Číslo cvičení: 2
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1. (a)
$$P = \begin{pmatrix} 1 & 1 & 1 & 0 \\ 1 & 2 & 0 & 1 \end{pmatrix}$$
   (b) $C = \{0000, 1022, 0121, 1110, 2102, 1201, 2011, 0212, 2220\}$

2. (a) Basis of such code can be in the form (AA), $(0A)$ or $(A0)$, the last two being equivalent. The respective codes are therefore: $C_1 = (00, 11, 22, 33)$, $C_2 = (00, 01, 02, 03)$. Hence possible values for d are 1, 2.
   (b) Basis of such code is in the form $G = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$. The only possible q to generate exactly 4 codewords is 2. $C = \{00, 01, 10, 11\}$.

3. (a) Because all operations are applied separately on columns "concateration" of two codes results in $n = n_1 + n_2$, $k = k_1 = k_2$, $d = d_1 + d_2$.
   (b) $n = n_1 + n_2$. All rows in G' are linearly independent, so $k = k_1 + k_2$. Codewords generated in the form $x_1 \dots x_{n_1} 0 \dots 0$ will exist in the resulting code. Similarly $0 \dots 0 x_1 \dots x_{n_2}$. Therefore $d = min\{d_1, d_2\}$.

4.

5. $R(1,m)$ is obtained by "adding" repetition codes to $R(1,1)$ like this: $R(1,1) + R(0,1) = R(1,2)$, $R(1,2) + R(0,2) = R(1,3), \dots$ Nuber of cosets generaly equals to q^{n-k}. $q = 2, n = 2^m$.

6. (a)