Project name, IRN	**AP15473190** - Methods for solving boundary value problems for differential equations with impulsive action at non-fixed times
Completion date	12.11.2022-31.12.2024
Project supervisor	Mukash Meirambek, teacher of the Department of Mathematics
Report	Impulse systems of differential equations serve as mathematical models of objects that are subjected to short-term forces in the process of evolution. In the mathematical description of the development of real processes with short-term perturbations, one can often neglect the duration of perturbations and consider these perturbations to be "instantaneous." Such a description leads to the need to study dynamical systems with continuous trajectories or differential equations with their impulsive action. The dissertation of the applicant considers a unique solution to boundary value problems and an algorithm for finding a solution to simple differential equations with impulsive action at non-fixed times. For ordinary differential equations with impulsive action at non-fixed moments of time, with the aim of further development of boundary value problems, methods for finding a solution to the problem are studied and an algorithm for finding a solution is developed. In this project, methods of averaging and parametrization are considered for solving boundary value problems for ordinary differential equations with impulsive action at non-fixed times. The averaging method is aimed at determining the conditions for the existence of a solution to a boundary value problem based on the conditions for solving an average boundary value problem for the corresponding system of differential equations. Considering first the averaged system for a given system, if there is a solution to the averaged boundary value problem, then for the values of the subparameter it is indicated to find a solution to the initial boundary value problem that is close to the solution of the average problem.
Purpose	Set the solvability conditions for boundary value problems for differential equations with impulsive action at non-fixed times. Develop numerical methods for solving boundary value problems for differential equations with impulsive action. Construct algorithms for finding solutions to boundary value problems for differential equations with impulsive action and their numerical implementation.
Expected results	Conditions for the solvability of boundary value problems for systems of differential equations with impulsive action at non-fixed times will be established. • Approximate and numerical methods for solving boundary value problems for systems of differential equations with impulsive action at non-fixed times will be developed. • Efficient algorithms for finding solutions to boundary value problems for systems of differential equations with impulsive action at non-fixed times will be built. Mathematical modeling of real processes often leads to boundary value problems for differential equations with impulsive actions. The expected scientific results and the approximate methods developed on their basis can be the mathematical basis for the qualitative and quantitative analysis of the simulated processes. Scientific results can be applied in the study of new classes of boundary value problems for systems of differential equations with impulsive

	actions, used for a comprehensive analysis of the simulated processes of physics, biology, chemistry, economics, etc.
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Publications in scientific publications	-