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ON ONE I. N. VEKUA METHOD OF CONSTRUCTING THE NON-LINEAR THEORY OF NON-SHALLOW SHELLS

In his studies I. N. Vekua, by means of the method of reduction of three-dimensional problems of elasticity to two-dimensional ones, several versions of the refined linear theory of thin and shallow shells, containing the regular process are constructed.

Under thin ans shallow shells I. Vekua meant three-dimensional shell-type elastic bodies satisfying the conditions

$$a_\alpha^\beta - x_3 b_\alpha^\beta \cong a_\alpha^\beta, \quad -h(x_1,x_2) \le x_3 \le h(x_1,x_2) \ \ (\alpha,\, \beta = 1,2), \qquad (*)$$

where a_α^β and b_α^β are mixed components of the metric tensor and tensor of midsurface curvature of the shell, x_3 is the thickness coordinate and h is the semi-thickness, depending on curvilinear coordinates x_1, x_2.

The assuption of the type $(*)$ means that the interior geometry of the shell does not vary in thickness and therefore such kind of shells are usually called the shells with non-varying geometry.

In the sequel, under non-shallow shells will be meant elastic bodies free from the assumption of the type $(*)$, or more exactly the bodies with the conditions

$$a_\alpha^\beta - x_3 b_\alpha^\beta \ne a_\alpha^\beta, \quad |x_3 b_\alpha^\beta| < 1.$$

Such kind of shells are called shells with varying in thickness geometry, or non-shallow shells.

In the present paper by means of the method of Vekua using the results obtained by Muskhelishvili and his disciples the author has obtained the system of differential equations for the non-linear theory of non-shallow shells.

One important class of three-dimensional shell-like types of spherical bodies are considered when the vector displacement doesn't depend on the thickness coordinate. In this case general representations of the components of vector displacement are expressed by means of three holomorphic functions of z and some practical probelms of stress concentration are solved.