Solutions to Quiz 3

Question 1

A code is composed of the following four 6-bit codewords: `000000`, `010101`, `101010`, `111111` (or `111111`, `010101`, `101010`, `000000`).

(a) What is the minimum distance of this code?

(b) What are the *values* of n, k, and the code rate?

(c) How many errors is this code guaranteed to detect?

(d) How many errors is this code guaranteed to correct?

(e) If the codeword `011001` (or `100110`) is received, which codeword was most likely transmitted?

Solution

(a) The minimum distance of this code is: 3 (the number of bits that differ between either of the two middle code words and either of the end ones; the other two distances are 6).

(b) $n = 6, k = 2$ ($\log_2(4)$) and the code rate $= k/n = 2/6$ (1/3).

(c) This code is guaranteed to detect $d - 1 = 2$ errors.

(d) This code is guaranteed to correct $\lfloor (d-1)/2 \rfloor = 1$ errors.

(e) `011001` is at distance 2 from `010101`, 4 from `101010`, and 3 from `000000` or `111111`. So the best choice would be `010101`.

`100110` is at distance 2 from `101010`, 4 from `010101`, and 3 from `000000` or `111111`. So the best choice would be `101010`.