Proper Circulant Weighing Matrices of Weight p^2

S.L. Ma

May 18, 2011

A weighing matrix of weight n is an $v \times v$ matrix M with $0, \pm 1$ entries such that $MM^T = nI_v$. Let $G = \{g_1, g_2, \ldots, g_v\}$ be an abelian group of order v. For any integer t and $A = \sum_{i=1}^{v} a_i g_i$ in the group ring $\mathbb{Z}[G]$ (or $\mathbb{C}[G]$) with $a_i \in \mathbb{Z}$ (or $\mathbb{C}$), we define $A^{(t)}$ to be $\sum_{i=1}^{v} a_i g_i^t$. If A satisfies $a_i = 0$, ± 1 and $AA^{(-1)} = n$, then the group matrix $M = (b_{ij})$, where $b_{ij} = a_k$ if $g_i g_j^{-1} = g_k$, is a weighing matrix of order v and weight n and is called a *group weighing matrix*. In particular, if G is a cyclic group, then M is a *circulant weighing matrix*. A group weighing matrix is said to be *proper* if the support of A is not contained in any coset of any proper subgroup of G. In this talk, we shall discuss some new results on proper circulant weighing matrices of weight p^2 where p is an odd prime.