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Enumeration of self-dual and self-orthogonal negacyclic codes over finite fields. (English)

Summary: The main objective of this article is to study self-orthogonal negacyclic codes of length \( n \) over a finite field \( \mathbb{F}_q \), where the characteristic of \( \mathbb{F}_q \) does not divide \( n \). We investigate issues related to their existence, characterization and enumeration. We find the necessary and sufficient conditions for the existence of self-orthogonal negacyclic codes of length \( n \) over a finite field \( \mathbb{F}_q \). We characterize the defining sets and the corresponding generator polynomials of these codes. We obtain formulae to calculate the number of self-dual and self-orthogonal negacyclic codes of a given length \( n \) over \( \mathbb{F}_q \). The enumeration formula for self-orthogonal negacyclic codes involves a two-variable function \( \chi(d, q) \) defined by \( \chi(d, q) = 0 \) if \( d \) divides \( (q^k + 1) \) for some \( k \geq 0 \) and \( \chi(d, q) = 1 \), otherwise. We give necessary and sufficient conditions when \( \chi(d, q) = 0 \) holds.

MSC:
94B05 Linear codes (general theory)
94B15 Cyclic codes
11T71 Algebraic coding theory; cryptography (number-theoretic aspects)

Keywords:
generator polynomial; negacyclic codes; self-dual; self-orthogonal

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References:

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