

Double-Change Covering Designs with block size $k = 2$ or 3

Nirosh T. Gamachchige, Kristen A. Lindbloom, John P. McSorley*

Department of Mathematics-4408, Southern Illinois University, Carbondale, IL 62901-4408, mcsorley60@hotmail.com

A double-change covering design (DCCD) is an ordered collection of b blocks, $\mathcal{B} = (B_1, B_2, \dots, B_b)$, each block B_s is a k -subset of $[v] = \{1, 2, \dots, v\}$, which obey: 1. every unordered pair of $[v]$ is covered by at least one block, and 2. each block differs from the previous block by two elements. The object is to minimize b for a fixed v and k . Tight designs are those in which each pair is covered exactly once. We construct tight DCCD's for all $v \geq 6$ when $k = 2$, and $v \equiv 1$ or $3 \pmod{6}$ when $k = 3$. We also construct an economical DCCD for $v \equiv 5 \pmod{6}$ when $k = 3$, and minimal DCCD's for $v \equiv 0, 2, \text{ or } 4 \pmod{6}$ when $k = 3$.