

SPECIAL TRANSPOSITIONS OF ELEMENTS OF PERMUTATIONS, THEIR PROPERTIES AND APPLICATION IN VEHICLE ROUTING PROBLEMS

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In some research and applied problems in different areas the mathematical models are based on combinatorial sets. The most utilized sets are permutations and its various subsets including cyclic permutations. Properties of the sets may be used when modeling and solving generation and combinatorial optimization problems. A class of the applied problems, mathematical models of which may be constructed on the base of permutations and its various subsets, is the widespread Vehicle Routing Problems.

Inclusion mapping of permutations into Euclidean space is one of the ways to investigate its properties. The convex hull of permutations set after the mapping is a permutation polyhedron. One of the basic properties of permutation polyhedron is a criterion for the adjacency of its vertices.

Permutations could be constructed by transpositions of generative elements. Special class of transpositions, which correspond to the criterion of adjacency in the permutation polyhedron, is considered in the report. We investigate the properties of the composition of several transpositions from special class, and analyze their impact on some types of permutations. It is necessary to take into account that different order of the transpositions in the following composition defines the various changes in a permutation for which the composition is used.

The report is devoted to the investigation properties of the composition of several transpositions of the considered special class, analysis of their impact on the permutations and application of some of these properties for mathematical modeling and solving the combinatorial optimization problems including Vehicle Routing Problems.

Propositions about the number of different permutations that can be obtained by applying a predetermined composition of transpositions that follow in a different order are proved.

Approvals examined in this report allow creating an algorithm for solving the problem of optimization of a linear function on the set of cyclic permutations.