

**Abstract**

**Codes from designs from Hamming graphs**

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The Hamming graph  $H^k(n, m)$ , for  $n, k, m$  integers,  $1 \leq k < n$ , is the graph with vertices the  $m^n$   $n$ -tuples of  $R^n$ , where  $R$  is a set of size  $m$ , and adjacency defined by two  $n$ -tuples being adjacent if they differ in  $k$  coordinate positions. They are the graphs from the Hamming association scheme. In particular, the  $n$ -cube ( $Q_n$  or  $H(n, 2)$ ) is  $H^1(n, 2)$  where  $R = \mathbb{F}_2$ .

We examine the  $p$ -ary codes, for  $p$  any prime, that can be obtained from incidence and neighbourhood designs from  $H^k(n, m)$  and its line graphs. For the incidence designs we obtain the main parameters, including the minimum weight and nature of the minimum words, for all  $m$  when  $k = 1$ , and for  $m = 2$  when  $k \geq 2$ . The automorphism groups of the graphs, designs and codes are also established for these parameters, and permutation decoding shown to be applicable.

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