

The Kramer-Mesner Method for Quasi-symmetric Designs

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A t - (v, k, λ) design is a set \mathcal{V} of v points and a collection of k -subsets of \mathcal{V} , called blocks, with the property that any t -subset of \mathcal{V} is contained in exactly λ blocks. The design is *quasi-symmetric* if any two blocks intersect either in x or in y points, for non-negative integers $x < y$. Quasi-symmetric designs have important connections with strongly regular graphs and other combinatorial structures.

One of the most common methods for construction of designs with prescribed automorphism groups is the Kramer-Mesner method. We adapt it to quasi-symmetric designs and, using the adapted method, we find many new quasi-symmetric 2- $(28, 12, 11)$ and 2- $(36, 16, 12)$ designs. Furthermore, we find new quasi-symmetric design with parameters 2- $(56, 16, 18)$, which had previously been unknown. The associated block graph is the Cameron graph with parameters $SRG(231, 30, 9, 3)$.

MSC2000: 05B05.

Keywords: quasi-symmetric design, Kramer-Mesner method.