MODULE D DATA TRANSMISSION · D4

# Parity checks and checksums

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 2.2.1, 2.2.2

Name _____ Date _____

**Instructions.** Answer all questions in the spaces provided. No calculator. In every byte on this worksheet the parity bit is the left-most (most significant) bit. The marks for each part are shown in brackets [ ]. The total for this worksheet is **21 marks**.

## 1

**Total: 4 marks**

A farm sends sensor readings along a long cable to an office computer.

**(a)** Interference on the cable can cause errors in the data. Identify **two** different ways the data can be affected. **[2]**

1

2

**(b)** Explain why the office computer needs to check the data for errors after it is received. **[2]**

## 2

**Total: 6 marks**

**(a)** The farm uses **even** parity. Complete the parity bit for each byte. **[3]**

| Parity bit | Data bits | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**(b)** A different system uses **odd** parity. Tick (✓) **one** box in each row to show whether an error is detected in each received byte. **[3]**

| Received byte | Error detected (✓) | No error detected (✓) |
|---|---|---|
| 11010010 | | |
| 01110110 | | |
| 10000000 | | |

**3** **Total: 2 marks**

An engineer says: "If a byte passes its parity check, it must have arrived with no errors."

**(a)** Explain why the engineer is wrong. **[2]**

**4** **Total: 5 marks**

The farm sends four bytes and a parity byte as a parity block, using **even** parity. One bit changed during transmission. This is the block that is received.

| | Col 1 (parity bit) | Col 2 | Col 3 | Col 4 | Col 5 | Col 6 | Col 7 | Col 8 |
|---|---|---|---|---|---|---|---|---|
| **Byte 1** | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| **Byte 2** | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| **Byte 3** | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| **Byte 4** | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| **Parity byte** | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

**(a)** Identify the byte number and the column number of the bit that changed. **[2]**

Byte number .....

Column number .....

**(b)** Write the correct value of the byte that contained the error. **[1]**

Correct byte: .....

**(c)** Describe how the parity byte was created before the block was sent. **[2]**

**5** **Total: 4 marks**

The office computer also sends a weekly report file to a head office. A checksum is used to check the file for errors.

**(a)** Describe how a checksum is used to detect errors in the file after transmission. **[4]**

**Total for this worksheet: 21 marks**