

## THE METHOD OF UPPER AND LOWER SOLUTIONS FOR INITIAL VALUE PROBLEM OF CAPUTO FRACTIONAL DIFFERENTIAL EQUATIONS WITH VARIABLE MOMENTS OF IMPULSE

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**Abstract.** In this paper sufficient conditions for the existence of a solution for the initial value problem of Caputo fractional differential equations of order  $q$ ,  $0 < q < 1$ , with variable moments of impulse using the method of upper and lower solutions are established under the weakened hypothesis of  $C^q$  continuity.

**Keywords.** Initial value problem, Caputo fractional differential equations, impulses, variable moments, upper and lower solutions.

**AMS (MOS) subject classification:** 34A12,34A08,34A37, 34K07, 26A33

## 1 Introduction

The theory of fractional calculus has become a vast area of research with numerous applications in various fields like viscoelasticity, fluid mechanics, electrical networks, medicine etc, ([3,7,11,12,18]). The first application of fractional calculus was made by Abel(1802-1829) in the tautochronous problem. There has been a significant development in the theory of fractional calculus in recent years. The major contributions in this field are given in [3, 7, 9, 13, 17, 18, 20] and the references therein. The geometric and physical interpretation of fractional integration and fractional differentiation are given in [29] and the physical interpretation of initial conditions for fractional differential equations with Riemann-Liouville fractional derivatives are given in [6]. So many results were established in the fractional differential equations parallel to the theory of differential equations [9].

Dynamics of many evolution process from various fields such as biology, control theory, physics can be modelled by using the theory of differential