Abstract

Constructing some combinatorial matrices by using orthogonal arrays

Hadi Kharaghani

University of Letbridge, Lethbridge, Canada

A unified method is used to construct weighing matrices, balanced weighing matrices, balanced generalized weighing matrices, and symmetric designs. These include:

- Assuming the weight p in a seed weighing matrix $W(n, p)$ is a prime power, then there is a

$$W\left(\frac{p^{m+1} - 1}{p - 1}(n - 1) + 1, p^{m+1}\right)$$

  for each positive integer m. The case of $n = p + 1$ reduces to the balanced weighing matrices with classical parameters

$$W\left(\frac{p^{m+2} - 1}{p - 1}, p^{m+1}\right).$$

- Assuming the existence of a seed twin $SBIBD(2p + 1, p, \frac{p-1}{2})$, p an odd prime power, then there is a

$$SBIBD\left(2p(\frac{p^{m+1} - 1}{p - 1}) + 1, p^{m+1}, p^m(\frac{p - 1}{2})\right)$$

  for each positive integer m.

- Assuming the existence of a seed $SBIBD(n^2 + n + 1, n + 1, 1)$, $n + 1$ a prime power, then there is a

$$SBIBD\left((b - 1)\frac{a^k - 1}{a - 1} + 1, a^k, a^k(fraca - 1b - 1)\right),$$

  where $a = \frac{n^m - 1}{a - 1}$, $b = \frac{n^{m+1} - 1}{n - 1}$, m, n arbitrary positive integers.