On periodic boundary value problems with an inclined derivative for a second-order elliptic equation

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Abstract: In this paper, we study solvability of new classes of nonlocal boundary value problems for second-order elliptic type equation. The considered problems are multidimensional analogues (in the case of circular regions) of classical periodic boundary value problems in rectangular domains. To study the main problem, first, an auxiliary boundary value problem with inclined derivative is considered for the second order elliptic equation. The main problems are solved by reducing them to a sequential solution of the Dirichlet problem and the problem with inclined derivative. Theorems on existence and uniqueness of a solution of the problems are proved.

Note that similar problems for the Laplace and Poisson equations with normal derivatives of integer and fractional orders were studied in [1-3].

Keywords: elliptic equation, periodic problem, inclined derivative, boundary value problem, Dirichlet problem, solvability

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