GENERAL SOLUTION OF THE PROBLEM OF ELASTOSTATICS OF AN n-DIMENSIONAL HOMOGENEOUS ISOTROPIC SOLID IN AN n-DIMENSIONAL SPACE

BY H. M. WESTERGAARD

1. *Introduction.* Dealing with the important case of a three-dimensional solid subject to constant body forces (such as gravity) B. Galerkin* expressed the stresses and the displacements in terms of three functions, governed by the fourth-order equation $\Delta\Delta f = \text{const.}$, and mutually independent except through the boundary conditions. He has demonstrated the fruitfulness of his method in later papers.†

It is profitable to interpret Galerkin's three functions as components of a vector. Simplicity is gained and significance is added by doing this. It is proposed to call this vector *the Galerkin vector.* Its nature is such that only a slight amount of complexity is added in the general derivations by considering an n-dimensional space.

2. *Notation.* Let the following notation be used.

$i_1, i_2, \cdots, i_m, \cdots, i_p, \cdots, i_n$ = unit vectors in n directions perpendicular to one another; $m \neq p$.

$\boldsymbol{R} = i_1x_1 + i_2x_2 + \cdots + i_nx_n$ = radius vector drawn from the origin to any point; the point is called point $\boldsymbol{R}$.

$\boldsymbol{\rho} = i_1\xi_1 + i_2\xi_2 + \cdots + i_n\xi_n$ = displacement = increment of $\boldsymbol{R}$. The point $\boldsymbol{R}$ moves to the position $\boldsymbol{R}+\boldsymbol{\rho}$; $\boldsymbol{\rho}$ is assumed small.

$\boldsymbol{P} = i_1P_1 + i_2P_2 + \cdots + i_nP_n$ = force.

$\boldsymbol{K} = i_1K_1 + i_2K_2 + \cdots + i_nK_n$ = body force which is distrib-

* B. Galerkin, *Contribution à la solution générale du problème de la théorie de l'élasticité dans le cas de trois dimensions*, Comptes Rendus, vol. 190 (1930), p. 1047; *Contribution à l'investigation des tensions et des déformations d'un corps élastique isotrope* (in Russian), Comptes Rendus de l'Académie des Sciences de l'URSS, (1930), p. 353.

† Comptes Rendus, vol. 193 (1931), p. 568; vol. 194 (1932), p. 1440; vol. 195 (1932), p. 858; and papers in Russian: Comptes Rendus de l'Académie des Sciences de l'URSS, (1931), p. 273 and p. 281; Messenger of Mechanics and Applied Mathematics, Leningrad, vol. 1 (1931), p. 49; Transactions of the Scientific Research Institute of Hydrotechnics, vol. 10 (1933), p. 5.