Iterative methods for solving seepage problems in multilayer beds in the presence of a point source

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Abstract

This work is devoted to solving steady-state seepage problems of an incompressible fluid that obeys a nonlinear multivalued filtration law with limit gradient in a multilayer bed in the presence of a point source. The seepage problem is formulated as a mixed variational inequality with an inversely strongly monotone operator in a Hilbert space. An iterative splitting method is proposed to solve the variational inequality. Unlike the earliermethods, the method proposed allows one to find not only approximate values of the fluid pressure, but also the filtration rates, in particular, on the sets corresponding to multivalued points in the filtration law. The convergence of the method is analyzed. © 2012 Pleiades Publishing, Ltd.

Keywords

inversely strongly monotone operator, iterative process, multilayer bed, point source, seepage theory