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# APPROXIMATE EQUATION PLATE OSCILLATION FOR TRANSVERSE DISPLACEMENT OF POINTS OF THE MEDIAN PLANE

**Abstract.** The materials used in building structures have elastic and viscoelastic properties, are anisotropic, multilayer and other mechanical characteristics. Two-dimensional elements are components of many structures. Construction of general and approximate equations of oscillations of a various kind of plane elements is an actual problem in the development of theoretical bases of calculation of building designs and construction in general. These problems include the objectives of improved models of non-stationary nature of the structures and their elements, the materials of which are difficult mechanical, rheological properties inherent to various building designs under the influence of various external factors.

**Keywords:** plate, oscillation, mixed points, dynamic motion, approximate equation, three-dimensional problem, stress.

Let limitless in terms of plate thickness $2h_1$ is below the surface of a semi-infinite medium at depth $(h_0 - h_1)$. Put the plane $XY$ in the median plane of the plate at $z = 0$. Axis $OZ$ to the right towards the outer surface of the outer layer. Denote the layer parameters index" 1", the upper layer $[-\infty < (x, y) < \infty;\ h_1 \le z \le (h_0 - h_1)]$ by the index" 2", and the lower half-space $[-\infty < (x, y) < \infty;\ -h_1 \le z \le 0]$ - index" 3".

We assume that the materials of the upper layer of the plate and the grounds are homogeneous, isotropic, show the viscous properties.

We introduce the potentials of $\Phi^{(l)}$ and $\Psi^{(l)}$ transverse and longitudinal waves well-known formulas

$$\vec{u}^{(l)} = grad\Phi^{(l)} + rot\vec{\Psi}^{(l)}, \tag{1}$$

where $\vec{u}^{(l)}$ – the displacement vector points in the layer of the plate and the foundation.

In potentials $\Phi^{(l)}$ and $\Psi^{(l)}$ equations of motion of a layer of the plate and the foundation will take the form of:

$$N_l\left(\Delta\Phi^{(l)}\right) = \rho_l \frac{\partial^2 \Phi^{(l)}}{\partial t^2} \qquad M_l\left(\Delta\vec{\Psi}^{(l)}\right) = \rho_l \frac{\partial^2 \Psi^{(l)}}{\partial t^2}, \tag{2}$$

where the operator $N_l$ is equal to:

$$N_l = L_l + 2M_l,$$

$\Delta$ – three-dimensional Laplace operator; $\Delta = \dfrac{\partial^2}{\partial x^2} + \dfrac{\partial^2}{\partial y^2} + \dfrac{\partial^2}{\partial z^2}$ $L_l, M_l$ – viscoelastic operators.