 **Manyam Franchised Notes**

## Computer Studies Form Three

# Data representation in a computer

Data Representation refers to the methods used internally to represent information stored in a computer. Computers store lots of different types of information:

Text (this refers to letters, numbers and symbols)

Graphics (such as pictures, drawings and clipart)

Sound (voice data)

Instructions (computer commands)

At least, these all seem different to us. However, ALL types of information stored in a computer are stored internally in the same simple format: a sequence of 0's and 1's. *How can a sequence of 0's and 1's represent things as diverse as your photograph, your favorite song, a recent movie, and your term paper?*

It sounds complicated. However you should understand that computers don’t understand our natural languages like Kiswahili, English or Kalenjin. They have their own language called machine language. That means, what you type or speak into the computer is converted into a language that computers are able to understand.

 In digital computers, the user input is first converted and transmitted as electrical pulses that can be represented by two distinct states ON and OFF or ‘1’ and ‘0’ respectively. The sequence of ‘1’ and ‘0’ forms electrical signals that the computer can understand; the figure below shows the difference between a discrete signal (digital) and a continuous (analogue) signal

Digital

Analogue

**A digital signal** refers to an electrical signal that is converted into a pattern of bits. Unlike an analogue signal, which is a continuous signal that contains time-varying quantities, a digital signal has a discrete value at each sampling point. The precision of the signal is determined by how many samples are recorded per unit of time.

Parameters used with signals

AMPLITUDE (A) this is the maximum displacement that the waveform of an electrical signal can attain

FREQUENCY (f) this is the number of cycles made by the electrical signal in one second. Its measured in hertz (Hz) 1 cycle per second

Periodic time (T) periodic time is the reciprical of frequency i.e T=$\frac{1}{f}$

When a digital signal is to be sent over analogue telephone lines e.g email, it has to be converted to analogue signal . this is possible with the use of a device called the Modem derived from the words Modulation and Demodulation. **Modulation** stands for converting a digital signal to analogue and **demodulation** refers to converting an analogue signal to digital

## Concepts of data representation in digital computers

Data and instructions cannot be entered and processed directly into computers using human language. Any type of data, be it numbers, letters, special symbols, sounds or pictures must first be converted into machine readable form. Due to this reason, it is important to understand how a computer together with its peripheral devices handle data in its electronic circuits. On magnetic media and in optical devices.

Natural language like English

Application Software

System Software

Assembly Language

Binary Language

Computer

Hardware

High level language

Low level language

## Data epresentation in digital circuits

In digital circuits, when the circuit is ‘on’, its interpreted as a ‘1’ and when ‘off’ its interpreted as a ‘0’. These ‘1s’ and ‘0s’ is what computers understand and its refered to as binary language.

## Data representation in magnetic media

The presence of a magnetic field in one directionon magnet media is interpreted as ‘1’, while the field in the opposite direction is interpreted as ‘0’. Magnetic technology is mostly used on storage devices which are coated with special magnetic materials such as *iron oxide.* Data is written on the media by arranging the *magnetic dipoles* of some iron oxide particles to face in the same directionand some others in the opposite direction.

## Data representation on optical media

In optical devices, the presence of light is interpreted as ‘1’ while its absence is integrated as ‘0’. Optical devices use this technology to read or store data. Take an example of a CD-ROM. If the shiny surface is placed under a powerful microscope, the surface can be observed to have very tiny holes called **pits.** The areas that do not have pits are called **land. Land** reflects laser light that hits on the surface but bits don’t reflect. The reflected pattern of light from the rotating disk falls on a receiving photoelectric detector that transforms the patterns into digital form.

## Reasons for use of binary system in computers

Binary systems are:

1. Reliable
2. Occupy less space
3. Use less energy

## Bits, bytes, nibble and word

Bits: a bit can be defined as a binary digit which can either be 0 or 1. It is the basic unit of data or information in digital computers.

Byte: a group of bits (often 8) used to represent a character is called a byte. A byte is used to measure the memory of a computer

A nibble: half a byte, which is usually a grouping of 4 bits

Word: two or more bytes make a word

Word length: measure of the number of bits in each word

Example: let 11110000 represent a binary figure

There are 8 **bit**s in the figure. Count

These 8 figures make up **a byte**

1111 or 0000 is a **nibble** this is because they are 4 of the 8 figures thus half

11110000 and 11110000 are two figures thus **a word**

11110000 and 11110000 make a word that has 16 bits thus **word length**

## Questions

1. Why is the binary number system used in data representation?
2. Explain the following terminologies as used with data representation:
3. Word
4. Nibble
5. Byte
6. Bit
7. Word length
8. Define the following words
9. Amplitude
10. Frequency
11. Periodic time
12. Explain the role of a modem in communication
13. Using illustration, explain how data is represented:
14. In electronic circuits
15. On magnetic media
16. On CD-ROM

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