Extended Heaviside Algorithm for Resonance Mean-Periodic Solutions of Nonlocal Cauchy Problems

Ivan Dimovski, Margarita Spiridonova

Institute of Mathematics and Informatics
Bulgarian Academy of Sciences
Sofia, Bulgaria

dimovski@math.bas.bg, mspirid@math.bas.bg

An extension of the so-called Heaviside algorithm is presented for explicit representation of periodic solutions of Linear Ordinary Differential Equations (LODEs) with constant coefficients both in the non-resonance and in the resonance cases.

We consider nonlocal Cauchy problems (see [1]) consisting in solution of LODE with constant coefficients

$$P\left(\frac{d}{dt}\right) y \,=\, F(t)$$

under the "initial" conditions

$$\Phi\{\, y^{(k)}\} \,=\, 0,\;\; k \,=\, 1,\, 1,\, 2,\, \ldots,\, degP - 1,$$

with given $F(t) \in C(\mathbb{R})$ and a linear functional Φ in $C(\mathbb{R})$.

The algorithm for solving this problem and its implementation (using the computer algebra system *Mathematica*) for the "ordinary" periodic case was presented at the Special Session AADIOS 2010 and in some our papers.

Now we consider in more details our direct operational calculus approach to the resonance case. The representation of mean-periodic and antiperiodic solutions of LODEs with constant coefficients and systems of such equations is proposed. The considered explicit representations of the periodic solutions of any kind are convenient for practical computation using a computer algebra system.

References. [1] I. Dimovski, M. Spiridonova. Operational Calculus Approach to Nonlocal Cauchy Problems, J. Mathematics in Computer Science, Volume 4, Number 2-3, 2011, 243-258.