# OSCILLATORY BEHAVIOR OF HIGHER ORDER NONLINEAR NEUTRAL DELAY DYNAMIC EQUATIONS WITH POSITIVE AND NEGATIVE COEFFICIENTS - II 

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#### Abstract

In this paper, we derive some sufficient conditions for the oscillatory and asymptotic behavior of solution of the higher order nonlinear Neutral Delay Dynamic Equations ( $N D D E s$ ) of the form $$
\begin{equation*} \left(r(t)(y(t)+p(t) y(\alpha(t)))^{\Delta^{n}}\right)^{\Delta^{2}}+q(t) G(y(\beta(t)))-h(t) H(y(\gamma(t)))=0 \tag{H} \end{equation*}
$$ and $$
\begin{equation*} \left(r(t)(y(t)+p(t) y(\alpha(t)))^{\Delta^{n}}\right)^{\Delta^{2}}+q(t) G(y(\beta(t)))-h(t) H(y(\gamma(t)))=f(t) \tag{NH} \end{equation*}
$$


for $t \in\left[t_{0}, \infty\right)_{\mathbb{T}}, t_{0}(\geqslant 0) \in \mathbb{T}$, where $\mathbb{T}$ is a time scale with $\sup \mathbb{T}=\infty$, and $n \in \mathbb{N}$, are studied under the assumption

$$
\left(H_{1}\right) \quad \int_{t_{0}}^{\infty} \frac{(\sigma(t))^{n-1}}{r(t)} \Delta t<\infty
$$

for the various ranges of $p(t)$. In addition, sufficient conditions are obtained for the existence of bounded positive solutions of the equation (NH) by using Krasnosel'skii's fixed point theorem. The results in this paper extended and generalizes the results of ([10],[11]). Examples are included to illustrate the validation of the results.
Keywords. Oscillation, NDDEs, higher-order, neutral dynamic equations, existence of positive solutions, asymptotic behavior, time scales.
AMS (MOS) subject classification: 34 C 10, $34 \mathrm{C} 15,34 \mathrm{~K} 11$.

## 1 Introduction.

A major tasks of mathematics today is to harmonize the continuous and the discrete, to include them in one comprehensive mathematics, and to eliminate obscurity from both.

The theory of time scales, which has recently received a lot of attention was introduced by Stefan Hilger in his Ph.D thesis in 1988 in order to unify continuous and discrete analysis (see [5]). Since then, there has been extensive improvement in the oscillation theory of dynamic equations. Our results in this paper concerned with not only new for differential and difference

