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OSCILLATION OF CERTAIN NONLINEAR IMPULSIVE NEUTRAL PARTIAL DIFFERENTIAL EQUATIONS WITH CONTINUOUS DISTRIBUTED DEVIATING ARGUMENTS AND A DAMPING TERM

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Abstract. In this work, we consider a new class of boundary value problems associated with nonlinear impulsive neutral partial differential equations with continuous distributed deviating arguments and a damping term. Sufficient conditions are obtained for the oscillation of the solutions using impulsive differential inequalities and an integral averaging method with two boundary conditions. Examples are given to illustrate our main results.

Keywords. Partial differential equations, oscillation, distributed deviating arguments, impulsive, neutral.

AMS (MOS) subject classification: 35B05, 35L70, 35R10, 35R12.

1 Introduction

The oscillation theory of ordinary differential equations has its origins in a paper by C. Sturm [15], in 1836 while the study of oscillations, in partial differential equations originated in the work of P. Hartman and A. Winter [6], in 1955.

In 1989, the pioneer work on impulsive delay differential equations [5] was published and its results were included in monograph [7]. The first results on impulsive partial differential equations appeared in a paper [4], published in 1991. In [4], the authors have shown that impulsive partial differential equations provide a natural framework, for the mathematical modeling of processes in ecology and biology, like population growth.

Partial functional differential equations have applications in medicine and the modeling of chemical, biological and physical systems [23]. The oscillation theory of impulsive partial differential equations is richer than the corresponding oscillation theory of partial differential equations without impulses, see [11–14, 18, 24, 25] and the references cited therein.