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خلاصه مقاله:

In this research, the aeroelastic stability of a blade made of composite material has been investigated and the effects of lay-up, aspect ratio, and blade thickness on flutter and divergence speeds and flutter frequency have been studied. The model considered for simulating the blade is a laminated rectangular cantilever plate with three-dimensional fluid flow on top of it. One of the best theories so far presented for computing the unsteady aerodynamic forces on the vibrating plate is the Doublet-Lattice Method (DLM), which has been used in this research. The structural and modal analyses have been performed using Finite Element Method (FEM) and coding in the MATLAB environment. The surface spline was used to couple the aerodynamic and structural loads. Finally, the P-K method was used to determine the flutter speed. It can be observed from the studies carried out in this research that the aeroelastic characteristics of a composite blade in addition to its structural characteristics such as natural frequencies are considerably affected by thickness, aspect ratio, and lay-up. The results show that the blade with a lay-up angle of ۴۵ degrees exhibits the best resistance to flutter and divergence. Furthermore, the aeroelastic instability speed increases with an increase in blade thickness but decreases with an increase in aspect ratio.

کلمات کلیدی:

Aeroelastic stability, composite blade, Doublet-Lattice Method, finite element