COMBINATÓRIA E TEORIA DE CÓDIGOS
Exercise List 2

2/3/2011

Exercises 2.2 - 2.4, 2.6 - 2.11 (R. Hill)

Problem 1. a) Exercises 2.17 and 2.19 in R. Hill;

b) (Generalization of 2.19) The important family of Reed-Muller binary codes can be obtained as follows:

$\forall r, m \in \mathbb{N}_0 : \begin{cases} 
RM(0, m) = \{\vec{0}, \vec{1}\} & \text{the binary repetition code with length } 2^m \\
RM(m, m) = (\mathbb{F}_2)^{2^m} \\
RM(r, m) = RM(r, m-1) \ast RM(r-1, m-1), & 0 < r < m
\end{cases}$

where $C_1 \ast C_2$ denotes the Plotkin Construction obtained from the codes $C_1$ and $C_2$.

Study this family of codes by showing that the parameters of $RM(r, m)$ are: $n = 2^m$, $M = 2^{\delta(r, m)}$, where $\delta(r, m) = \sum_{i=0}^{r} \left( \begin{array}{c} m \\ i \end{array} \right)$, $d = 2^{m-r}$.

Problem 2. a) Exercises 2.20 - 2.22 in R. Hill;

b) (Generalization of the Plotkin Bound) For q-ary codes, show that

$A_q(n, d) \leq \frac{d}{d - \theta n}$,

where $d > \theta n$ and $\theta = \frac{q-1}{q}$. 

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