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SOLUTION TO THE PROBLEM OF THE THERMOELASTIC VIBRATION OF A PLATE, IF THE TWO OF ITS EDGES ARE PINNED AND THE OTHER TWO ARE RIGIDLY FIXED

The operating conditions of uneven warming can cause changes in physical and mechanical properties of the material. Awareness of the intensity and nature of thermal stresses is required to perform a comprehensive analysis of the structural strength.

The authors provide their solution to the problem of identification of natural frequencies of vibrations of rectangular plates, if a thermal factor is taken into account.

The introductory section of the paper covers the equation of the thermoelastic vibration of a plate and formalizes initial and boundary conditions.

The middle section of the paper covers the method of frequency equation derivation for plates exposed to special boundary conditions, if the two opposite edges of a plate are pinned and their surface temperature is equal to zero, while the two other edges have an arbitrary type of fixation and an arbitrary thermal mode.

A general solution is developed for the boundary conditions of pinned edges, while any alternative types of fixation of the two other edges require derivation of transcendental trigonometric equations reducible to algebraic frequency equations expendable in series. Thus, derivation of frequency equations on the basis of the general solution becomes possible for different types of boundary conditions.

The final section of this paper covers the derivation of the solution for a selected problem through the application of the method proposed by the authors. The results demonstrate that a thermoelastic plate with two pinned and two rigidly fixed edges has five natural frequency patterns, two of which represent the frequencies produced by the plate, if it is free from any temperature influence.

Key words: thermoelastic plate vibration, plate vibration, vibration frequency.

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