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Q1. (a) In your opinion what are the 3 most important characteristics of computers, Explain each characteristic?

Following are the three most important characteristic of computers.

1. Automatic

Computers can work automatically without any human intervention. All that a human has to do is just to input data and the computers will do the rest by itself. This is probably the most important characteristic of computers.

2. Speed

Computers can perform data processing very fast usually measured in micro seconds (10), nano seconds (10<sup>-9</sup>), pico seconds (10<sup>-12</sup>)

3. Accuracy

Accuracy of a computer is steadily high and the degree of its accuracy depends upon its design. Computer errors caused due to incorrect input data or unreliable programs are often referred to as garbage-in-garbage out (GIGO)

(b) Write key characteristics of fourth generation of computers?

This period consists of computers made in 1975-1989. Key hardware technologies were ICs with VLSI technology, microprocessors, semi conductor memory, large capacity hard disks as in-built secondary storage, magnetic tapes and floppy disks as portable storage media, personal computers, super computers based on parallel vector processing and symmetric multi processing technologies.

Key software technologies were operating systems for PCs with GUI and multiple windows on a single terminal screen. It also included multi processing, OS with concurrent programming languages.

These computers were small, affordable, reliable and easy to use. These were more powerful and reliable mainframe systems and supercomputers.

Examples are IBM PC and its clones, Apple II, TRS-80, VAX-9000, CRAY I, CRAY II, CRAY-X/MP.

Q2. (a) Discuss the importance of Arithmetic logic unit and Control unit of a computer system?

An arithmetic logic unit (ALU) is a combinational digital electronic circuit that executes arithmetic and bitwise operations on integer binary numbers. This is in contrary to a floating-point unit (FPU), which does operation on floating point numbers. An ALU is a basic building block of several types of computing circuits, which includes central processing unit (CPU) of computers, FPUs, and graphics processing units (GPUs). A single CPU, FPU or GPU may contain multiple ALUs.

The inputs to an ALU are the data to be operated on are called operands, and a code indicating the operation to be performed. The ALU's output is the result of the performed operation.

A control unit coordinates how data moves around a CPU. The control unit (CU) is a component of a computer's central processing unit (CPU) that directs operation of the processor. It tells the computer's memory, arithmetic/logic unit and input and output devices how to respond to a program's instructions.

The control unit obtains data / instructions from memory. It interprets / decodes the instructions into commands / signals. It controls transfer of instructions and data in the CPU. It also coordinates the parts of the CPU.

(b) Write a detailed note on importance of RAM (Random Access Memory)?

RAM is basically the core of computer. It is considered just as important as processor, or hard drive. With the right size of RAM on computer, the performance of PC and the ability to support various types of software is enhanced.

The overall performance of your computer depends on how well your CPU and RAM work together. The more RAM your CPU has, the easier its job becomes. If you do not have a right size of RAM than your CPU has to work a lot, much harder to transfer data, which severely damages the computer's performance.

Random access memory also supports your system support software. Every software requires a minimum amount of space and memory to be able to run smoothly. If your computer does not have enough RAM to support all the software systems you are running, or trying to run, they move so slow that it might not be worth running that software system. Moreover, if there is not enough storage room, the software might not run at all.

RAM is such a crucial element to how your computer functions that if one storage location out of a million is damaged your entire system can possibly crash.

Q3. Write a detailed note on Basic Organization of a computer System along with the functions of each part.

### **Basic Organization of a Computer System**

#### **Computer Memory**

Computer memory is the storage space in the computer, where data is processed and instructions required for processing are stored. • Each location has a unique address in memory.

#### **CPU Registers**

CPU Register or processor register is a rapidly accessible location available to a computer's CPU. It is fastest among all types of data storage.

### **Cache Memory**

It is used to hold those parts of data and program which are most frequently required to execute program. It uses less access time as compared to main memory, so it is faster than main memory. It is the portion of memory made of high speed RAM (SRAM). Cache memory has reduced capacity to store data widely used for Memory Caching. It works on the "Principle of Locality of Reference".

### **Random Access Memory (RAM)**

RAM is used to hold the program and data during computation i.e. it stores temporary data.

### **Read Only Memory (ROM)**

It is non-volatile in nature. Information can simply be read by the user but cannot be modified. It generally stores BIOS(Basic Input Output System)

### **Secondary Memory**

Communicates indirectly with CPU through main memory. So, It is slower than the main memory. It is non-volatile in nature. So, it store data permanently.

### **Processor**

The CPU is usually referred to as a Processor. The CPU is a computer chip located on the motherboard. It performs processing and control activities performed by different parts of computer. It is the main electronic circuitry in the computer. It carries out the instructions confined in a computer program by performing arithmetic, logical, control and input/output operations. Most modern CPUs are contained on a single Integrated Circuit (IC) chip and are called microprocessors. A processor can have two or more CPUs or independent processing units called "cores" on a single chip and such processor is called a multi-core processor.

### **Buses**

Electrical route that transfer data and instructions among different parts of computer. Main memory is directly/indirectly connected to the processor through a bus.

### **Clock**

Used to harmonizing the activities performed by the computer.

### **Software**

Set of computer programs which includes instructions, used for performing a particular task using hardware. Software tells hardware: what to do? How to do?

### **System Software**

System software is "Background" software that helps the computer manage its own internal resources. It enables the application software to interact with the computer hardware. Eg. Operating System, Device Drivers, Utility Software, Translators etc.

### **Application Software**

Collection of programs written for a specific application.

### **Operating System**

System software which helps in managing the resources of a computer. Its primary goal is to make computer convenient and efficient to use. E.g. MS-DOS, MS-Windows, UNIX, Linux, Mac OS etc...

### **Device Drivers**

System Software, responsible for proper functioning of devices. Each device has a device driver associated with it. Whenever computer system needs the use of device, the processor issues general commands to the driver of device. When you buy an operating system, many device drivers are built into the product. In Windows operating systems, a device driver file usually has a file name suffix of DLL or EXE

### **Utility Software**

Used to analyse, configure and maintain the computer system. Examples of utility programs are antivirus software, backup software and disk cleaners, clean up tools, defragmentation tool etc.

**Compiler**

The name compiler is primarily used for programs that translate source code from a high-level programming language to a lower level language (e.g., assembly language, object code, or machine code) to create an executable program. Compiler resides on a disk or other storage media, when a high-level program is to be compiled, compiler is loaded into main-memory.

**Interpreter**

Converted high-level language code into corresponding machine code. Instead of entire program, one statement at a time is translated and executed immediately.

**Linker/Link Editor/Binder**

In high-level language built-in library functions need to be linked to the library. This is done by Linker. Sometimes, programs are divided into modules. These modules are combined and assembled and object module is generated. Linker has the responsibility to combine / Link all modules and generate a single executable file of the source program.