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NASA TECH BRIEF

Lewis Research Center

Computer Program to Compute Buckling Loads of Simply Supported Anisotropic Plates

The Problem:

Advanced fiber reinforced composite materials are finding numerous applications as structural components because of their high stiffness-to-density and high strength-to-density ratios. Panels made from these materials will have to meet both material strength and buckling requirements. A method was needed to determine the buckling loads of these panels.

The Solution:

A computer program has been developed for computing the buckling loads of such simply-supported, rectangular, anisotropic and layered composite material plates.

How It's Done:

The plates can be subjected to combinations of in-plane loads (normal and shear). The computer program is based on the Galerkin method for the plate displacement solution and the power method for obtaining the smallest buckling load.

The program needs for input the loading conditions, bending (flexural) rigidities (stiffness) and dimensions of the plate. It computes the buckling load and prints out the following: composite system input data, load condition, buckling load, terms in the series expansion, relative convergence error, and a normalized array of the buckled shape.

The program is set up to handle: (1) several types of composites and several load conditions for each plate, (2) both compressive or tensile membrane loads, and (3) bending-stretching coupling via the concept of reduced bending rigidities.

Notes:

1. The computer program can be (a) used to compute the buckling loads of homogeneous isotropic plates when the plates are subjected to combined normal and shear in-plane loads, and (b) slightly modified to calculate the vibration frequencies of homogeneous or layered anisotropic plates.
2. The program is written in FORTRAN IV for an IBM 7094 computer.
3. Inquiries concerning this program should be directed to:

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