Numerical Solution of Nonlocal Elliptic Problems

Allaberen Ashyralyev[1], Ayman Hamad[2]

[1] *Department of Mathematics, Near East University, Nicosia, TRNC, Mersin 10, Turkey.*
Peoples' Friendship University of Russia (RUDN University), Moscow , Russia.
Institute of Mathematics and Mathematical Modeling 050010, Almaty, Kazakhstan.

aallaberen@gmail.com

[2] *Department of Mathematics, Near East University, Nicosia, TRNC, Mersin 10, Turkey.*
Department of Mathematics, Omar Al-Mukhtar University, El-Beida, Libya.

ayman2952000@gmail.com

Abstract: The well-posedness in various Banach spaces of the local boundary value problem for the elliptic equation in an arbitrary Banach space with the positive operator and its related applications have been investigated by many researchers (see, for example, [1]- [3] and the references given therein).

In the present paper, the second order of approximation two-step difference scheme for the approximate solution of the nonlocal boundary value problem for the elliptic differential equation in an arbitrary Banach space with the positive operator is investigated. The well-posedness of this difference scheme in various Banach spaces is established. In applications, some illustrative numerical results are provided.

Keywords: Well-posedness; coercive stability; positive operators; elliptic equation.

2010 Mathematics Subject Classification: 2010 Mathematics Subject Classification: 35J25, 47E05, 34B27

References

[1] A. Ashyralyev, P.E. Sobolevskii, *New Difference Schemes for Partial Differential Equations*, Operator Theory: Advances and Applications, vol.148, Birkhauser, Verlag, Basel, Boston, Berlin 2004.

[2] A. L. Skubachevskii, *Elliptic functional differential equations and applications*, Birkhauser Verlag, Basel, Boston, Berlin, 1997.

[3] A. Lunardi, *Analytic semigroups and optimal regularity in parabolic problems*, Birkhauser Verlag, Basel, Boston, Berlin,1995.