An Analysis of Dynamic Stability of Composite Laminated Cylindrical Shells Subjected to Periodic Axial Compressive Loading

by

Keiichi NEMOTO[*1], Yasuji YAMAGISHI[*2] and Hirakazu KASUYA[*3]

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Abstract

This paper deals with the problem of dynamic stability of cross-ply laminated cylindrical shells subjected to periodic axial compressive loading. First, the axially symmetric motion of the shell is imposed by the periodic axial compressive loading. Subsequently, certain perturbations are superimposed on this motion, and their behavior sequential with time is investigated. The symmetric state of motion of the shell is considered to be stable if the perturbations remain bounded. The solutions for the prebuckling motion and the perturbated motion are obtained by the use of Galerkin's method. Calculations are carried out for cross-ply laminated cylindrical shells and the instability regions are determined by utilizing Mathieu's equation. Mathieu's equation includes static buckling values, so, we aim at the static buckling value analyzing. The buckling values by Flügge shell theory. These of Mathieu's equation are solved with good accuracy. Regarding the instability mode, we compared the results of Flügge theory with Donnell theory. The inevitability of dynamically unstable behavior is proved analytically and the effects of various factors, such as static buckling pattern, vibrated ampilude and dynamic unstable mode, are clarified.

Key words : *Structural analysis, Cross-ply laminated cylindrical shell, Dynamic stability, Periodic axial compressive loading, Mathieu's equation*

*1 Aerospace Engineering Department, Yokohama Rubber Co., Ltd.
*2 Graduate Student, Course of Mechanical Engineering.
*3 Professor, Department of Prime Mover Engineering.