

Group Divisible Designs with Three Groups and Block Size 4

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Group divisible designs are classical combinatorial designs studied for their applications as well as for their own sake. They provide an ample opportunity of developing techniques to study combinatorial designs construction and are inherently hard to construct, specially when the number of groups is less than the block size and group sizes are different. The subject matter for this work is GDDs of block size four with three groups of different sizes. A previous study of the problem addressed the cases when first group size, say n_1 is 1 or 2, second group size $n_2 = n$ greater than or equal to n_1 , and the third group size is $n + 1$. First part of the present work tackles again the case of first group size one, and second group size n and third group size $n + 2$. Unlike the earlier study mentioned here, we also obtain several non-existence results when restrictions on block configurations are placed. Second part of our work deals with three group sizes 3, n ($n \geq 3$) and $n + 1$, respectively. We hope that these constructions of specific families will help to develop a more unified approach to construct such GDDs.

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