

# ECE4304 Homework Assignment Number 5

Due by 4:50pm on Tuesday 20-Feb-2007

## 1 Required Reading

- Haykin 9.1-9.7

## 2 Problems

80 points total. You must show all of your work and your work must be neat to receive credit for a problem. Complete the following problems:

1. 10 points. Haykin 9.2. Express your answers in bits. Also compute the entropy (bits of information per symbol) of this source.
2. 20 points. Suppose you have a binary discrete memoryless source  $X$  with alphabet  $\mathcal{A} = \{a, b\}$  and probabilities  $P(X = a) = 0.3$  and  $P(X = b) = 0.7$ . You are to design a source coder to remove the redundancy in this symbol stream. Use the Huffman coding technique to design an efficient and lossless binary source code for blocks of two, three, and four DMS symbols. Write your codebooks explicitly. Compute the average codeword length of each of your source codes (in bits per DMS symbol) and the efficiency of each code. Comment on the trends as the block-length increases.
3. 10 points. Haykin 9.12.
4. 10 points. Haykin 9.17-9.18 (9.18 is just a follow-up to 9.17)
5. 15 points. Haykin 9.22.
6. 15 points. Haykin 9.23.