GDD (n1, n, n + 1, 4; λ1, λ2) for n1 = 1 or 2

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Abstract

The main subject matter for this paper is GDDs with three groups of sizes 1, n, ($n \geq 2$) and n + 1, respectively, and block size four. A block has Configuration (1, 1, 2), means the block has the point from the group of size 1 and one point from one of the other two groups and the remaining two points from the third group. A block has configuration (2, 2) if the block has exactly two points from each of the two groups of sizes n and n + 1. First, we prove that these GDDs do not exist if we require that the number of the blocks having Configuration (1, 1, 2) is equal to the number of block shaving Configuration (2, 2). Then we provide necessary conditions for the existence of a GDD ({1, n, n + 1}, 3, 4; $\lambda 1$, $\lambda 2$) and prove that these conditions are sufficient for several families of GDDs. We also prove several nonexistence results, where these usual necessary conditions are satisfied.

Key words: Group Divisible Designs (GDDs), Blocks and Configuration.