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MONOTONE TECHNIQUE FOR FINITE SYSTEM OF CAPUTO FRACTIONAL DIFFERENTIAL EQUATIONS WITH PERIODIC BOUNDARY CONDITIONS

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Abstract. Monotone technique for finite system of Caputo fractional differential equations with periodic boundary conditions (PBVP) using coupled lower and upper solutions is developed. Two convergent monotone sequences which converges to minimal and maximal solutions of PBVP are obtained. Monotone technique is successfully applied to obtain existence and uniqueness of solutions of finite system of Caputo fractional differential equations with periodic boundary conditions.

Keywords. Fractional Differential Equations, Monotone Technique, Periodic Boundary Conditions, Lower and Upper solutions.

AMS (MOS) Subject Classification: 34A12, 34C60, 34A45.

1 Introduction

The fractional differential equations are found to be fractional models in the following two monographic works by Podlubny [22, 23] and Kilbas, Srivastava and Trujillo [5] and references therein. It is found that good analytical as well as numerical methods are available for studying fractional differential equations such as power series method, compositional method, transform method and Adomain methods etc.(see details in [1, 5, 16, 23] and references therein). An effective technique that offers theoretical as well as constructive results in a closed set, namely the sector is the monotone iterative technique [6]. It is also useful for the investigation of qualitative properties of solutions. Differential inequality approach [7, 8] is successfully applied to develop basic theory of fractional differential equations involving Riemann-Liouville fractional differential operators [10] of arbitrary order $q\,(0 < q < 1)$. The general existence and uniqueness of solutions of initial value problem for Riemann-Liouville fractional differential equations are proved in [11], which exhibits the idea of comparison principle. Lakshmikantham and Vatsala [9] have developed the monotone method for Riemann-Liouville fractional differential equations of order $q\,(0 < q < 1)$ and obtained local and global exis-