



4.5.5 Information Coding Systems

- 1) A communication system is currently using a parity bit to detect errors during transmission and characters are being encoded using ASCII.

It is proposed that the system is modified so that:

- A majority voting system is used instead of the parity bit
- Unicode is used to encode the characters to be transmitted instead of ASCII

Discuss the **improvements** that will occur in the communication system as a result of these changes and any **disadvantages** that will result from them.

[4 marks]

Improvements

- Majority voting can some correct transmission errors as well as detect them
- Multi-bit errors could possibly be detected
- A greater range of characters can be transmitted with Unicode
- Eliminates problems caused by different versions of ASCII sets

Disadvantages

- Each character will require more bit to encode with Unicode
- Each bit will be sent multiple times using majority voting
- The effective rate at which information can be transmitted will be reduced

-
- 2) **Figure 1** shows some of the fields contained in a packet, transmitted on a computer network.

Figure 1

Destination Address	Source Address	Payload(data)	Checksum
---------------------	----------------	---------------	----------

- a) Explain what the checksum is used for **and** outline how the checksum's value will be determined.

[2 marks]

- Checksums are used to check if the contents of the packet/data have been corrupted/changed during transmission
- A checksum is calculated from the payload/data/contents of the packet





3) Describe **one** limitation of the use of parity bits for managing errors.

[1 mark]

- Errors that change an even number of bits cannot be detected
 - Errors can be detected but not corrected
-

4) **Figure 2** contains a bit pattern.

Figure 2

0	0	1	1	1	0	0	1
---	---	---	---	---	---	---	---

- a) The ASCII code for the numeric character "0" is 48_{10} ; other numeric characters follow on from this in sequence.

What character is represented by the bit pattern in **Figure 2** if it is an ASCII code?

[1 mark]

- 9

- b) Parity bits are often used to detect errors during data transmission. If the most significant bit in the bit pattern in **Figure 2** (the leftmost bit) is a parity bit, explain how the value of this was calculated by the sending device before the byte was transmitted. You should assume that the even parity system is being used.

[2 marks]

- There are four 1s in the 7 bits
- there are an even number of 1s so the parity bit has been set to 0 to keep the number of 1s even

- c) Majority voting is an alternative to using parity bits. Explain how the majority voting system works in the context of data transmission.

[2 marks]

- Each bit is sent multiple times (odd number greater than 2)
 - The receiver checks the bits it has received and if they are not all the same it assumes the one it received the most copies of is the correct value for the bit
-

