

## 15 Source Mixtures

Suppose we have two alphabets,  $A_1$  and  $A_2$ , consisting of different letters. Each letter produced by the source is drawn randomly from one of the two alphabets (probability of choosing alphabet  $A_1$  is  $\alpha$ ). Within each alphabet, the letter probabilities are  $p_i^{(1)}$  and  $p_i^{(2)}$ .

- (a) Find the entropy of this source in terms of  $\alpha$  and the entropies of each alphabet.
- (b) In source coding terms, what is the worst-case value of  $\alpha$ ?
- (c) Suppose we encode this source from the Huffman codes derived for each component alphabet. The first bit indicates the alphabet and is then followed by the Huffman coding sequence for that alphabet. Is this code optimal?