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Dynamic interaction of flat isotropic elements with the deformable environment taking into account the temperature. Analysis of the approximate equation of vertical oscillations of the plate under the layer.

Abstract: The construction of the deformable environment allows to solve various boundary value problems of oscillations and to study the wave processes in a flat element with a combination of approximate equations, boundaries and initial conditions.

Keywords: Deforming environment, construction design, dynamical problem, ideal-elastic, smooth elements, dynamical motion.

In the approximate equation of the fourth order of vertical oscillations of the plate, the reaction of the base $P\left(W^{(1)}\right)$, along with the velocity of the points of the middle plane of the plate z=0, has odd products in time, as well as the connector $\left(A_4 = 4(1 - M_1N_1^{-1})\frac{h_1^3}{3} - 4(1 - M_2N_2^{-1})(N_2^{-1} \cdot M_2)\frac{(h_0-h_1)^3}{6}\right)$.

$$Q = 2(p_1N_1^{-1})(p_2N_2^{-1})\left(\frac{\partial^3}{\partial t^3}\right)h_1(h_0 - h_1) \qquad (1)$$

This connector takes into account the parameters of the top layer.

The operators A_j (j = 1, 2, 3, 4) have the following connectors

$$Q_1 = p_1N_2^{-1}(h_0 - h_1)$$

$$Q_2 = p_1N_2^{-1}\left[p_1N_2^{-1}\frac{(h_0 - h_1)^3}{6} - p_1N_1\frac{h_1^2(h_0 - h_1)}{2}\right]$$

(2)

$$Q_3 = \left[(3 - 4M_2N_2^{-1})\frac{(h_0 - h_1)^3}{6} - (2M_2N_2^{-1} - 1)\frac{h_1^2(h_0 - h_1)}{2}\right]P_2N_2^{-1}$$

$$Q_4 = -4(1 - M_2 N_2^{-1})(N_2^{-1} \cdot M_2)\frac{(h_0 - h_1)}{6}$$

These connectors take into account the parameters of the top layer. If there is no top layer, ie $h_0 - h_1 = 0$, then the approximate equation $A_1\left(\frac{\partial^2 W_1^{(1)}}{\partial t^2}\right) + A_2\left(\frac{\partial^4 W_1^{(1)}}{\partial t^4}\right) + A_3\left(\frac{\partial^2 W_1^{(1)}}{\partial t^2}\right) + A_4\left(\Delta^2 W_1^{(1)}\right) + p\left(W_1^{(1)}\right) = \Phi(x, y, t)$ is as follows.

$$P_1 M_1^{-1}\left(\frac{\partial^2 W_1^{(1)}}{\partial t^4}\right) + \frac{h_1^2}{6}\Big[p_1^2 M_1^{-1}(N_1^{-1} + 3M_1^{-1})\left(\frac{\partial^2 W_1^{(1)}}{\partial t^4}\right) - 4p_1(3M_1^{-1} - 2N_1^{-1})\left(\Delta\frac{\partial^2 W_1^{(1)}}{\partial t^2}\right) + 8(1 - M_1 N_1^{-1}) \cdot \left(\Delta^2 W_1^{(1)}\right)\Big] + p_1\left(W_1^{(1)}\right) = \frac{1}{h_1}\Phi_1(x, y, t) \quad (3)$$

Here

$$p_1\left(W_1^{(1)}\right) = \frac{s}{2h} p_1 M_1 \left\{\frac{\partial W_1^{(1)}}{\partial t} + \frac{h_1^2}{2}\Big[p_1^2 (M_1^{-1} + 3N_1^{-1}) \cdot \left(\frac{\partial W_1^{(1)}}{\partial t^2}\right) - 2\left(\frac{\partial}{\partial t}\right)\Delta W_1^{(1)}\Big]\right\} \quad (4)$$

This equation is the same as the equation obtained in [1]. In the absence of a lower base, ie $P\left(W_1^{(1)}\right) = 0$, , the equation $A_1\left(\frac{\partial^2 W_1^{(1)}}{\partial t^2}\right) + A_2\left(\frac{\partial^4 W_1^{(1)}}{\partial t^4}\right) + A_3\left(\frac{\partial^2 W_1^{(1)}}{\partial t^2}\right) + A_4\left(\Delta^2 W_1^{(1)}\right) + p\left(W_1^{(1)}\right) = \Phi(x, y, t)$ is as follows.

$$\frac{1}{в_1^2}\left(\frac{\partial W_1^{(1)}}{\partial t^2}\right) + \frac{h_1^2}{6}\left[\frac{1}{в_1^2}\left(\frac{1}{a_1^2} + \frac{3}{в_1^2}\right)\frac{\partial W_1^{(1)}}{\partial t^2} - 4\left(\frac{3}{в_1^2} + \frac{2}{a_1^2}\right) \cdot \Delta\frac{\partial^2 W_1^{(1)}}{\partial t^2} + 8\left(1 - \frac{в_1^2}{a_1^2}\right)\Delta^2 W^{(1)}\right] = \Phi(x, y, t) \quad (5)$$

To solve applied problems, instead of exact equations, it is advisable to use approximate ones that include one or another finite order with respect to derivatives: such approximate equations can easily be obtained from exact ones, limited to a finite number of first terms.

This equation is the same as the specified equation for the vertical oscillation of a dynamic plate. Equation (2.2.33) is the same as the equation obtained on the basis of the Tymoshenko model [2], but $\frac{\partial^4 W_1^{(1)}}{\partial t^4}$ and $\Delta \frac{\partial^2 W_1^{(1)}}{\partial t^2}$ have different coefficients before derivatives.

If we exclude these components, then equation (5) becomes Kirchhoff's (Кирхгоф) classical equation of vertical oscillations. Because this equation is of parabolic type, it poorly describes the oscillation process.

In the study of the tempo of the temperapump in the vertical and horizontal oscillations of the elements of the defoamable construction constructions, the plastinap is used as a flat element in the design and technique.

The problem of calculating oscillation on a depopulation-based basis, taking into account the anisotropy of the tempo-type and metadepad, is an urgent problem of modern-day mechanics.

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