

2009 Paper 5 Question 8

Digital Communication I

- (a) Define the following terms and illustrate with an example.
- (i) Baud (sometimes referred to as the Baud rate), comparing it with bit rate. [1 mark]
 - (ii) Manchester line-encoding. [2 marks]
 - (iii) CRC (Cyclic-Redundancy Check) function. [3 marks]
 - (iv) Hamming distance. [3 marks]
- (b) Digital data may be represented as 1's and 0's. On a communications link it may be difficult to differentiate an idle link (consecutive 0's) from a broken link. A number of schemes are used to indicate that the link is idle but functioning; two examples include *data scramblers* and *block codecs*.
- (i) Compare and contrast block codecs with scramblers, taking care to describe each fully. [4 marks]
 - (ii) We wish to achieve an encoded data rate of 1Gbps. Compute the required (symbol) line bit rate for a block codec (e.g. the 8b/10b block codec) and a fixed-length scrambler (e.g. as used in the 64b/66b codec) to achieve a 1Gbps data rate. Which method is more efficient? [2 marks]
 - (iii) Give an example where the 8b/10b block codec would be more desirable than the 64b/66b codec. [2 marks]
 - (iv) Scramblers such as that used in the 64b/66b codec are sometimes referred to as self-synchronising. Describe, using an example if required, what is meant by self-synchronising. [3 marks]