



The Hong Kong University of Science and Technology

Department of Mathematics

PhD THESIS EXAMINATION

2-to-1 Functions over Finite Fields

By

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ABSTRACT

2-to-1 functions over finite fields have gained much attention due to their vast applications in different areas of mathematics and engineering. Since their first systematic study appeared in 2019, there has been a lot of research on building a solid theoretical foundation of these functions. One recent development is AGW-like criteria for constructing 2-to-1 functions over finite fields. Since AGW-like criteria for 2-to-1 functions is similar to those for permutations, many permutation polynomials obtained from the AGW criterion can be turned into 2-to-1 polynomials with some adjustments in the parameters. In this thesis, by adopting this approach, we also obtain many families of 2-to-1 functions over finite fields of both even or odd characteristics. Moreover, by employing the technique from Ding and Zieve's work on permutation polynomials over finite fields, we provide a complete characterization of two families of 2-to-1 polynomials over finite fields of odd characteristics. Their technique is so strong that their results resolved eight conjectures and open problems on permutation polynomials from the literature. Due to the technique's effectiveness, we also obtain three infinite families of permutation pentanomials over finite fields which also provide a generalization of 14 families of permutation polynomials from the literature.

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Thesis Examination Committee:

Chairman	:	Prof. Sen YANG, LIFS/HKUST
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(Open to all faculty and students)

The student's thesis is now being displayed on the reception counter in the General Administration Office (Room 3461).