**C.P. PATEL & F.H. SHAH COMMERCE COLLEGE**
**(MANAGED BY SARDAR PATEL EDUCATION TRUST)**
**BCA, BBA (ITM) & PGDCA PROGRAMME**
**PGDCA SEM I PS01CDCA22: C AND DATA STRUCTURE**
**UNIT 1: INTRODUCTION**

## Introduction:

- A computer is a multipurpose electronic device that can receive, process and store data.
- It is consisting of Input, output and processing devices.

## Characteristics of Computers:

The main characteristics of a computer are

- Speed
- Accuracy
- Efficiency
- Storage capability
- Versatility
- No feelings
- No I.Q
- Speed

- **Speed**

Computer is a very fast electronic device. It can perform millions of calculations in few seconds. Computer has units of speed in microsecond, nanosecond and even in the pico second.

- **Accuracy**

The accuracy of a computer is high. It can perform the calculations with zero error rate. Some errors may occur in computer, but they are mainly due to human fault. Computer is based on the principle of Garbage-In-Garbage-Out. If wrong data is given as input then it will produce wrong data as output.

- **Efficiency**

The efficiency of computer is very high. For human being it is very difficult to work continuously for hours with out loosing concentration, but computers does not lose concentration and can work for hours with out creating any errors.

- **Storage capability**

Large amount of information can be stored in computer and also retrieved whenever required. It can store any type of data such as text, images, video, audio etc. Computer does not forget information like human being. They can store the information permanently. Even after several years computer can recall the information without forgetting anything.

- **Versatility**

Computer is a versatile device. It can perform different tasks. At one moment you can use computer for play games and in the next moment you can use computer for watching videos.

- **No feelings**

Computer does not have feelings or emotions because it is a machine. It cannot make any decision based on experience, love, knowledge.

- **No I.Q**

Computer has no intelligence to perform any task on its own like human being. Every instruction is given by human being to computer for performing the task.

## Applications Areas of Computers:

The various applications of computers in different areas:

1. Business
2. Education
3. Marketing
4. Banking
5. Insurance
6. Communication
7. Health Care
8. Military
9. Engineering Design

**1. Business :**

- A computer has high speed of calculation, diligence, accuracy, reliability, or versatility which made it an integrated part in all business organisations.
- Computer is used in business organisations for: Payroll calculations, Sales analysis, Budgeting, Financial forecasting, Managing employees database and Maintenance of stocks etc.

**2. Education :**

Computers have its dominant use in the education field which can significantly enhance performance in learning. Even distance learning is made productive and effective through internet and video-based classes. Researchers have massive usage of these computers in their work from the starting to till the end of their scholarly work.

**3. Marketing**

- In marketing, uses of computer are :
    - Advertising - With computers, advertising professionals create art and graphics, write and revise copy, and print and disseminate ads with the goal of selling more products.
    - Home Shopping - Home shopping has been made possible through use of computerized catalogues that provide access to product information and permit direct entry of orders to be filled by the customers.

**4. Banking**

- Today banking is almost totally dependent on computer. Banks provide the facilities of:
- Banks provide online accounting facility, which includes current balances, deposits, overdrafts, interest charges, shares, and trustee records.
- ATM machines are making it even easier for customers to deal with banks.

**5. Insurance**

Insurance companies are keeping all records up-to-date with the help of computers. The insurance companies, finance houses and stock broking firms are widely using computers for their concerns.

**6. Communication**

Communication means to convey a message, an idea, a picture or speech that is received and understood clearly and correctly by the person for whom it is meant for. Some main areas in this category are: Chatting, E-mail, Usenet, FTP, Video-conferencing and Telnet.

**7. › Health Care**

Most of the medical information can now be digitized from the prescription to reports. Computation in the field of medicine allows us tooffer varied miraculous therapies to the patients. ECG's, radiotherapy wasn't possible without computers.

**8. Military**

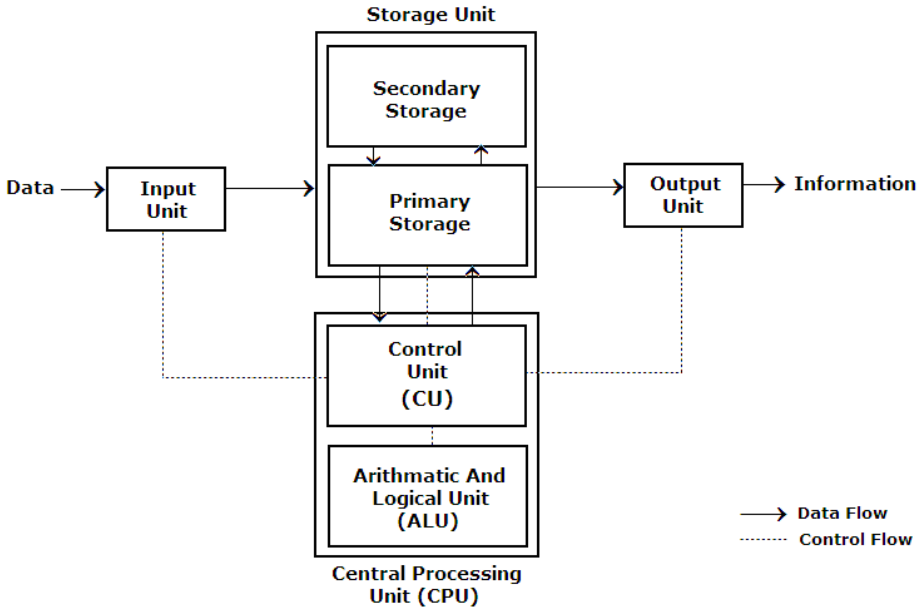
Computers are the main tools which help in developing missiles and other equipment in the deference system. Designing and the maintenance are possible only through computers. Computer builds the links between the soldiers and commanders through the satellite. Construction of weapons and controlling their function is not possible without the aid of computers. The list of the criminals and the records of the cops are maintained regularly in the system.

**9. Engineering Design**

As per the title, computers aid in designing buildings, magazines, prints, newspapers, books and many others. The construction layouts are designed beautifully on system using different tools and software's.

## Block Diagram of Computers

Block diagram of the computers is consisting of main 3 processes that is:



1. **Input**: This is the process of entering data and programs in to the computer system. You should know that computer is an electronic machine like any other machine which takes as inputs raw data and performs some processing giving out processed data. Therefore, the input unit takes data from us to the computer in an organized manner for processing.

2. **Storage:** The process of saving data and instructions permanently is known as storage. This storage unit or the primary storage of the computer system is designed to do the above functionality. It provides space for storing data and instructions.

3. **Processing**: The task of performing operations like arithmetic and logical operations is called processing. The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit.

4. **Output**: This is the process of producing results from the data for getting useful information. Similarly the output produced by the computer after processing must also be kept somewhere inside the computer before being given to you in human readable form. Again the output is also stored inside the computer for further processing.

5. **Control:** The manner how instructions are executed and the above operations are performed. Controlling of all operations like input, processing and output are performed by control unit. It takes care of step by step processing of all operations inside the computer.

**FUNCTIONAL UNITS**

In order to carry out the operations mentioned in the previous section the computer allocates the task between its various functional units. The computer system is divided into three separate units for its operation. They are

**Arithmetic Logical Unit (ALU)**

After you enter data through the input device it is stored in the primary storage unit. The actual processing of the data and instruction are performed by Arithmetic Logical Unit. The major operations performed by the ALU are addition, subtraction, multiplication, division, logic and comparison. Data is transferred to ALU from storage unit when required. After processing the output is returned back to storage unit for further processing or getting stored.

**Control Unit (CU)**

The next component of computer is the Control Unit, which acts like the supervisor seeing that things are done in proper fashion. Control Unit is responsible for co ordinating various operations using time signal. The control unit determines the sequence in which computer programs and instructions are executed. Things like processing of programs stored in the main memory, interpretation of the instructions and issuing of signals for other units of the computer to execute them. It also acts as a switch board operator when several users access the computer simultaneously. Thereby it coordinates the activities of computer's peripheral equipment as they perform the input and output.

**Central Processing Unit (CPU)**

The ALU and the CU of a computer system are jointly known as the central processing unit. You may call CPU as the brain of any computer system. It is just like brain that takes all

major decisions, makes all sorts of calculations and directs different parts of the computer functions by activating and controlling the operations.

**Memory Unit (MU):**

Memory Unit is consisting of Primary Memory Device (RAM) and Secondary Storage Devices (Hard Disks and others)

**Stored-program concept**:

It is the concept to Store of program instructions in computer memory to enable it to perform a variety of tasks in sequence.

The idea was introduced in the late 1940s by John von Neumann.

A program can be electronically stored in a memory device so that instructions could be modified by the programmer as per his requirements.

**Editors:**

**Def:-**An editor is a special program which helps in creating and modifying simple text files

- An editor is program that helps in reviewing and altering of the text and programming instructions.
- An editor is used to generally create a program, edit or modify a program.

**Functions of Editors:**

- An editor does not support text or paragraph formatting.
- It is useful in creating simple memos, text etc.
- It can also be used in typing the programs for different programming languages.

According to the functions of editors they can be divided into following categories:

- Line Editors
- Full Screen Editors
- Linkage Editors

List of commonly used editors:

- Notepad
- Vi

## Programming Language Generations or Levels:

We use languages for the communication just the same way programmers use the programming languages to develop the programs.

According to the development in the computing technologies, programming languages have also been changed very much. According to the changes of the programming languages they can be classified in to 4 generations.

1. First Generation is known as a Machine Level Language and it was introduce in 1940.
2. Second Generation is known as Assembly Language and it was introduce in 1950.

3. Third Generation is known as High Level Languages and it was introduce in 1950 to 1970.
4. Fourth Generation is known as Query Level Languages and it was introduce in after 1970.

**Machine level Language:**

**Def: -** The language which is in the form of binary number is known as machine level language.

**Or**

The language which is in the form of 0 and 1 is known as machine level language**.**

This language is written only in 1s and 0s, means in binary form. Computer can understand this language directly without translating it, because it is the native form for the computer. So we do not require any translating program.

**A Sample Machine Language Program**

| | |
|---|---|
| 00100000000000001100111001 | 10001471 |
| 00110000000000010000100001 | 14002041 |
| 01100000000000011100101110 | 30003456 |

**Advantages & Limitations of Machine Language:-**

**Advantage:**

- It can be executed very fast.
- It does not require any translation program.

**Limitations:**

- It is machine dependent language means different computer have the different machine level language..
- It is difficult to create the program because users can't understand it easily.
- The programs are hard to modify.
- User can't easily locate and correct the error.

**Assembly/Symbolic Language:**

**Def: - The language which is in the form of symbolic code is known as Assembly language.**

It is the programming language that:

1. Uses alphanumeric ***mnemonic*** codes

e.g. using ADD instead of 1110 (binary)

2. Allows storage locations to be represented in form of ***alphanumeric addresses*** instead of numeric addresses:

e.g. representing memory locations 1000, 1001, and 1002 as FRST, SCND, and ANSR

3. Respectively provides ***pseudo-instructions*** that are used for instructing the system

e.g. START PROGRAM AT 0000

This overcomes the limitations of machine language programming.

This language is written only in symbolic code so Computer can't understand this language directly so we required one translating program. The **ASSEMBLER** can do this job.

**Advantages of Assembly Language Over Machine Language**

- It is easy to understand and use
- Easy to locate and correct errors
- Easy to modify program
- No worry about addresses
- It provides efficiency of machine language

**Limitations of Assembly Language:**

- Its code is machine dependent
- Knowledge of hardware is required for programming
- Slow in execution compared to machine language. (Because of the conversion from Assembly to Machine Language)

**High-Level Languages:-**

**Def: - The language which is in the form of mathematical symbol is known as high –level language.**

- The programs in this language are written using English like words, Mathematical symbols and expressions. The programs written in these languages are easiest to understand for user.
- It is a machine independent language. Which means the code written in these languages can be executed on any platform and on any machine without affecting instructions.
- It does not require programmers to know anything about the internal structure of computer on which high-level language programs will be executed.
- This language is written only in mathematical symbol so Computer can't understand this language directly so we required one translating program.and the **COMPILER** and **INTERPRETER** can do this job.

**Advantages of High-Level Languages:**

- Machine independent programs means programs can be run on any machine.
- Easier to learn and use
- Fewer errors during program development
- Easy to maintain the program.

**Limitations of High-Level Languages:**

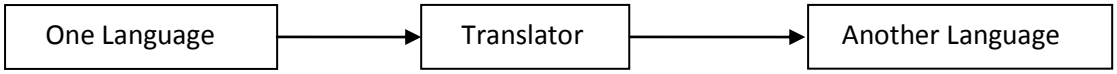
- Lower execution efficiency. Programs get slower in execution during the translation by the compiler.
- It required more storage space.

➢ **Translators:**

**Def**:- Translators are the computer programs which convert one language program to another language program-generally to the machine level language program .

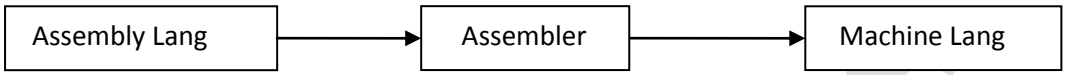
For example, an assembly language program to machine code. Or high level language program to machine level Language program code.

Examples of translators are: Complier, Interpreter, Assembler..




**1) Assembler:**

**Assembler**:- An assembler is a translating program which translates the Assembly language program to the machine language program.

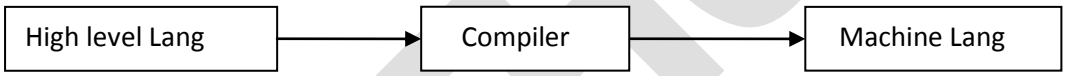



**2) Compilers:**

The high level language is written only in mathematical symbol so Computer can't understand this language directly so we required one translating program.and the **COMPILER** can do this job.

**Compiler:-**

Compiler is a translating program which translates the high level language program to the machine level language program.

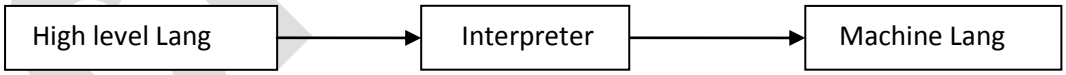



**3) Interpreters:**

The high level language is written only in mathematical symbol so Computer can't understand this language directly so we required one translating program.and the **Interpreter** can do this job.

**Interpreter:-**

An interpreter is a translating program which translates the high-level language program to the machine language program.




**Difference between Compiler and Interpreter**

| Compiler | Interpreter |
|---|---|
| 1. In Compiler all the instruction are translated then executed | 1. In interpreter the first instruction are translated and executed immediately then go for the next instruction. |
| 2. Here the every time translator are not required | 2. Here every time translator are required |
| 3. Object program will save in memory | 3. Object program will not save in memory |
| 4. Error solving process is more time consuming. | 4. Error solving process is more time consuming. |
| 5. It required more storage space | 5. It required less storage space |
| 6. Execution is fast | 6. Execution is slow. |