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GENERALIZED MONOTONE METHOD FOR CAPUTO FRACTIONAL INTEGRO DIFFERENTIAL EQUATIONS WITH NONLINEAR BOUNDARY CONDITION

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Abstract. The notion of coupled quasisolutions is introduced, in this paper, for a nonlinear boundary value problem of Caputo fractional integro differential equation of order q, $0 < q < 1$. Next, using the well known monotone iterative technique, we construct the coupled quasisolutions which lead to the existence and uniqueness of solutions of the considered problem.

Keywords. Caputo fractional integro differential equation,coupled quasisolutions, monotone method, upper lower solutions.

AMS (MOS) subject classification: 34A08,34K10,45K99.

1 Introduction

The method of coupled lower and upper solutions together with MIT yields monotone sequences or alternating sequences when the forcing function is the sum of two monotone functions, one of which is monotone non-decreasing and other one is monotone non-increasing. It is a useful technique to find the minimal and maximal solutions of a nonlinear differential equation.

Though the theory of fractional calculus is more than three centuries old, the interest in the theory of fractional differential equations is recent and with the work of Oldham and Spanier [17] it has been widely and efficiently used in many areas ranging from rheology, engineering physics to biology (see for details)[1, 12]. The monograph of Prof. V. Lakshmikantham et.al., [19] has given the much needed impetus to the theory of fractional differential equations. The monotone iterative technique(MIT) for initial value problems (IVPs) of fractional integro differential equations has been well established [22, 15, 16].