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Vibration and buckling of laminated plates of complex form under in-plane uniform and non-uniform loading

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Abstract: Abstract: The vibration and buckling analysis of symmetrically laminated plates with complex form subjected to in–plane uniform and non–uniform loading is performed using variational Ritz method and the R-functions theory. Classical and First order shear deformations theory of Timoshenko's type are adopted. Each ply is assumed to be as an orthotropic homogeneous one without slip at interfaces. The developed approach includes several stages: determination of the heterogeneous subcritical state of the plate; finding buckling critical load; solving linear vibration problem. Ritz's method is applied on each stage. Systems of the admissible functions, that satisfy at least main (kinematic) boundary conditions have been built by the R-functions method. Validation of the proposed method and created software are confirmed by comparison of buckling load and frequencies vibration with known results for square laminated plates with free circle or rectangular cut-outs. Buckling loads for laminated rectangular plates with two clamped and free rectangular cut-outs have been obtained. It is assumed that plates can be made of different materials and have the different ply orientation. Effect of the cut-outs sizes and their position inside of the domain also as ways of cuts fixing on critical load and frequencies values are studied in details. Number of layers, degree of orthotropic, boundary conditions, ply orientation, type of loading (uniform and non-uniform) on buckling critical load and frequencies value are investigated.

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