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Existence of solution for infinite system of nonlinear integral equations via measure of noncompactness and homotopy perturbation method to solve it

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Abstract

In this paper we prove existence of solution for infinite system of nonlinear integral equations in the Banach spaces $\ell_p, p > 1$ with the help of a technique associated with measure of noncompactness and generalized Meir-Keeler fixed point theorem. We also provide some illustrative examples in support of our existence theorems. Finally, we introduce an iteration algorithm constructed by modified homotopy perturbation method to solve of the above problem with high accuracy.

Key words:
Measure of noncompactness; Meir-Keeler condensing operator; System of integral equations; Homotopy perturbation method.
2010 MSC: 34A12, 46B45, 46T99, 47H09, 47H10.

1. Introduction

The measure of noncompactness can be applied to prove the existence of solution for various nonlinear problems such as, integral equations, intrego-differential equations, differential equations and their infinite systems. The measure of noncompactness was first introduced by Kuratowski [23]. We refer [10] for details on various measures of noncompactness. Banaś and Lecko [11] adapted measure of noncompactness to prove the existence of solution for infinite systems of differential equations in classical Banach spaces c_0, c and ℓ_1. Mursaleen and Mohiuddine [27] presented a generalization of the existence theorem which was proved by Banaś and Lecko [11] for ℓ_1 space by choosing ℓ_p space of absolutely p-summable series. Aghajani and Pourhadi [8] used Darbo type fixed point theorem to obtain existence theorem in ℓ_1 space for an infinite system of second-order differential equations. Also Mohiuddine et al.[26] proved the same results in a more general in ℓ_p space. Rzepka and Sadarangani [33] discussed the solvability of infinite systems of integral equations with the help of measures of noncompactness. Banaś et al. [13] obtained the solutions of a quadratic Hammerstein integral equation on an unbounded interval. Aghajani and Haghighi [5] used measure of noncompactness and Darbo fixed point theorem to prove existence results for solutions of system of nonlinear equations in Banach spaces and discussed about existence of solutions for a general system of nonlinear functional integral equations. Aghajani et al. [6] used a generalization of Darbo theorem for the solvability of integral equations system. Alotaibi et al. [9] applied measure of noncompactness to study existence of solution for infinite system of linear equations in different sequence spaces. Srivastava et al.

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