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正规稀疏幻方的存在性

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Existence of Regular Sparse Magic Squares

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全文: PDF (326 KB) HTML (1 KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要 设$d < n$为两个正整数. 一个密度为d 的n 阶正规稀疏幻方, 记为$S_n(d,0)$, 是一个$n \times n$的整数矩阵, 其每行每列恰有d 个非零元素、n-d 个零元素, 其非零元素集为1到nd 的所有整数构成的集合, 其每行每列每两条对角线上元素和都相等. 正规稀疏幻方是幻方的推广且在图的标号中有很好的应用. 本文证明存在一个 $S_n(d,0)$当且仅当n 为奇数时$d \geqslant 3$, n 为偶数时d 也为偶数且 $d \geqslant 4$.

关键词： 幻方 正规稀疏幻方 均匀稀疏幻方

Abstract： Let $d < n$ be two positive integers. An order n regular sparse magic square with density d, denoted by $S_n(d, 0)$, is an $n \times n$ integer array containing the entries 1, 2, $\cdots$, nd with the remainder of its entries 0s, there are exactly n-d of 0s in each row and each column, and its rows and columns and two principal diagonals have a constant sum k. Regular sparse magic squares are a generalization of magic squares and have good applications to labelings of graphs. It is proved in this paper that there is an $S_n(d, 0)$ if and only if n is odd and $d \geqslant 3$ or n is even and $d \geqslant 4$ is even.

Key words： magic squares regular sparse magic squares uniform sparse magic squares

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