

## Existence of Minimal and Maximal Mild Solutions for Non-Local in Time Subdiffusion Equations of Neutral Type

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**Abstract :** In this work is proved the existence of at least one minimal and maximal mild solutions to the Cauchy problem, for fractional evolution equation of neutral type, involving a general kernel. An operator  $A$  generating a resolvent family and integral resolvent family on a Banach space  $X$  and a kernel belonging to a large class appears in the equation, which covers many relevant cases from physics applications, in particular, the important case of time - fractional evolution equations of neutral type. The main tool used in this work was the Kuratowski measure of noncompactness and fixed point theorems, specifically Darbo-type, and an iterative method of lower and upper solutions, based in an order in  $X$  induced by a normal cone  $P$ . Initially, the equation is a Cauchy problem, involving a fractional derivate in Caputo sense. Then, is formulated the equivalent integral version, and defining a convenient functional, using the theory of resolvent families, and verifying the hypothesis of the fixed point theorem of Darbo type, give us the existence of mild solution for the initial problem. Furthermore, the existence of minimal and maximal mild solutions was proved through in an iterative method of lower and upper solutions, using the Azcoli-Arzela Theorem, and the Gronwall's inequality. Finally, we recovered the case derivate in Caputo sense.

**Keywords :** fractional evolution equations, Volterra integral equations, minimal and maximal mild solutions, neutral type equations, non-local in time equations

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