

## Quiz 3

Name:

Student ID:

1. Consider a random variable  $X$  which takes on four values with probabilities  $(\frac{1}{3}, \frac{1}{3}, \frac{1}{4}, \frac{1}{12})$ .
- (a). Given three different sets of codeword  $\{1, 00, 01, 110\}$ ,  $\{00, 01, 10, 11\}$ ,  $\{0, 11, 100, 101\}$ , which are uniquely decodable?
- (b). For the uniquely decodable codeword sets in (a), are they optimal (best)?

**Hint:** Check the expected length and Kraft inequality.

2. **Huffman coding.** Consider the random variable  $X = \begin{pmatrix} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & x_7 \\ 0.10 & 0.49 & 0.26 & 0.05 & 0.05 & 0.01 & 0.04 \end{pmatrix}$ .

- (a) Find a binary Huffman code for  $X$ .
- (b) Find the expected code length for this encoding.
- (c) Find a ternary Huffman code for  $X$ .