

# Computer Generations, Types, Speed, Binary Numbers

## Characteristics of a Computer:

The computer has the following characteristics:

### ( 1 ) Speed :

The computers main characteristic is a speed i.e. the calculations per seconds. Computer is capable of doing million of calculations per second.

### ( 2 ) Accuracy:

Computers are highly accurate. They do given task very accurately. The term 'Computer error' is more of 'Human error' as the computer carry out the users instructions. If the data and instructions given to the computer is faulty, there will be errors in the computer's output.

### ( 3 ) Diligence:

Human beings generally tire after a couple of hours of work and tend to make mistakes. A computer is free from tiredness, lack of concentration, fatigue etc.

### ( 4 ) Storage:

Computer can store a large amount of data and instructions. This data can be stored in the primary memory ( around 2 to 8 GB) or in secondary memory ( hard disk, blue ray, DVDs, pen drives).

### ( 5 ) Versatility:

Even though the computer has no brain of its own and it follows user's instructions, it is versatile in doing ( performing) arithmetic calculations, logical comparisons, moving data within various sections of the computer and in input and output operations. Computers can be used for home uses, for business tasks, weather forecasting, space explorations, teaching, railways, banking, medicine etc.

### ( 6 ) Automation:

Computer is an automatic machine. It capable of receiving instructions in advance, store them and on user's message, to execute them (without users intervention).

## Basic Components of the Digital Computer:

A computer can receive ( or read) data in the binary form. It process data, pictures, sound and graphics. They can solve complicated problems and display the results / outputs.

The following are the components of the digital computer:

( 1) Central Processing Unit ( CPU) ( 2)Memory Unit ( 3)Input Unit (4) Output Unit

### ( 1 ) Central Processing Unit ( CPU) :

The CPU consists ( A) Control Unit and ( B)ALU

#### ( A) Control Unit :

It controls all the other units of the computer. It controls the flow of data and instructions from the memory to the ALU and flow of processed results back to the memory or output device. Hence it is called the central nervous system of the computer.

#### ( B) Arithmetic and Logical Unit (ALU):

ALU performs the following tasks:

i ) Arithmetic calculations like addition, subtraction, multiplications, division and exponentiation take place in ALU.

ii ) Logical Operations like >, <, = etc. using AND, OR, NOT are carried out in ALU.

iii )Increment, decrement, shift and clearance operations are also carried out in ALU.

### ( 2 ) Memory or Storage Unit:

Computer memory consists of a set of chips whose function is to store the data and

instructions in coded form. The data storage may be temporarily or permanently.

Units of Measure of Computer Memory :

The smallest units of memory is called as a **BIT**. (value either 0 or 1 called binary digits)

1 BIT	Binary Digit (either 1 or 0)
8 bits	1 Byte
1024 Bytes	1 Kilobytes (KB)
1024 Kilobytes	1 Megabytes (MB)
1024 Megabytes	1 Gigabytes (GB)
1024 Gigabytes	1 Terabytes (TB)
1024 Terabytes	1 Petabytes
1024 Petabytes	1 Exabytes
1024 Exabytes	1 Zettabytes
1024 Zettabytes	1 Yottabytes
1024 Yottabytes	1 Brontobytes
1024 Brontobytes	1 Geopbyte

The memory can be classified into two categories:

[1] Primary memory and [2] Secondary memory.

**[ 1] Main or Primary Memory:**

The primary memory consists :

( a) **RAM** ( Random Access Memory) :

It holds the data and programs that is being currently processed. It is called temporary memory ( volatile), because its contents will be lost when electric power to the computer is cut off.

( b) **ROM** ( Read Only Memory) :

The programs stored in ROM are permanent and are not lost or erased when the current is switched off.

**[ 2] Secondary or Auxiliary Memory :**

The most important kinds of secondary memory are:

(A) Hard disks (B)Solid State Storage. (C)Optical Disks

**( A) Hard Disk :**

They are used to store large data files and software ( programs). Data is stored on rigid metallic platters using a magnetic charge. Read / Write heads moves over the platters to read and write the data. Storage capacity ranges from 500 GB to 1 TB or more.

**( B) Solid State Storage:**

They have less power on moving parts and are more reliable. They are of two types:

( i) Flash Memory cards ( ii) USB Flash Drives.

**( i) Flash Memory cards :**

They are electronic flash memory data storage device. They are used to store digital information and used in mobile phones, camera etc. They are re-recordable and retain data even without power.



Flash Memory Card



USB Flash Drives

**( ii) USB Flash Drives:**

USB flash drives are removable and rewritable. They are smaller, faster, more capacity transportable, more durable and reliable. Capacity ranges from 2 GB to 64 GB. They are also called as Pen Drives.

**( C) Optical Disks:**

They are round in shape, single sided and use lesser technology. They are of three types, compact disk (CD), digital versatile disk (DVD) and high definition disks (hi def).

Blue- ray is the newest high definition optical format. Developed by Sony, Blue ray disk offer 25GB per layer with upto 2 layers per disk ( i.e. upto 50 GB per disk).

**( 3) Input Unit:**

The main function of the input unit is to accept / receive the data from the user.

The most common devices are:

- ( a) **keyboard:** Which accepts letters, numbers and commands.
- ( b) **Mouse :** Permits selection of options from on screen menu by using the mouse. ( pointing device)
- ( c)**Touch pad:** The movement of a finger on a small surface controls the cursor.
- ( d) **Joysticks:** It is a pointing device used for playing games.
- ( e)**Touch screen :** Allows input by touching options displayed on the screen.
- ( f) **Stylus Pen :** Used with PDA's
- ( g) **Scanners:** Where documents, pictures, graphics can be captured and stored.
- ( h) **Voice recognition Device:** permits voice input to computers.

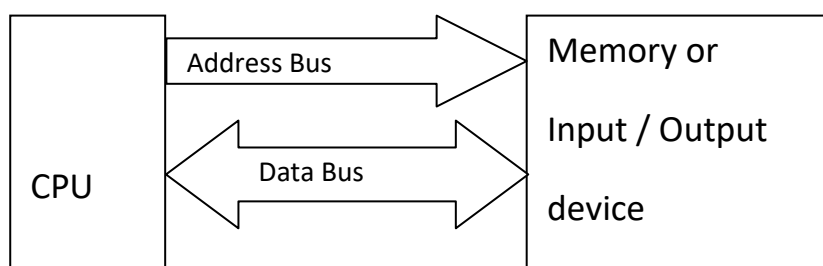
**( 4) Output Unit**

The main function of this unit is to display the data or outputs. The computer sends information to the output device in binary form. The output device converts it into the form which is suitable to the user. This output can be obtained in the form of hard copy ( printed) or soft copy ( view on the screen). Also we can store this output on the secondary storage device. The output devices are:

- ( a)**Monitors:** They allow viewing of soft copy of the output on the screen.
- ( b)**Printers:** They give a hard copy (printed) of the output.

**Memory Addressing Capability of CPU:**

The CPU is connected to the memory and Input / Output devices by a group of lines, which is called a bus. These lines are able to carry information and are of three types, Address Bus, Data Bus and Control Bus. The address bus is unidirectional and carries the address of an Input / Output device or memory location that has to be address by the CPU. This enables the CPU to address that location. The Data and Control bus are bidirectional, which enables data to flow in either direction, from VPU to memory or input / output device or vice versa.





The memory addressing capability of the CPU depends on the number of lines in the Address Bus i.e. width of Address Bus. If the address bus of the CPU is 2 bit wide, then it can address  $2^2 = 4$  memory locations. As in 1 memory location one byte of information can be stored, a CPU with 2 bit wide Address Bus can directly address 4 bytes of memory. Consider a CPU with 20 lines in its address bus. This CPU can then address 220 ( about 1 million) memory locations directly, which means about 1 MB memory.

**Decimal Number System**

This is most common numbering system which is used by us in our day to day work.

Symbols: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Base : 10, as there are 10 digits.

The units place is represented by  $10^0=1$ , the tens place by  $10^1=10$ , the hundreds place by  $10^2=100$  and so on.

The digit used to represent a number, carries a specific weight when used in a particular position. e.g. consider the number 459 which is  $400+50+9$ .

The third digit 4 is in hundreds place ( has weight 100) has a value  $4 \times 10^2=4 \times 100=400$ .

The second digit 5 is in the tens place ( has weight 10) has a value  $5 \times 10^1=50$

The first digit 9 is in the units place ( has weight 1) has a value  $9 \times 10^0=9 \times 1=9$

**Binary Number System:**

The binary number system uses only two digits 0 and 1, hence it is called as binary.

Symbols: 0, 1

Base: 2 as there are only 2 digits.

Binary Addition:

The following rules should be followed during binary addition.

Rules:

$0+0=0$

$1+0=1$

$0+1=1$

$1+1=0$  with carry of 1

$1+1+1=1$  with carry of 1

e.g. Add the binary numbers

( 1 )100 and 011

```

  1 0 0
+ 0 1 1
-----

```

1 1 1

(2) 101 and 001

```

  1 0 1
+ 0 0 1
-----

```

1 1 0 (as  $1+1=0$  with carry of 1)

(3) 1011 and 1001

```

  1 0 1 1
+ 1 0 0 1
-----

```

1 0 1 1 0            ( as 1+1 =0with carry of 1 and 1+1+1 with carry of 1)

## Question Bank

### Q.1 Select an appropriate option from the following:

- (14) 1 Terabyte is equal to ---- Gigabytes. ( 1024)
- (15) Blue-ray disks offer --- GB per layer with upto 2 layers per disk.( 25)
- (16) The decimal number system has a base of ---- . (10)
- (17) The binary number system has a base of ---- . (2)

### Q.2 State whether the following statements are true or false:

- (8) A tablet is generally equipped with a camera, Wi-Fi capabilities and also has a cellular network data connection. (T)
- (9) Apple iPad which uses the operating system Apple's iOS. (T)
- (10) 1024 megabytes = 1 Terabyte (F)

### Q.3 Answer the following: ( 6 marks)

- (4) Write short note on : CPU
- ( 5) Write short note on : Memory Unit
- (6) Write short note on : (i) Binary Number System (ii) Input Unit.
- (7) Write short note on : (i)Decimal Number System (ii) Output Unit