

QUANTUM CODES THROUGH CONSTACYCLIC CODES OVER
 $\mathcal{F}_p + \mu\mathcal{F}_p + \nu\mathcal{F}_p + \varpi\mathcal{F}_p + \mu\nu\mathcal{F}_p + \nu\varpi\mathcal{F}_p + \mu\varpi\mathcal{F}_p + \mu\nu\varpi\mathcal{F}_p$

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Abstract: The purpose of this paper is to identify the structural characteristics and construction of quantum codes over \mathcal{F}_p using $\alpha_1 + \alpha_2\mu + \alpha_3\nu + \alpha_4\varpi + \alpha_5\mu\nu + \alpha_6\nu\varpi + \alpha_7\mu\varpi + \alpha_8\mu\nu\varpi$ -constacyclic codes over ring $\mathcal{R} = \mathcal{F}_p[\mu, \nu, \varpi] / \langle \mu^2 - \mu, \nu^2 - \nu, \varpi^2 - \varpi, \mu\nu - \nu\mu, \nu\varpi - \varpi\nu, \mu\varpi - \varpi\mu \rangle$, here \mathcal{F}_p is a finite field with p elements. We define a Gray map from \mathcal{R} to \mathcal{F}_p^8 , a distance-preserving map. Breaking down constacyclic codes into cyclic and negacyclic codes results in the creation of quantum codes over the finite field \mathcal{F}_p . As an application, some examples are illustrated to obtain the quantum codes of different parameters.

Keywords and Phrases: Gray map, cyclic codes, constacyclic codes, negacyclic codes.

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1. Introduction

Quantum error correcting(QEC) codes are extremely useful for quantum computation as well as quantum communication. An effective method for overcoming decoherence is provided by QEC codes. As the QEC code was first discovered by Shor [15], in subsequent research, Calderbank et al. [7] developed a measure of distinction between QEC codes and conventional error-correcting codes.

Later in [8], Gao constructed the quantum codes through cyclic codes over $F_q + vF_q + v^2F_q + v^3F_q$. Ashraf and Mohammad [2] constructed the constacyclic codes