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OSCILLATION OF SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS WITH FUNCTIONAL ARGUMENTS

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Abstract. Sufficient conditions are established for the oscillations of partial differential equation with functional arguments of the form

$$\frac{\partial}{\partial t}(p(t)\frac{\partial}{\partial t}u(x,t)) = a(t)\Delta u(x,t) + \sum_{k=1}^{l} a_k(t)\Delta u(x,\rho_k(t)) - q(x,t)u(x,t)$$

$$-\sum_{j=1}^{m} q_j(x,t)u(x,\sigma_j(t)),\ (x,t) \in \Omega \times [0,\infty) \equiv G,$$

where Ω is a bounded domain in R^n with a piecewise smooth boundary $\partial\Omega$ and Δ is the Laplacian in Euclidean n-space R^n.

Keywords: oscillation, partial differential equation, functional arguments

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1 Introduction

Recently, the oscillation problem for the partial functional differential equation has been studied by many authors. We refer the reader to [1,2,3] for parabolic equations and to [4,5,6,7] for hyperbolic equations.

In this paper, we study the oscillation of solutions of partial differential equations with functional arguments of the form

$$(1)\quad \frac{\partial}{\partial t}(p(t)\frac{\partial}{\partial t}u(x,t)) = a(t)\Delta u(x,t) + \sum_{k=1}^{l} a_k(t)\Delta u(x,\rho_k(t)) - q(x,t)u(x,t)$$