Summary

OPTIMAL DESIGN OF STRUCTURES FOR DYNAMIC STABILITY MAXIMIZATION – SUPERSONIC FLUTTER PHENOMENON

In the present paper the optimal design of composite structures for dynamic stability maximization – supersonic flutter phenomenon is discussed. The analysis is carried out for two types of structures: rectangular plates (laminated multilayered composite materials and porous functionally graded materials) and cylindrical panels (laminated multilayered composite materials).

A special attention is focused on the methods of solution of dynamic stability problems (analytical and numerical methods). The phenomena of free vibrations frequency and aerodynamic pressure maximization were also discussed in order to solve optimization problems. The structures with different geometrical parameters, boundary conditions, stacking sequences and porosity distribution configuration for functionally graded materials are analyzed. For discrete fibre orientations a new form of design variables is proposed and successfully employed.

The optimization problems are solved analytically using the Mathematica symbolic package (structure with specific boundary conditions) and numerically using the finite element method – NISA II package (structure with any boundary conditions).