ES5.

FACTORISATION OF SEMIREGULAR RELATIVE DIFFERENCE SETS

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Relative Difference Sets (RDSs) have been found by a number of techniques, and there are iterative methods which construct a larger relative difference set as the product of given smaller relative difference sets. Recently, J.A. Davis and A. Pott have shown how to construct a new RDS in a larger group by taking product of two RDSs in smaller groups.

This work shows under certain conditions, how to factorize a given relative difference set in a bigger group to two relative difference sets in smaller groups.

We work in the group algebras $R[G]$, where R is a commutative ring with identity and G is a finite group, and in the twisted group algebras $R^{\alpha}[G]$, where α is a cocycle over G. We will follow standard practice and identify any subset X of G with the group algebra element $X = \sum_{x \in X} x$ in $R[G]$.

Theorem:

Let $G = K \times H$ be a finite group with $|K| = v_1$ and $|H| = v_2$, let C be a finite abelian group of order w such that $w|v_1$ and $w|v_2$, and let $\alpha : K \times K \to C$ and $\beta : H \times H \to C$ be cocycles.

If $T(\alpha \otimes \beta) = \{(1, g) : g \in G\}$ is a relative $(v_1v_2, w, v_1v_2, v_1v_2/w)$ – differences set in $E_{\alpha\otimes\beta}$ relative to C x 1, then $T(\alpha \otimes \beta)$ factorises into relative differences set; that is, $T(\alpha)$ is a relative $(v_1, w, v_1, v_1/w)$-differences set in E_α relative to C x 1 and $T(\beta)$ is a relative $(v_2, w, v_2, v_2/w)$-difference set in E_β relative to C x 1.