Buckling and vibro-acoustic response of the clamped composite laminated plate in thermal environment

Xiangyang Li, Kaiping Yu, Jingyong Han, Haiyang Song, Rui Zhao

www.elsevier.com/locate/ijmecsci

PII: S0020-7403(16)30588-4
DOI: http://dx.doi.org/10.1016/j.ijmecsci.2016.10.021
Reference: MS3463

To appear in: *International Journal of Mechanical Sciences*

Received date: 29 June 2016
Revised date: 22 September 2016
Accepted date: 26 October 2016

Cite this article as: Xiangyang Li, Kaiping Yu, Jingyong Han, Haiyang Song and Rui Zhao, Buckling and vibro-acoustic response of the clamped composite laminated plate in thermal environment, *International Journal of Mechanical Sciences,* http://dx.doi.org/10.1016/j.ijmecsci.2016.10.021

Buckling and vibro-acoustic response of the clamped composite laminated plate in thermal environment

Xiangyang Li, Kaiping Yu*, Jingyong Han, Haiyang Song, Rui Zhao

Department of Astronautic Science and Mechanics, Harbin Institute of Technology, No.92 West Dazhi Street, Harbin 150001, China

eagletosun@gmail.com (X. Li)

yukp@hit.edu.cn (K. Yu)

Abstract

Composite structures are extensively applied in aircraft and marine industries because of their high stiffness-to-weight ratios and other advantages. The composite structures in the hypersonic aircraft are usually exposed to the thermal and noise environment. The paper is focused on the buckling and vibro-acoustic response of the clamped composite laminated plate excited by a concentrated harmonic force in the thermal environment. The analytical solution of vibration and acoustic response for fully clamped boundary condition is derived in the paper. Meanwhile, the natural frequencies and buckling temperatures of the plate in uniform temperature environment are also derived by applying the classical laminate theory (CLT) and first order shear deformation theory (FOSDT). The vibration response is obtained by applying the mode superposition method, while the sound pressure and radiation efficiency are calculated by Rayleigh integral in sequence. The accuracy of the presented method is verified by the numerical simulations. The structural and acoustic response affected by the thermal load is demonstrated through a numerical example.