Fedotov, Aleksandr Ivanovich


Summary: Among the approximate methods for solving the operator equations, the most used methods are collocation and Galerkin methods. Each of them has their own advantages and disadvantages. For instance, Galerkin methods are used for the equations in Hilbert spaces. The estimates for the errors of the solutions obtained by these methods have the order of the best approximations of the exact solutions. However, Galerkin methods are not always constructive, as for their implementation one needs to calculate integrals and this is not always possible to do explicitly. Collocation methods are used for the equations in the spaces of continuous functions and thus are always constructive. However, the estimates for the errors obtained by collocation methods are usually worse than those of the best approximation of the exact solutions.

In the present paper, we justify a polynomial collocation method for one class of singular integro-differential equations on an interval. For the justificiation, the technic of reducing the polynomial collocation method to Galerkin method is used for the first time for such equations. This technique was first used by the author to justify the polynomial collocation method for a wide class of periodic singular integro-differential and pseudo-differential equations. For the equations on a open interval, this approach is used for the first time. Also for the first time we prove that the interpolative Lagrange operator is bounded in the Sobolev spaces $H^s$, $s > 1/2$, with the Chebyshev weight function of the second kind. Exactly this result gives an opportunity to show that in non-periodic the polynomial collocation method provides the same convergence rate as the Galerkin method.

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References:


  · Zbl 0448.65002


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