

## EXISTENCE OF SOLUTIONS FOR FRACTIONAL PARTIAL NEUTRAL INTEGRO-DIFFERENTIAL EQUATIONS OF SOBOLEV TYPE IN BANACH SPACES

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**Abstract.** In this paper, we establish the existence of mild solution for fractional partial neutral integro-differential equations of Sobolev type in Banach spaces. The results are obtained by using Sadovskii's fixed point theorem. An example is provided to illustrate the main result.

**Keywords.** Fractional differential equations, Neutral equation, Integro-differential equations, Fixed point theorem.

**AMS (MOS) subject classification:** 34A08, 34K40, 45J05, 47H10.

## 1 Introduction

Fractional calculus is an area having a great attention, because fractional derivatives provide a powerful tool for the description of memory and hereditary properties of several processes. Fractional differential equations appear in various applications in many physical phenomena such as seepage flow in porous media and in fluid dynamic traffic models. Also, the study of fractional differential equations have gained considerable importance due to their application in various fields of engineering, mechanics, electrical networks, control theory of dynamical systems, viscoelasticity, electrochemistry and many other fields. In recent decades there has been a significant development in fractional differential equations involving fractional derivatives, see the monographs of [10–12, 22, 24] and the papers [14, 15, 17, 18, 25, 31, 35, 38, 41, 42].

In the current years, the study of neutral differential equations originate in many areas of applied mathematics. For example, a simplified model for compartmental systems with pipes is represented by nonlinear neutral integrodifferential equation. Compartmental models are frequently used in theoretical epidemiology, physiology, population dynamics, analysis of ecosystems.