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On the construction of 3-way 3-homogeneous Steiner trades

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Abstract

A μ-way d-homogeneous (v, k, t) Steiner trade $T = \{T_1, T_2, ..., T_\mu\}$ of volume m consists of μ disjoint collections $T_1, T_2, ..., T_\mu$, each of m blocks of size k, such that every t-subset of v-set V occurs at most once in T_1 $(T_j,\ j \geq 2)$ and each element of V occurs in precisely d blocks of T_1 $(T_j,\ j \geq 2)$. In this paper we characterize the 3-way 3-homogeneous $(v, 3, 2)$ Steiner trades of volume v.

Keywords: Steiner trade, μ-way trade, Homogeneous trade
Mathematics Subject Classification [2010]: 05B05

1 Introduction

Let V be a set of v elements and k and t be two positive integers such that $t < k < v$. A (v, k, t) trade $T = \{T_1, T_2\}$ of volume m consists of two disjoint collections T_1 and T_2, each of containing m, k-subsets of V, called blocks, such that every t-subset of V is contained in the same number of blocks in T_1 and T_2. A (v, k, t) trade is called (v, k, t) Steiner trade if any t-subset of V occurs in at most once in $T_1(T_2)$. In a (v, k, t) trade, both collections of blocks must cover the same set of elements.

The concept of μ-way (v, k, t) trade, was defined recently in [3].

Definition 1.1. A μ-way (v, k, t) trade $T = \{T_1, T_2, ..., T_\mu\}$ of volume m consists of μ disjoint collections $T_1, T_2, ..., T_\mu$, each of m blocks of size k, such that for every t-subset of v-set V the number of blocks containing this t-subset is the same in each T_i (for $1 \leq i \leq \mu$). In other words any pair of collections $\{T_i, T_j\}$, $1 \leq i < j \leq \mu$ is a (v, k, t) trade of volume m. It is clear by the definition that a trade is a 2-way trade. A μ-way (v, k, t) trade is called μ-way (v, k, t) Steiner trade if any t-subset of found(T) occurs at most once in T_1 $(T_j,\ j \geq 2)$.

Definition 1.2. A μ-way (v, k, t) trade is called d-homogeneous if each element of V occurs in precisely d blocks of T_1 $(T_j,\ j \geq 2)$.

Definition 1.3. A trade $T' = \{T'_1, T'_2, ..., T'_\mu\}$ is called a subtrade of $T = \{T_1, T_2, ..., T_\mu\}$, if $T'_i \subseteq T_i$ for $1 \leq i \leq \mu$.

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