IT Fundamentals

Overview of computer fundamentals :

Today world is an information –rich world and it has become a necessity for everyone to know about computer and its fundamentals. A computer is an electronic data processing device, which accepts and stores the data input, process the data input, and generates the output in a required format.

Functionality of a computer : If we look at it in a very broad sense, any digital computer carries out the following five functions:

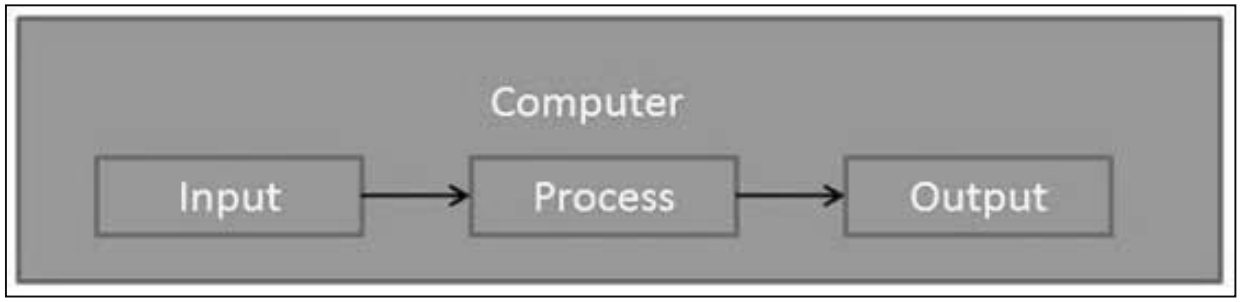
Step 1 - Takes data as input.

Step 2 - Stores the data/instructions in its memory and uses them as required.

Step 3 - Processes the data and converts it into useful information.

Step 4 - Generates the output.

Step 5 - Controls all the above four steps.



Following are certain advantages of computers.

High Speed

- Computer is a very fast device.
- It is capable of performing calculation of very large amount of data.
- The computer has units of speed in microsecond, nanosecond, and even thepicosecond.

Accuracy

- In addition to being very fast, computers are very accurate.
- The calculations are 100% error free.
- Computers perform all jobs with 100% accuracy provided that the input is correct.

Storage Capability

- Memory is a very important characteristic of computers.
- A computer has much more storage capacity than human beings.
- It can store large amount of data.
- It can store any type of data such as images, videos, text, audio, etc.

Diligence

- Unlike human beings, a computer is free from monotony, tiredness, and lack ofconcentration.
- It can work continuously without any error and boredom.
- It can perform repeated tasks with the same speed and accuracy.

Versatility

- A computer is a very versatile machine.
- A computer is very flexible in performing the jobs to be done.
- This machine can be used to solve the problems related to various fields.
- At one instance, it may be solving a complex scientific problem and the very nextmoment it may be playing a card game.

Reliability

- A computer is a reliable machine.
- Modern electronic components have long lives.

Automation

- Computer is an automatic machine.
- Automation is the ability to perform a given task automatically. Once the computer receives a program i.e., the program is stored in the computer memory, then the program and instruction can control the program execution without human interaction.

Reduction in Paper Work and Cost

- The use of computers for data processing in an organization leads to reduction in paper work and results in speeding up the process.
- As data in electronic files can be retrieved as and when required, the problem of maintenance of large number of paper files gets reduced.

- Though the initial investment for installing a computer is high, it substantially reducesthe cost of each of its transaction.

Applications of it fundamentals :

- ✓ Banking
- ✓ Insurance
- ✓ Education
- ✓ Marketing
- ✓ Advertiasing
- ✓ Home shopping, health care etc,.

Generations of computer

Generation in computer terminology is a change in technology a computer is/was being used. Initially, the generation term was used to distinguish between varying hardware technologies. Nowadays, generation includes both hardware and software, which together make up an entire computer system.

There are five computer generations known till date. Each generation has been discussed in detail along with their time period and characteristics. In the following table, approximate dates against each generation has been mentioned, which are normally accepted.

Following are the main five generations of computers.

Sr. No.	Generation & Description
1	**First Generation** The period of first generation: 1946-1959. Vacuum tube based.
2	**Second Generation** The period of second generation: 1959-1965. Transistor based.
3	**Third Generation** The period of third generation: 1965-1971. Integrated Circuit based.
4	**Fourth Generation** The period of fourth generation: 1971-1980. VLSI microprocessor based.
5	**Fifth Generation** The period of fifth generation: 1980-onwards. ULSI microprocessor based.

Computer programming :

Computer programming is the process that professional uses to write that instructs how computer, applications or software program performs. As its most basic, computer programming isa set of instruction to facilate specific actions. computer programming is the process of designing and building an executable computer program to accomplish a specific computing result or to perform a specific task. Programming involves tasks such as: analysis, generating algorithms, profiling algorithms' accuracy and resource consumption, and the implementation of algorithms in a chosen programming language (commonly referred to as coding).[1][2] The source code of a program is written in one or more languages that are intelligible to programmers, rather than machine code, which is directly executed by the central processing unit. The purpose of programming is to find a sequence of instructions that will automate the performance of a task (which can be as complex as an operating system) on a computer, often for solving a given problem. Proficient programming thus often requires expertise in several different subjects, including knowledge of the application domain, specialized algorithms, and formal logic.

History : An early proposal for a high-level programming language was Plankalkül, developed by Konrad Zuse for his Z1 computer between 1943 and 1945 but not implemented at the time. The first functioning programming languages designed to communicate instructions to a computer were written in the early 1950s.

COMPUTER SYSTEMS

-A Computer is an electronic device that stores, manipulates and retrieves the data.|| We can also refer computer computes the information supplied to it and generates data.

A System is a group of several objects with a process. For Example: Educational System involves teacher, students (objects). Teacher teaches subject to students i.e., teaching (process). Similarly a computer system can have objects and process.

The following are the objects of computer System

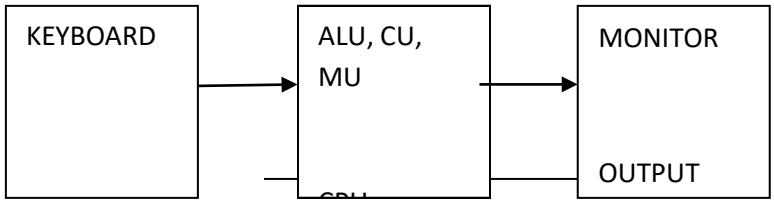
a) User (A person who uses the computer)
b) Hardware
c) Software

Hardware: Hardware of a computer system can be referred as anything which we can touch andfeel.

Example : Keyboard and Mouse.

The hardware of a computer system can be classified asInput Devices(I/P)

Processing Devices (CPU)Output Devices(O/P)



ALU: It performs the Arithmetic and Logical Operations such as

+,-,*,/ (Arithmetic Operators)&&, || (

Logical Operators)

CU: Every Operation such as storing , computing and retrieving the data should be governed bythe control unit

MU: The Memory unit is used for storing the data.The Memory unit is classified into two types.They are

1) Primary Memory

2) Secondary Memory

Primary memory: The following are the types of memoruies which are treated as primary ROM: It represents Read Only Memory that stores data and instructions even when the computeris turned off. The Contents in the ROM can't be modified once if they are written . It is used tostore the BIOS information.

RAM: It represents Random Access Memory that stores data and instructions when the computer is turned on. The contents in the RAM can be modified any no. of times by instructions. It is used to store the programs under execution.

Cache memory: It is used to store the data and instructions referred by processor.

Secondary Memory: The following are the different kinds of memories

Magnetic Storage: The Magnetic Storage devices store information that can be read, erased andrewritten a number of times.

Example: Floppy Disks, Hard Disks, Magnetic Tapes

Optical Storage: The optical storage devices that use laser beams to read and write stored data.

Example:CD(Compact Disk),DVD(Digital Versatile Disk)

COMPUTER SOFTWARE

Software of a computer system can be referred as anything which we can feel and see. Example: Windows, icons Computer software is divided in to two broad categories: system software and application software .System software manages the computer resources .It provides the interface between thehardware and the users. Application software, on the other hand is directly responsible for helping users solve their problems.

System Software

System software consists of programs that manage the hardware resources of a computer and perform required information processing tasks. These programs are divided into three classes: the operating system, system support, and system development.

COMPUTER LANGUAGES

To write a program (tells what to do) for a computer, we must use a computer language. Over the years computer languages have evolved from machine languages to natural languages.The following is the summary of computer languages

1940‘s	--	Machine Languages
1950‘s	--	Symbolic Languages
1960‘s	--	High Level Languages

Machine Language

In the earliest days of computers, the only programming languages available were machine languages. Each computer has its own machine language which is made of streams of 0‘s and 1‘s. The instructions in machine language must be in streams of 0‘s and 1‘s. This is alsoreferred as binary digits. These are so named as the machine can directly understood the programs

Advantages:

1) High speed execution
2) The computer can understood instructions immediately
3) No translation is

needed.Disadvantages:

1) Machine dependent
2) Programming is very difficult
3) Difficult to understand
4) Difficult to write bug free programs
5) Difficult to isolate an error

Example Additon of two numbers

```
    2        0 0 1 0
+   3        0 0 1 1
   ---      ----------
    5        0 1 0 1
```

Symbolic Languages (or) Assembly Language

In the early 1950's Admiral Grace Hopper, a mathematician and naval officer, developed the concept of a special computer program that would convert programs into machine language. These early programming languages simply mirrored the machine languages using symbols or mnemonics to represent the various language instructions. These languages were known as symbolic languages. Because a computer does not understand symbolic language it must be translated into the machine language. A special program called an Assembler translates symbolic code into the machine language. Hence they are called as Assembly language.

Advantages:

1) Easy to understand and use
2) Easy to modify and isolate error
3) High efficiency
4) More control on

hardwareDisadvantages:

1) Machine Dependent Language
2) Requires translator
3) Difficult to learn and write programs
4) Slow development time
5) Less
6) Example:

```
    2          PUSH 2,A
    3          PUSH 3,B
+              ADD A,B
    5          PRINT C
```

High level languages : The symbolic languages greatly improved programming efficiency they still required programmers to concentrate on the hardware that they were using working with symbolic languages was also very tedious because each machine instruction had to be individually coded. The desire to improve programmer efficiency and to change the focus from the computer to the problems being solved led to the development of high-level languages. High-level languages are portable to many different computer allowing the programmer to concentrate on the application problem at hand rather than the intricacies of the computer.

C	A systems implementation Language
C++	C with object oriented enhancements
JAVA	Object oriented language for internet and general applications using basic C syntax

Advantages:

1) Easy to write and understand
2) Easy to isolate an error
3) Machine independent language
4) Easy to maintain
5) Better readability
6) Low Development cost
7) Easier to document
8) Portab

leDisadvantages:

1) Needs translator
2) Requires high execution time
3) Poor control on hardware
4) Less efficient

Example: C language

```
#include<stdio.h>
                    void main()
                    {
        int a,b,c;
        scanf("%d%d%",&a,&b);


        c=a+b;
        printf("%d",
        c);
                    }
```

Difference between Machine, Assembly, High Level Languages

Feature	Machine	Assembly	High Level
Form	0‘s and 1‘s	Mnemonic codes	Normal English
Machine Dependent	Dependent	Dependent	Independent
Translator	Not Needed	Needed(Assembler)	Needed(Compiler)
Execution Time	Less	Less	High
Languages	Only one	Different Manufactgurers	Different Languages
Nature	Difficult	Difficult	Easy
Memory Space	Less	Less	More

Language Translators

These are the programs which are used for converting the programs in one language into machine language instructions, so that they can be excuted by the computer.

Compiler : It is a program which is used to convert the high level languageprograms into machine language

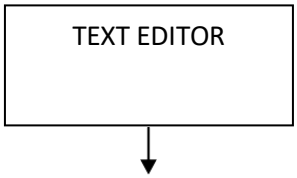
Assembler : It is a program which is used to convert the assembly levellanguage programs into machine language

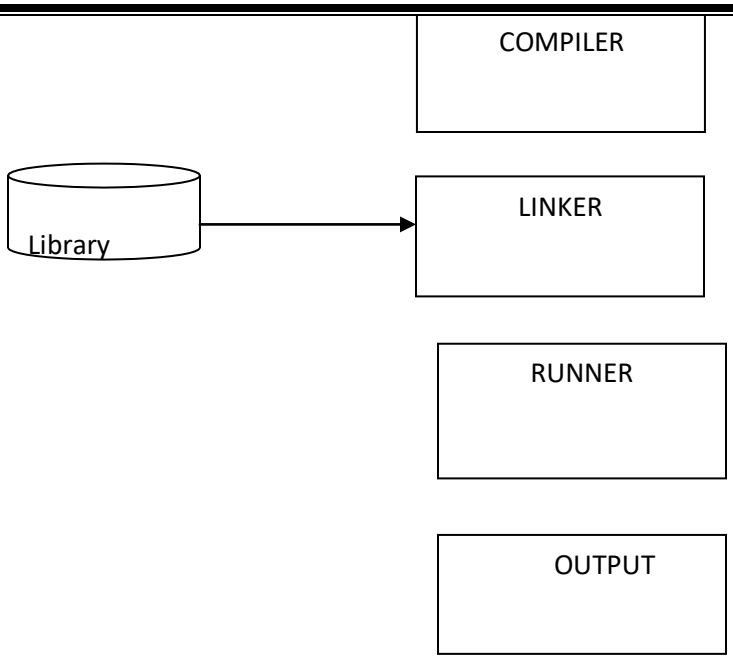
Interpreter : It is a program, it takes one statement of a high level language program, translates it into machine language instruction and then immediatelyexecutes the resulting machine language instruction and so on.

Comparison between a Compiler and Interpreter

CREATING AND RUNNING PROGRAMS

The procedure for turning a program written in C into machine Language. The process is presented in a straightforward, linear fashion but you shuld recognize that these steps are repeated many times during development to correct errors and make improvements to the code.





The following are the four steps in this process

1) Writing and Editing the program
2) Compiling the program
3) Linking the program with the required modules
4) Executing the program

Sl. No.	Phase	Name of Code	Tools	File Extension
1	TextEditor	Source Code	C Compilers Edit, Notepad Etc..,	.C
2	Compiler	Object Code	C Compiler	.OBJ
3	Linker	Executable Code	C Compiler	.EXE
4	Runner	Executable Code	C Compiler	.EXE

Writing and Editing Programs

The software used to write programs is known as a text editor. A text editor helps us enter, change and store character data. Once we write the program in the text editor we save it using a filename stored with an extension of .C. This file is referred as source

code file.

Compiling Programs

The code in a source file stored on the disk must be translated into machine language. This is the job of the compiler. The Compiler is a computer program that translates the source code written in a high-level language into the corresponding object code of the low-levellanguage. This translation process is called *compilation.* The entire high level program is converted into the executable machine code file. The Compiler which executes C programs is called as C Compiler. Example Turbo C, Borland C, GC etc.,

The C Compiler is actually two separate programs : The PreprocessorThe Translator

The Preprocessor reads the source code and prepares it for the translator. While preparing the code, it scans for special instructions known as preprocessor commands. These commands tell the preprocessor to look for special code libraries. The result of preprocessing is called the translation unit.

After the preprocessor has prepared the code for compilation, the translator does the actual work of converting the program into machine language. The translator reads the translation unit and writes the resulting object module to a file that can then be combined with other precompiled units to form the final program. An object module is the code in the machine language.

Linking Programs

The Linker assembles all functions, the program‘s functions and system‘s functions into one executable program.

Executing Programs

To execute a program we use an operating system command, such as run, to load the program into primary memory and execute it. Getting the program into memory is the function of an operating system program known as the loader. It locates the executable program and reads it into memory. When everything is loaded the program takes control and it begin execution.

ALGORITHM

Algorithm is a finite sequence of instructions, each of which has a clear meaning and can be performed with a finite amount of effort in a finite length of time. No matter what the input values may be, an algorithm terminates after executing a finite number of instructions. The ordered set of instructions required to solve a problem is known as an *algorithm*.The characteristics of a good algorithm are:

Precision – the steps are precisely stated (defined).

Uniqueness – results of each step are uniquely defined and only depend on the inputand the result of the preceding steps.

Finiteness – the algorithm stops after a finite number of instructions are executed.

Input – the algorithm receives input.

Output – the algorithm produces output.

Generality – the algorithm applies to a set of inputs.

Example

Q. Write a algorithem to find out number is odd or even?

Ans.

```
step 1 : start
step 2 : input number
step 3 : rem=number mod 2
step 4 : if rem=0 then
            print "number even"
            else
               print "number
            odd"endif
step 5 : stop
```

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FLOWCHART

Flowchart is a diagrammatic representation of an algorithm. Flowchart is very helpful in writing program and explaining program to other

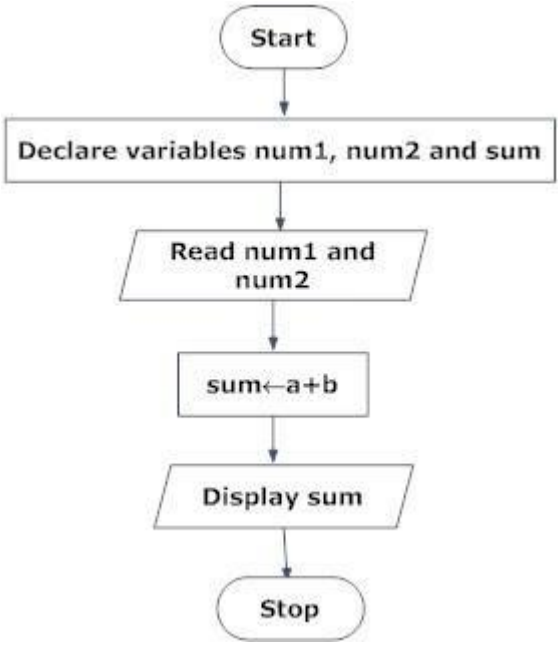
Symbols Used In Flowchart

Different symbols are used for different states in flowchart, For example: Input/Output and decision making has different symbols. The table below describes all the symbols that are used inmaking flowchart

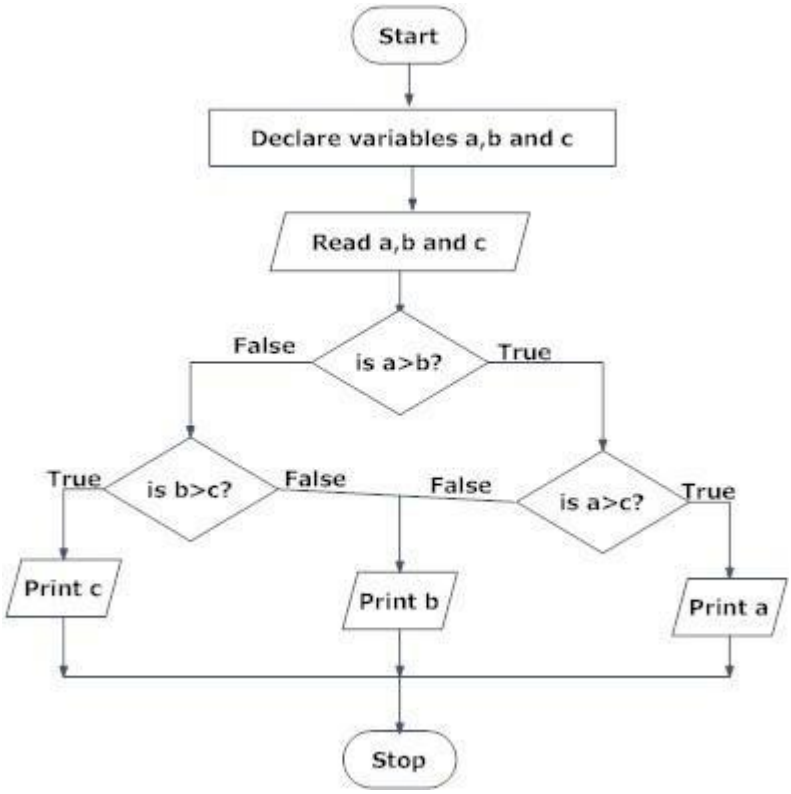
Symbol	Purpose	Description
	Flow line	Used to indicate the flow of logic by connecting symbols.
	Terminal(Stop/Start)	Used to represent start and end of flowchart.
	Input/Output	Used for input and output operation.
	Processing	Used for airthmetic operations and data-manipulations.
	Desicion	Used to represent the operation in which there are two alternatives, true and false.
	On-page Connector	Used to join different flowline
	Off-page Connector	Used to connect flowchart portion on different page.
	Predefined Process/Function	Used to represent a group of statements performing one processing task.

Examples of flowcharts in programming

Draw a flowchart to add two numbers entered by user.



Draw flowchart to find the largest among three different numbers entered by user.



Example program :

**

*simple HelloButtoon () method.

*@version1.0

*@author john doe <doe.j@example.com>

*/

```
Hello*Button()

{

JButtoon hello=new JButton(“Hello, wor

hello.addActionListener(new HelloBtnList

//use the Jframe type until support for t

//new component is finished

JFrame frame=new JFrame (“Hello Button”

Container frame pane = frame.getcontent pane();

Pane.add(hello);

Frame.pack();

Frame.show();                    //display the frame

}
```