



On a periodic problem for higher-order differential equations with a deviating argument

Sulkhan Mukhigulashvili^{a,b}, Nino Partsvania^{c,d,*}, Bedřich Půža^e

^a Mathematical Institute, Academy of Sciences of the Czech Republic, Branch in Brno, Brno, Czech Republic

^b I. Chavchavadze State University, Faculty of Physics and Mathematics, Tbilisi, Georgia

^c A. Razmadze Mathematical Institute, Georgia

^d International Black Sea University, Tbilisi, Georgia

^e Masaryk University, Department of Mathematics and Statistics, Brno, Czech Republic

ARTICLE INFO

Article history:

Received 28 October 2009

Accepted 3 February 2011

MSC:

34K13

Keywords:

Nonlinear

Linear

Higher order

Differential equation

Deviating argument

Periodic problem

Existence

Uniqueness

Periodic solution

ABSTRACT

For higher-order nonautonomous linear and nonlinear differential equations with deviating arguments, new sufficient conditions of existence and uniqueness of a periodic solution are found.

© 2011 Elsevier Ltd. All rights reserved.

1. Statement of the main results

1.1. Statement of the problem

In the present paper, for the differential equations with the deviating argument

$$u^{(n)}(t) = p(t)u(\tau(t)) + q(t) \quad (1.1)$$

and

$$u^{(n)}(t) = f(t, u(\tau(t))) + f_0(t), \quad (1.2)$$

a problem on the existence and uniqueness of a periodic solution with a prescribed period $\omega > 0$ is considered. In the case, when $\tau(t) \equiv t$, i.e. when Eqs. (1.1) and (1.2) have the forms

$$u^{(n)}(t) = p(t)u(t) + q(t), \quad (1.3)$$

$$u^{(n)}(t) = f(t, u(t)) + f_0(t), \quad (1.4)$$

* Corresponding address: A. Razmadze Mathematical Institute, 1 M. Aleksidze Str., 0193 Tbilisi, Georgia. Tel.: +995 32 334595; fax: +995 32 3640856.
E-mail addresses: mukhig@ipm.cz (S. Mukhigulashvili), ninopa@rmi.acnet.ge (N. Partsvania), puza@math.muni.cz (B. Půža).