

1. Data Representation

1.1 Data Representation

Candidates should be able to:

Show understanding of binary magnitudes and the difference between **binary prefixes and decimal prefixes**

Show understanding of the basis of different number systems

Perform binary addition and subtraction

Describe **practical applications** where **Binary Coded Decimal (BCD)** and **Hexadecimal** are used

Show understanding of and be able to represent character data in its internal binary form, depending on the character set used

Notes and guidance

Understand the difference between and use:

- kibi and kilo
- mebi and mega
- gibi and giga
- tebi and tera

Use the binary, denary, hexadecimal number bases and Binary Coded Decimal (BCD) and one's and two's complement representation for binary numbers

Convert an integer value from one number base / representation to another

Using positive and negative binary integers

Show understanding of **how overflow can occur**

Familiar with ASCII (**American Standard Code for Information Interchange**), extended ASCII and Unicode. Students will not be expected to memorise any particular character codes

Prefixes

Binary prefix name	symbol	value	Decimal prefix name	symbol	value
Kibi	Ki	2 ¹⁰	Kilo	k	10 ³
Mebi	Mi	2 ²⁰	Mega	M	10 ⁶
Gibi	Gi	2 ³⁰	Giga	G	10 ⁹
Tebi	Ti	2 ⁴⁰	Tera	T	10 ¹²

Overflow: the result of carrying out a calculation which produces a value too large for the computer's allocated word size

Applications

Application of hexadecimal system

- Memory dumps
 - Memory contents are output to printer or monitor
- MAC address
- Error message
- IP address
- Unicode
- Colour in HTML

Application of Binary Coded Decimal (BCD)

- Calculator
 - Clock
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Character sets

Character set:

- The symbols that computer uses
- A list of characters recognized by computer software and hardware
- Each character has a character code
- The binary code for each character in the string is stored in sequence

Disadvantage of ASCII:

- Only 256 characters can be represented
- Uses values 0 to 127/256
- Many characters in other languages cannot be represented
- The extended ASCII the characters from 128 to 255 may be coded differently in different system.

UNICODE:

- UNICODE has greater range of characters than ASCII
- UNICODE represents most written language in the world, while ASCII does not; used for English only

- ASCII uses 7-8 bits per character, whereas UNICODE uses up to 4 bytes per character
 - UNICODE is standardized while ASCII is not
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