

EQUATIONS OF THE FINITE ELEMENT METHOD FOR PROBLEMS OF THE THEORY OF ELASTICITY

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Introductions. The finite element method is a numerical method for solving a wide range of problems. One of the essential from the point of view of practical needs is the problems of the theory of elasticity. This is due to a wide nomenclature of problems, when the elements work under conditions of elastic deformations and the complexity of the shape of many elements of modern technology is determined by the finite element method as a practically non-alternative and universal method for these cases.

Aim. The work considers the methods used to solve the problems of the theory of elasticity using the finite element method and the interpretation of their essence and general methodology.

Materials and methods. Two methods are used to solve the problems of elasticity theory.

The essence of the first method is to solve differential equations with given boundary conditions. When applying the second method, the integral value of the work of stresses and external load is minimized.

The second method is the basis for using the finite element method for solving problems of the theory of elasticity.

Problems can be solved in displacements or in tensions.

When solving the problem in displacements, the potential energy of the system is minimized, taking into account the appropriate boundary conditions. When solving the stress problem, the additional work of the system with the given limit forces is minimized.

When solving problems of the theory of elasticity using the finite element

method, displacement fields are determined under the condition of minimizing the potential energy of the system when calculating the nodal values of the displacement vector. After determining the displacements, the components of the strain and stress tensors are calculated.

Results and discussion. The finite element method is a numerical method for solving a wide range of problems and, in particular, problems of the theory of elasticity, which include a wide range of practical problems. The complexity of the form of many elements of modern technology is determined by the finite element method as a virtually non-alternative and universal method for the specified cases.

Conclusions. The paper examines two methods used to solve problems of the theory of elasticity using the finite element method and interpretation of their essence and general methodology.

Literature

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