Accepted Manuscript

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PII: S0893-9659(17)30119-2
DOI: http://dx.doi.org/10.1016/j.aml.2017.04.006
Reference: AML 5227

To appear in: *Applied Mathematics Letters*

Received date : 3 March 2017
Revised date : 4 April 2017
Accepted date : 4 April 2017

Please cite this article as: H. Wu, et al., Oscillation criteria for second order superlinear dynamic equations with oscillating coefficients, Appl. Math. Lett. (2017), http://dx.doi.org/10.1016/j.aml.2017.04.006

Oscillation criteria for second order superlinear dynamic equations with oscillating coefficients

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Abstract. This paper is concerned with oscillation of second order superlinear dynamic equations with oscillating coefficients. By using generalized Riccati transformations, oscillation theorems are obtained on an **arbitrary** time scale. We illustrate the versatility of our results by means of examples.

Keywords: superlinear; Oscillation; Second order; Time scales

1 Introduction

In this paper, we consider the following second order superlinear dynamic equation

$$\left(r(t)x^{\Delta}(t)\right)^{\Delta} + p(t)x^{\alpha}(\sigma(t)) = 0, \quad t \in \mathbb{T}, \quad t \geq t_0, \tag{1.1}$$

where the independent variable is in a time scale $\mathbb{T}$, $\alpha > 1$ is a quotient of odd positive integers.

For the sake of simplicity, we use $[t_1, t_2] = [t_1, t_2]_{\mathbb{R}} \cap \mathbb{T}$. Throughout this paper, we shall assume the following condition holds:

(H) $p \in C_{rd}(\mathbb{T}, \mathbb{R})$, $1/r \in C_{rd}(\mathbb{T}, \mathbb{R}^+)$ and $\int_{t_0}^{\infty} \frac{1}{r(s)}\Delta s < \infty$.

For background information on time scales, we refer to the monographs by Bohner and Peterson [1]. The oscillation theory of dynamic equations has been developed extensively during the past several years. We refer the reader to [2–9, 11] and the references cited therein. For completeness, we review some earlier results. In 1975, Kusano et al [8] considered the following differential equation

$$(r(t)x'(t))' + p(t)x^{\alpha}(t) = 0, \quad t \geq t_0 \tag{1.2}$$

and established the following necessary and sufficient conditions when $r(t) > 0$ and $\int_{t_0}^{\infty} \frac{1}{r(t)}dt < \infty$.

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