There are a fairly large number of studies (see, for example, the review given in [2]) that treat the development of methods and discussion of results on the investigation of the effect of stiffness and geometric parameters on the natural vibrations of cylindrical shells reinforced by stiffening ribs. From the indicated review, it follows that in the overwhelming majority of studies, shells made of isotropic materials are considered. Natural vibrations of ribbed shells made of orthotropic and multilayer materials have been considered in only a few studies. As a rule, for the study of the natural vibrations of such ribbed shells, the theory of structural orthotropic shells was used. The discrete arrangement of the ribs was taken into account in [5]; however, the method proposed in this study prevents us from taking into account the nonsymmetric arrangement of the ribs with respect to the middle surface of the sheathing. Below, on the basis of the initial relations, which are analogous to those presented in [3], we obtain computational formulas, and we study the effect of the eccentricity, number, and height of the ribs on the natural vibrational frequencies of orthotropic cylindrical shells reinforced by either annular or longitudinal ribs.

The equations of motion of the applied theory of multilayer, orthotropic, cylindrical shells reinforced in an arbitrary way by arranged longitudinal and annular ribs, constructed with the use of the Kirchhoff-Love hypothesis for a characteristic shell (sheathing) and the Kirchhoff-Clebsch hypothesis for the ribs, can be written in the form

$$
C_{11} \frac{\partial^2 u}{\partial x^2} + \left( C_{66} - \frac{K_{66}}{R} + \frac{D_{66}}{R^2} \right) \frac{\partial^2 u}{\partial y^2} + \left( C_{12} + C_{66} - \frac{K_{12}}{R} - \frac{K_{66}}{R} - \frac{D_{66}}{R^2} \right) \times
$$

$$
\times \frac{\partial^2 v}{\partial x \partial y} + \frac{C_{12}}{R} \frac{\partial w}{\partial x} + K_{11} \frac{\partial^2 w}{\partial x^2} + \left( 2K_{66} + K_{12} + \frac{2D_{66}}{R} \right) \frac{\partial^2 w}{\partial x \partial y} -
$$

$$
C_p \frac{\partial^2 u}{\partial t^2} - K_p \frac{\partial^2 w}{\partial x \partial t^2} + \sum_{j=1}^{k} F_j \delta (y - y_j) \left[ E_j \frac{\partial^2 u}{\partial x^2} + E_j h_j \frac{\partial^2 w}{\partial x^2} +
$$

$$
- \rho_j \frac{\partial^2 u}{\partial t^2} + p_j h_j \frac{\partial w}{\partial x} \right] - \sum_{j=1}^{k} \delta (x - x_j) \left[ E_j h_j \frac{\partial^2 u}{\partial y^2} + p_j F_j \frac{\partial^2 u}{\partial y^2} +
$$

$$
+ \rho_j F_j h_j \frac{\partial w}{\partial y} \right] = 0;
$$

$$
\left( C_{12} + C_{66} - \frac{K_{12}}{R} - \frac{D_{66}}{R^2} \right) \frac{\partial^2 v}{\partial x \partial y} + \left( C_{22} - 2 \frac{K_{22}}{R} + \frac{D_{22}}{R^2} \right) \frac{\partial^2 v}{\partial y^2} +
$$

$$
+ \left( C_{66} + \frac{K_{66}}{R} + \frac{D_{66}}{R^2} \right) \frac{\partial^2 w}{\partial x^2} + \frac{1}{R} \left( C_{22} - \frac{K_{22}}{R} \right) \frac{\partial w}{\partial y} + \left( K_{22} - \frac{D_{22}}{R} \right) \frac{\partial^2 w}{\partial y^2} +
$$

$$
+ \left( K_{12} + 2K_{66} - \frac{D_{12}}{R} + \frac{2D_{66}}{R} \right) \frac{\partial^2 w}{\partial x \partial y} - \left( C_p - 2 \frac{K_p}{R} + \frac{D_p}{R^2} \right) \frac{\partial^2 v}{\partial t^2} -
$$

Here we assume the following notation: $x$ and $y$ are the Cartesian coordinates on the coordinate surface of the sheathing; $t$ is the time; $u$, $v$, and $w$ are the components of the displacement vector of a point on the indicated surface; $C_{ss}$, $K_{ss}$, $D_{ss}$, ($s, s' = 1, 2, 6$), and $C_p$, $K_p$, $D_p$, ... are the stiffness and mass characteristics of the sheathing; $R$ is the radius of the coordinate surface (we use the notation and the rule of signs assumed in [1]); $F_j$, $I_{yj}$, $I_{zj}$, and $I_{tj}$ are the cross-sectional area of the $j$-th longitudinal rib, the natural moments of inertia of this rib for bending in the radial plane and in the plane tangent to the coordinate surface of the sheathing, and also the torsional moment of inertia, $h_j$ is the distance from the axis of the $j$-th rib up to the coordinate surface of the sheathing; $E_j$, $G_j$, and $\zeta_j$ are the elastic modulus of the material of the $j$-th longitudinal rib, its shear modulus, and its density; $k$ is the number of longitudinal ribs; $F_{j1}$, $I_{yj1}$, $I_{zj1}$, $I_{tj1}$, $h_{j1}$, $E_{j1}$, $G_{j1}$, $\rho_{j1}$, and $k_1$ are similar to $F_j$, $I_{yj}$, $I_{zj}$, $I_{tj}$, $h_j$, $E_j$, $G_j$, $\rho_j$, and $k$, characteristics of the $j_1$-th annular rib; $\delta(x - x')$ is the Dirac delta function; and $x_{j1}$ and $y_j$ are the coordinates.