

# ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

School of Computer and Communication Sciences

**Handout 3**  
Homework 4

Modern Coding Theory  
March 23, 2008

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PROBLEM 1. Problem 3.5

PROBLEM 2. Problem 3.11

PROBLEM 3. Problem D.4. Use this result to compute the expected number of codewords of weight  $w = 0, 1, 2, 3$  for the  $(l, r)$ -regular ensemble.

PROBLEM 4. Consider an  $(l, r)$ -regular ensemble of LDPC codes of length  $n$  as introduced in class. Pick a random edge and consider the computation graph of this edge of depth  $\ell$ . Prove that if  $\ell$  is fixed and if  $n$  tends to infinity, then this computation graph is a tree with probability  $1 - o_n(1)$ , where  $o_n(1)$  denotes a quantity which converges to 0 as  $n$  tends to infinity.