Differential and Integral Equations, Volume 2, Number 2, April 1989, pp. 123-131.

LINEARIZED OSCILLATIONS FOR EQUATIONS WITH PIECEWISE CONSTANT ARGUMENTS

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Abstract. Let $[\cdot]$ denote the greatest-integer function and consider the nonlinear equation with piecewise constant arguments

$$\dot{y}(t)+\sum_{i=1}^{m} P_i(t) f_i(y[t-k_i]))=0, \quad t \geq 0. \tag{1}$$

We obtained sufficient and also necessary and sufficient conditions for the oscillation of all solutions of Eq. (1) in terms of the oscillation of all solutions of an associated linear equation with piecewise constant arguments.

1. Introduction. Consider the equation with piecewise constant arguments (EPCA for short)

$$\dot{y}(t)+\sum_{i=1}^{m} P_i(t) f_i(y[t-k_i]))=0, \quad t \geq 0 \tag{1}$$

where for $i=1,2,\cdots,m$

$$P_i \in C[\mathbb{R}^+,\mathbb{R}], \;\; f_i \in C[\mathbb{R},\mathbb{R}], \;\; k_i \in \mathbb{N}$$

$\mathbb{N}$ is the set of natural numbers $0,1,2,\cdots$, and $[\cdot]$ denotes the greatest-integer function.

Our aim in this paper is to obtain sufficient and also necessary and sufficient conditions for the oscillation of all solutions of Eq. (1) in terms of the oscillation of all solutions of an associated linear EPCA with constant coefficients of the form

$$\dot{x}(t)+\sum_{i=1}^{m} p_i x([t-k_i])=0, \quad t \geq 0. \tag{2}$$

In the process, we will obtain some interesting results connecting the oscillation of all solutions of Eq. (2) to its characteristic equation

$$\lambda-1+\sum_{i=1}^{m} p_i \lambda^{-k_i}=0 \tag{3}$$

Received March 7, 1988.

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AMS Subject Classifications: 34K15.