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# Computer Application Theory

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## CHAPTER 2

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### *Computer Organization*

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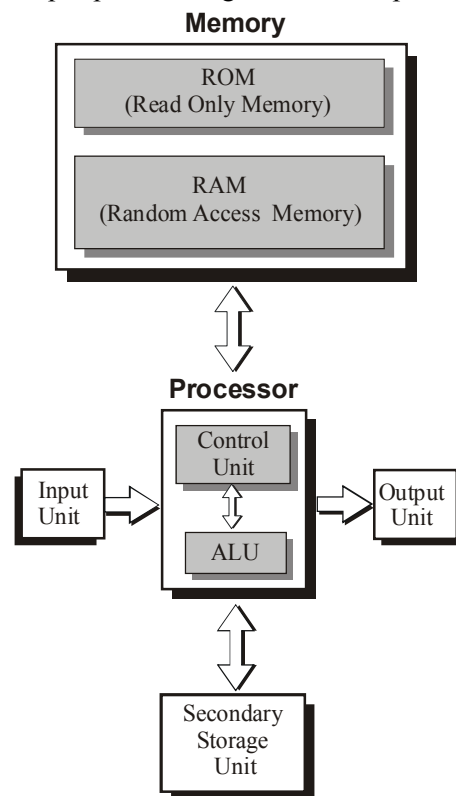
Computer is electronic equipment. It is mainly used for automating manual tasks. Using computer you can perform tasks quickly, effectively and in error free manner. Be it any organization, office, factory or institution, you can find people making use of computer there. In offices, computers are used for preparing letters, documents and reports. In hotels, computers are used for advance booking of rooms, preparing bills and providing enquiry services. In railways, computers are used for rail reservation, printing of tickets and preparation of reservation charts. Doctors use computers for diagnosing illness and treatment of deceases. Architects use them for map designing and city planning. In meteorology department, computers are used for weather forecasting. In short you can say that there is hardly any sphere of life left now, in which computers are not being used. What computer is, what are its main units, how does it function are the issues, which are described in this chapter.

#### **BASIC COMPONENTS OF DIGITAL COMPUTER**

As you know, computer is an electronic device, it comprises of many units. These units work in coordination with each other to perform the given task. Block diagram of computer is shown in figure 2.1.

Refer this figure and note that computer comprises of following units:

1. Input Unit
2. Output Unit



**Figure 2.1**

3. Input/Output Unit
4. Central Processing Unit
  - (a) Memory Unit
  - (b) ALU
  - (c) Control Unit

Physically these units exist in the form of electronic devices in computer. Each unit performs its own function, in co-ordination with other devices and thus computer performs the given task. What is the role of each unit and in what form do they physically exist, is explained below.

## INPUT UNITS

The role of input unit in computer is to provide means for supplying data or instructions to the computer. In other words, you can say that what you supply to the computer for processing is supplied through input unit. For example, if you wish to calculate simple interest on Rs. 10,000, @ 7% for 5 years then the data 10,000, 7, 5% etc. and the instructions for calculating the simple interest will have to be given to the computer, through input unit.

All those devices, using which input is provided to the computer are termed as input units. Following are few commonly used input units that can be found attached with almost every computer.

### Keyboard

Keyboard consists of many keys. Keys have alphabets, numbers, characters or words written on them. Keyboard is illustrated in figure 2.2.

When keyboard is connected to the computer, a blinking sign (| or –) appears on the monitor. This sign is called cursor. When you press an alphabet or number key, the character written on the key gets typed at current cursor position and the cursor moves forward.



**Figure 2.2**

### Keys

Keys of the keyboard are broadly classified into following categories:

- Alphabet keys
- Number keys
- Special character keys
- Function keys
- Cursor keys
- Action keys

**Alphabet Keys**

Alphabet keys have alphabets, from A to Z, written on them. By pressing these keys, you can type alphabets, words, sentences etc. in lower case. For example, when you press 'A' key, 'a' gets typed. To type the alphabet in upper case, you need to press Shift key along with the alphabet key. For example, if you press 'A' key along with Shift key, letter 'A' gets typed.

**Number Keys**

Number keys have digits, from 0 to 9, written on them. These keys are used for typing the numbers. Note that each number key also has a special character written just above the number. To type this character, you will have to press the number key along with the Shift key. For example, number 5 key has % sign marked on it. When you press number 5 key, 5 will get typed. If you press the same key, along with Shift key % sign will get typed.

**Special Character Keys**

Few keys of the keyboard have special characters like semicolon (;), comma (,), dot (.) etc. marked on them. Such keys are called special character keys. When you press special character key, character marked on it gets typed at current cursor position.

**Function Keys**

There are 12 function keys present on the keyboard. They are named as F1, F2, F3 .....F12. When you press these keys they perform special functions.

**Cursor Keys**

Four cursor keys are there on the keyboard. They are marked with arrows on them, pointing in four different directions. Using cursor keys, you can move the cursor from one place to another.

**Action Keys**

Keyboard has many action keys. When you press an action key, a special event takes place. Most commonly used action keys of the keyboard are described below.

**Caps Lock Key**

When you press this key, capital lock becomes on. When you press an alphabet key, while capital lock is on, the letter written on it gets typed in upper case.

**Shift Key**

Shift key is always pressed along with other keys. When you press this key along with number key then the symbol written on upper part of the key gets typed. When you press Shift key along with alphabet key then the alphabet gets typed in upper case.

**Enter Key**

Enter key is used to start a new line. When you press this key; cursor comes to the next line. Whatever you type now, gets typed in the next line.

### **Space Bar**

This key is used to put blank spaces between the two characters.

### **DEL Key**

This key is used to rub a character from current cursor position.

### **Backspace Key**

This key removes one character from the left side of the cursor.

### **Insert Key**

This key is used to insert characters in between the two characters, which have already been typed.

### **Page Keys**

There are two page keys on the keyboard, named as PgDn (i.e. Page Down) and PgUp (i.e. Page Up). When you press PgUp key, previous page gets displayed on the screen. When you press PgDn key, next page gets displayed on the screen.

### **Tab Key**

This key is used for making the cursor jump in forward direction, by many places.

### **ESC Key**

This key is called Escape key. Currently on-going activity gets cancelled when this key is pressed.

## **Mouse**

Mouse is an input device. It is shown in figure 2.3. It looks like a real mouse with few buttons placed on its back. When mouse is connected to the computer, an arrow sign appears on the monitor screen. This sign is called Mouse Pointer.



**Figure 2.3**

When you move the mouse on plane surface, mouse pointer also moves in the same direction. Thus by moving the mouse, you can make the mouse pointer point to anything present on the screen. After pointing the mouse on any desired object, following actions can be performed:

**Clicking The Mouse**

Pressing the left button of the mouse and releasing it is called clicking the mouse.

**Double Clicking The Mouse**

Pressing the left button of the mouse twice, in quick succession, is called double clicking the mouse.

**Dragging The Mouse**

Moving the mouse, with its left button pressed is called dragging the mouse.

**Dropping**

Moving the finger away from the mouse after dragging it is called dropping.

**CD-ROM Drive**

CD is acronym for Compact Disk. It works as a medium for storing data or instructions. It looks like circular plastic disk. Huge amount of data can be stored on CD. For example, single CD can hold personal data of all the students studying in a college.

CD-ROM drive is an input unit that reads data from CD. As the name indicates, CD-ROM (Compact Disk Read Only Memory) can only read the data from CD, it cannot write on it. CD and CD-ROM drive are shown in figure 2.4.



**Figure 2.4.**

**Other Input Units Of Computer**

Microphone, Barcode Reader, Magnetic Ink Character Reader (MICR), Joystick, Touchpad, T Mouse, Light Pen, Touch Screen, Scanner etc. are other input devices.

**OUTPUT UNIT**

The role of output unit is to show the result of processing. In other words, you can say that computer displays all the results on its output unit. For example, if you are calculating simple interest on computer, it will display the interest amount on its output unit. Following are few commonly used output units of computer.

## VDU

VDU is acronym for Visual Display Unit. It looks like portable TV. VDU is shown in figure 2.5. It is primarily used for following two purposes:

- ❑ To display the contents that are being typed through keyboard.
- ❑ To display the result of processing (output).



**Figure 2.5**

## Printer

Printer is an output device. It prints the output on paper. Different types of printers print differently. Their quality and speed of printing differ from each other. Following are different types of printers, which are being commonly used these days:

1. Dot Matrix Printer
2. Inkjet Printer
3. Laser Printer

### Dot Matrix Printers

These printers are very versatile printers and derive their name "Dot Matrix" from the fact that they print the characters making dots. Pins of the printer print these dots so close to each other that the gap between them is hardly visible. Viewer gets an impression of full continuity. These printers are versatile printers and are capable of printing not only text, but up to some extent graphics also. They are relatively fast printers and their speed varies from 300 Character Per Second (CPS) to 600 CPS.

### Inkjet Printers

For printing the characters and drawings, inkjet printers make use of colored inks. They use Cyan, Magenta, Yellow and Black inks. Using these four basic colors, inkjet printers generate all other colors. These printers are very popular due to their high quality and low cost.

### Laser Printers

These are high quality, high speed and high cost printers. In such type of printers, printing is done, using laser beam and black magnetic powder, called Toner. Speed of these printers can range from 10 pages per minute to about 200 pages per minute. They cost much higher than dot matrix and inkjet printers. All the three types of printer are shown in figure 2.6.



**Dot Matrix Printer**



**Inkjet Printer**



**Laser Printer**

**Figure 2.6**

## Other Input Units Of Computer

Plotter, Web Camera, Digital Camera, Speakers, etc. are few other output devices.

## INPUT/OUTPUT UNITS

As you know, input units provide means for supplying data or instructions to the computer, while output units provide mechanism for displaying the results. While making use of them data, instructions or results involved in this process do not get retained permanently in computer. They get erased when computer is switched off. If you need them again, process has to be repeated. On contrary to this, Input/Output units serve the purpose of both i.e. input unit and output unit as well. They retain the data/result permanently. Whenever required, the data, instructions or results can be written on them. Later, as and when required, they can be read from there.

All such units, which provide means for storing the data, instructions or results permanently, are called input/output units. Following types of Input/Output units are commonly used in computer.

### Floppy Drive

Floppy drive is an Input/Output unit. It is basically an assembly, in which you put the floppy, close its door and then perform read / write operations on the floppy. For analogy, you can think of tape recorder's cassette housing assembly, in which you put the cassette, close the door and then perform read / write operations on the cassette. Similarly you either write the data on the floppy or read the data from the floppy. Whatever you write on floppy, it gets permanently stored there, until you delete it yourself or mishandle the floppy. Floppy and floppy drive are shown in figure 2.7.

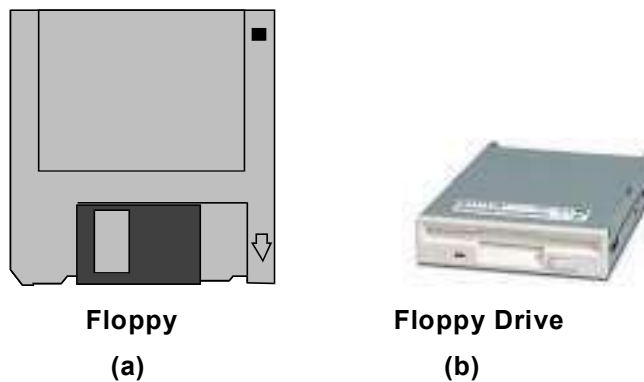


Figure 2.7

Floppy is basically a data storage medium, on which you record the data or programs to read them later. Floppy consists of flexible plastic coated with magnetic material iron oxide. This plastic is enclosed in a thick black gasket cover, which protects it from heat, dust, sun etc. Most commonly used floppies are of 3 ½" size.

## Hard Disk

Hard disk is another unit, which stores the data permanently in computer. Externally it looks like a box and remains fixed within computer chassis. Its internal composition is shown in figure 2.8.

Refer this figure and note that hard disk consists of multiple dish like units, on which the data is stored. These dishes are called platters. Each platter has a corresponding read-write head.

Read-write heads write the data or instructions on the platters. Thus they get permanently stored there.

Note that floppy and hard disk both are used for storing data but the capacity of the hard disk is generally many times more than that of a floppy. Floppy is a removable storage medium while hard disk is a fixed medium.

## CD-Writer

CD writer is another Input/Output device, which stores data, instructions, results etc. permanently on medium called CD-R and CD-R/W.

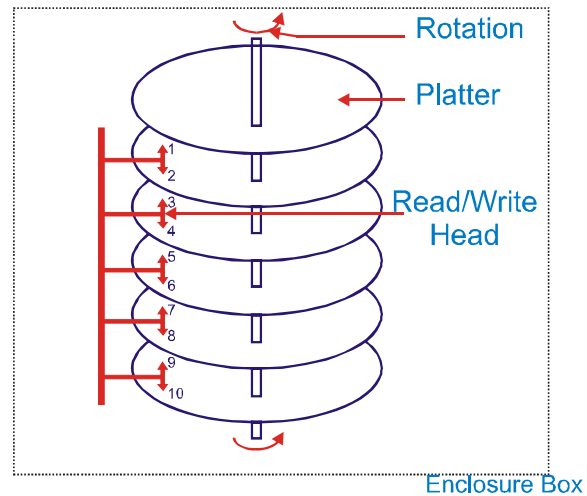


Figure 2.8

## CD-R

CD-R is acronym for Compact- Disk Readable. It resembles CD, on which data can be written. Data is written on CD-R through a device called CD Writer. CD-R looks like CD but its internal composition remains different. But note that data can only be written once on CD-R but not again and again.

## CD-R/W

CD-R/W is acronym for Compact Disk Re-Writeable. It looks similar to CD-R but data can be written multiple times on it. If you wish, you could write data on it, read data from it and erase the data as many times as required. CD-Writer and CD-R are shown in figure 2.9.

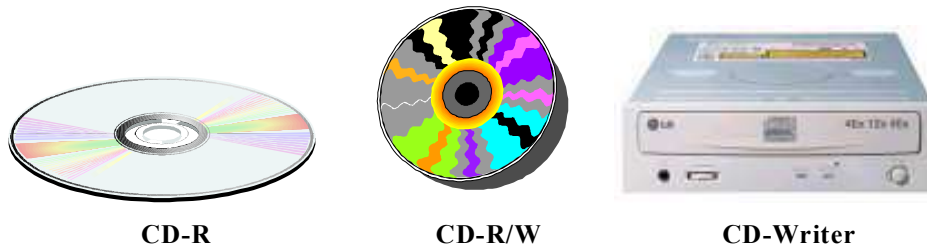


Figure 2.9



## Magnetic Tape Drive

Magnetic tape drive is another input/output unit, which is used for storing the data permanently. It accesses the data sequentially. Using this unit, data is recorded on magnetic tapes. Magnetic tape drive in its appearance looks like older spool based tape records. Its block diagram is illustrated in figure 2.10.

In magnetic tape drive, magnetic tape from feeder spool passes below the Read/Write head and remains tied in other spool.

When magnetic tape drive is switched on and instructions for writing the data are given, the spool on the right hand side rotates. Thus the tape moves forward. Read/Write head records the data on moving tape.

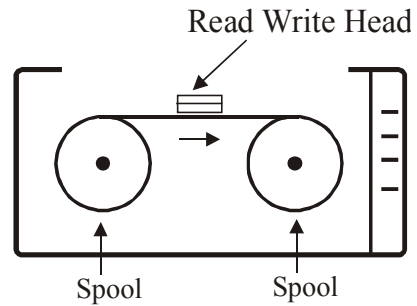


Figure 2.10

To record the data properly on tape, it is necessary that magnetic tape should always remain in stretched position. While the spools move or stop, tape should not get loose. If it so happens, data will not get recorded properly and will produce garbage, when read. Generally two techniques are used to keep the tape stretched. They are as follows:

1. Tension arm
2. Vacuum column.

In tension arm technique, tape is kept stretched, with the help of mechanical arms while in vacuum column technique tape is kept stretched by creating vacuum. Those tape drives, which use tension arm technique, are called tension arm tape drives. Those tape drives, which use vacuum technique, are called vacuum column tape drives.

## Magnetic Tape

Magnetic tape is a medium to record the data. Generally it is 12.5 mm. to 25 mm wide and 500 meters to 1200 meters in length. It is made of magnetic material coated plastic. When the tape passes below read/write head, it creates magnetic waves and writes data on the tape. Note that data does not get continuously written on the tape. It gets recorded in blocks. There remains a gap (blank space) between the two blocks. This block is called Inter Block Gap or IBG in short. The way data gets stored on the tape, is illustrated in figure 2.11.

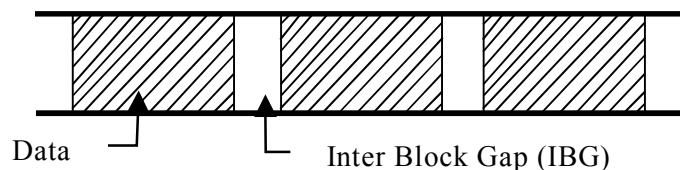


Figure 2.11

## Magnetic Cartridge Tape Drive

Like magnetic tape drive, magnetic cartridge tape drive is also an Input/Output unit, which records the data on tape. Cartridge tape drives are much smaller in size than magnetic tape drives. They do not store the data on spool tapes. They store it on cartridge tapes. Cartridge tape resembles small video tape that is used in handy cams. The shape of cartridge tape is shown in figure 2.12.

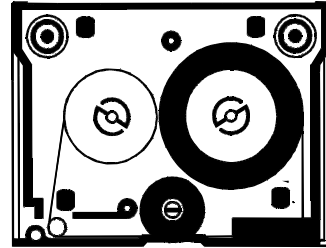


Figure 2.12

## CENTRAL PROCESSING UNIT

Refer figure 2.1 and note that three units viz. Memory, ALU and Control Unit put together are referred to as Central Processing Unit or CPU in short. Role of each unit is explained below.

### Memory

Memory holds data, instruction or results temporarily. For example, when you give instructions to the computer to compute simple interest on Rs. 10,000, @ 7% for 3 years, this data and instructions come into computer from any of the input or Input/output devices and get stored in memory. Similarly result (simple interest in this example) also gets stored in memory. In other words, you can say that the unit, which holds data, instructions or results in it, is called memory.

### Types Of Memory

Depending upon the nature and behavior of memory, computer memories could be categorized into following categories:

1. Primary Memory
2. Cache Memory

Characteristic behavior of each type of memory is described below.

### Primary Memory

That memory, which is utilized by the computer for its internal functioning, is called primary memory. Since it plays an important role in internal functioning of computer hence it is often referred to as internal memory. Primary memory is further categorized into two categories:

1. Read Only Memory (ROM)
2. Random Access Memory (RAM)

### Read Only Memory (ROM)

This memory by its nature is quite special. Computer cannot write data in it. Using special devices, such as ROM programmer, instructions are written in it. Once instructions are written in it, it is put inside the computer. As and when required, computer reads instructions from it. Since data can only be read from it hence it is called Read Only

Memory or ROM in short. ROM physically exists in the form of blank electronic chip, in which programs or data are written, using special devices. Those ROMs, in which data once written, cannot be erased by any means are called Programmable Read Only Memory or PROM in short. Other type of ROM, in which data is written or erased, using ultraviolet rays is called Erasable Programmable Read Only Memory or EPROM in short.

### Random Access Memory

In short, Random Access Memory is called RAM. It differs from ROM in nature. It provides both, reading and writing facilities. As and when required, computer writes data or instructions in it and reads them whenever necessary. This is the reason why they are also called Read/Write memory.

Note that whatever data or instructions are given to the computer for processing, computer writes them in RAM. As and when required, it reads them from there and processes them to generate the result. Computer first writes all the results in RAM and then whenever necessary, it transfers them to output unit.

The data written in Random Access Memory remains there till the time computer power is on. As soon as the power goes off, data written in RAM gets erased. This is the reason why they are also called Temporary memory.

### Cache Memory

In cache memory reading and writing operations take place at very fast speed but it costs very high. When it is introduced into computer, it increases its speed and cost also. For best cost-performance ratio, sufficient amount of cache memory (less than the size of RAM) is introduced in the computer, in between the processor and Random Access Memory, as shown in figure 2.13.

First time, when computer requires data/instructions/results from RAM, it reads them from there. But at the same time, many more of them are read and put in cache memory. Next time, whenever computer requires something from RAM, it reads it from cache memory. Since the speed of cache memory is faster than RAM hence reading is done in much shorter time. When computer doesn't get the required item in cache memory, it goes back to RAM and reads it from there along with many more items. The whole mechanism of reading and writing, in computers, is implemented in such a way that most of the time required items are found in cache memory. On the other hand, if computer has to write the data in RAM, it writes it in cache memory, from where it is transferred to RAM.

Thus cache memory improves the speed of computer. In short, it can be said that the memory, which is introduced in the computer with objective of increasing its speed, is called cache memory.

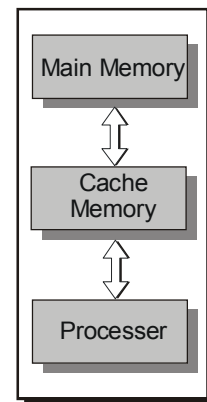


Figure 2.13

### Arithmetic & Logic Unit - ALU

ALU is acronym for Arithmetic and Logic Unit. It performs arithmetic and logical calculations in computer. Recall that calculations like, addition, subtraction, multiplication

division etc. fall into the category of arithmetic calculations. Operations like  $a > b$ ,  $c >= d$  etc. are logical operations. In computer terminology, the activity of performing arithmetic and logical calculations is called processing. In other words it can be said that in computer ALU performs data processing.

### **Control Unit**

While computer functions, data moves from one unit to another unit. For example, when you give input to computer, data and instructions move from input unit to memory. When data is processed, it moves from memory to ALU. Similarly when processing is over, results move from ALU to memory and memory to output unit. Now the question is which part of computer organizes data movement within the computer? Well, Control Unit is the main unit, which performs traffic police like task. It ensures movement of right data from right source, to right destination at right time so that all the units of computer perform their functions in coordination with each other.

## **CHARACTERISTICS OF COMPUTER**

Following are the characteristics of computer:

1. Computers are basically dumb devices. They cannot perform any function on their own. For doing anything on computer, you have to give instructions to them. Generally these instructions are written in computer language and are given from the keyboard.
2. Computer performs the tasks according to the instructions provided by the user. In other words, you can say that the correctness of output depends upon the correctness of the data and the instructions provided by the user. For example, if you add two numbers 70 and 30, the result could be 40 in case you have given wrong instruction i.e. subtraction instead of addition.
3. The speed, with which a computer performs a task is much faster than manual speed. As a result of which, computers are widely used for performing those tasks, in which speed is of prime importance.
4. Computer can perform a task with the same speed for several days without getting tired. This is not possible in case of manual activities. Human beings get tired after sometime and the chances of making mistakes start getting high as the time passes by. So you can say that computers are capable of performing error free tasks efficiently for the duration, which is beyond human capabilities.

## **SUMMARY**

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*Computer is basically an electronic device. It is mainly used for data processing. Computer comprises of many devices. Its block diagram is shown in figure 2.1.*

*All those devices, using which data or instructions are provided to the computer are called*

*input units. Keyboard, Mouse, CD-ROM drive etc. are common input devices.*

*All those devices of computer, using which it provides result of processing to us are called output devices. VDU, printer etc. are common output devices.*

*Those devices of computer, on which it stores data permanently so that it could be read later, are called input / output devices. They are called so because they serve the purpose of input and output devices, both. Floppy drive, Hard disk, Magnetic tape drive, Cartridge tape drive, CD-Writer etc. are few examples of Input / Output devices. Since these devices are used for storing bulk data hence they are also called bulk storage devices or secondary storage devices. The medium, on which they store data / information are called permanent memory. For example, floppy drive stores data on floppy. Floppy is often referred to as permanent memory.*

*Those units, in which computer holds data for some time are called memory. Depending upon the nature and behavior of memory, computer memories are categorized into following categories:*

- 1. Primary Memory*
- 2. Cache Memory*

*That memory, which is utilized by the computer for its internal functioning, is called primary memory. It is further categorized into two categories:*

- 1. Read Only Memory (ROM)*
- 2. Random Access Memory (RAM)*

*That memory, in which computer performs only read operations is called Read Only Memory. Computer can't write in this memory.*

*That memory, in which computer performs read and write operations randomly is called Random Access Memory.*

*Cache memory is fast memory. Its basic objective is to increase the speed of computer. It is placed in between processor and RAM. If it remains present in computer, computer performs all its read write operations in it, instead of performing in RAM. Later whatever is written in it is transferred to RAM. Cache memory makes computer read write operations very fast.*

*Arithmetic and Logic Unit (ALU) of computer performs all arithmetic and logical operations.*

*Control Unit of computer ensures movement of right data from right source, to right destination at right time so that all the units of computer perform their functions in coordination with each other.*

*Computers are basically dumb devices. They perform the tasks according to the instructions given to them by the user. Their working capabilities are much beyond the capabilities of human beings. They can perform a task at very fast speed for long durations without making any mistake.*

**Short Type Questions****A. Select most appropriate answer for following questions:**

1. Which type of device, a computer is?  
(a) Mechanical            (b) Electrical                            (c) Magnetic    (d) Electronic
2. Which part of computer stores data temporarily?  
(a) RAM                      (b) ALU                                      (c) CU              (d) CPU
3. Which of the following device will be used for displaying the result?  
(a) Keyboard                (b) ALU                                      (c) VDU            (d) Mouse
4. Which of the following can be used for storing the data permanently?  
(a) RAM                      (b) Hard disk                                (c) Mouse        (d) VDU
5. Which of the following is an example of software?  
(a) Mouse                      (b) Memory    (c) Operating System                      (d) Printer
6. Which of the following is purely an input device?  
(a) Mouse                      (b) Floppy        (c) Hard disk                                      (d) Printer
7. Which of the following is an not an input/output device?  
(a) Hard disk                      (b) Floppy drive  
(c) CD-ROM drive            (d) Magnetic tape drive
8. Which of the following is used for increasing the speed of read write operations in computer ?  
(a) RAM                      (b) ROM            (c) Cache memory            (d) Bulk memory
9. Which of the following unit performs all calculations in computer?  
(a) ALU                      (b) Memory    (c) Control Unit                                (d) Keyboard
10. Which of the following is sequential storage device?  
(a) Hard disk                      (b) Magnetic tape drive  
(c) CD-ROM drive            (d) Floppy drive

**B. Fill in the blanks:**

11. RAM is acronym for .....
12. ROM is acronym for .....
13. PROM is acronym for .....
14. CU is acronym for .....
15. ALU is acronym for .....

16. Those devices, using which data is provided to the computer are called ..... devices.
17. .... is an example of input device.
18. .... stores data on metallic platters.
19. Floppy drive stores data on ..... permanently.
20. .... is an example of secondary storage device.
21. Cache memory in computer is placed in between ..... and .....

**C. State, true or false for following statements:**

22. Keyboard is the main input unit for computer.
23. Floppy drive is an output device.
24. Data, instructions or results can be permanently stored on hard disk.
25. In computer, Control Unit performs all arithmetic and logical operations.
26. ROM programmers are the special devices that are used for writing data in Random Access Memory.
27. Mouse is a pointing device.
28. Drag and drop operations are generally done using keyboard.
29. Speed of RAM is always faster than cache memory speed.
30. Contents can always be written in ROM but not read from it.
31. Computer cannot work without instructions.

**D. Differentiate between the following:**

32. Input and output units of computer.
33. RAM and ROM.
34. Secondary memory and cache memory.
35. Tension arm tape drive and vacuum column tape drive.
36. Magnetic tape drive and cartridge tape drive
37. Dot matrix printers and inkjet printers.
38. Floppy and CD.
39. Arithmetic operations and logical operations.
40. CD-R and CD-R/W.
41. CD ROM drive and CD Writer.

**Detailed Answer Type Questions**

**E. Answer the following questions in detail:**

42. What is computer? For what purpose it is used?
43. Name any three places, where computers can be used?
44. Draw a block diagram of computer and label its component.

45. Describe the role of keyboard and mouse in computer? What are the fundamental similarity and differences between them?
46. Name any two output devices.
47. What is the role of memory in computer? Name any two medium, which serve the purpose of permanent memory.
48. What do you understand by logical operations? Which part of computer performs arithmetic and logical operations?
49. Describe characteristics of computer.
50. What is cache memory? What is its purpose in computer?
51. Describe the functioning of cache memory in computer?
52. Describe the way magnetic tape drive stores data on magnetic tapes.
53. Describe the role ALU in computer?
54. Describe the role of Control Unit in computer.

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