



Weakly Nonlinear Integral Equations of the Hammerstein Type

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Abstract: By using the theory of Moore-Penrose pseudoinverse operators, the necessary and sufficient conditions for the solvability of a weakly nonlinear integral equation with a nondegenerate kernel are obtained. Equations for generating constants are constructed. A connection between the necessary and sufficient conditions has been established. The iterative procedure for finding a solution is proposed.

Keywords: *weakly nonlinear integral equations; Moore-Penrose pseudoinverse matrix; generating solution; equation for generating constants; iterative process.*

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1 Introduction

A lot of works are devoted to the investigation of different aspects of the theory of linear and nonlinear integral, differential and integro-differential equations [1, 2, 8–10, 12, 18, 19, 21]. A large part of such equations, in particular integral equations, belong to the equations with not everywhere invertible operator and arise in different areas of the natural science such as electrodynamics, mathematical physics, biology, economics and others [11, 22, 24]. The application of the theory of pseudoinverse operators enabled us to establish the conditions for the existence and the structure of solutions of such equations in the case where the kernel of integral equation is degenerate [5–7, 23, 25]. In the present paper, continuing the research mentioned above, we use one of possible approaches to finding the necessary and sufficient conditions for the solvability of weakly nonlinear integral equations with non-degenerate kernels and propose an algorithm for finding a solution. The obtained theoretical results can be used to study mathematical models and to create effective computational algorithms frequently encountered in applied research.

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