the special session: "Dynamics of parametric and self-excited systems: analysis and applications" organized by F. Dohnal and J. Warmiński.

[2)] Jerzy Warmiński, Professor: Lublin University of Technology, Nadbystrzycka 36, Lublin, Poland (PL), j.warminski@pollub.pl.