

# **Week -4: Basic Computer Architecture & Academic Honesty**

## **Part 1:**

### **1.0 Types of Computer: Based on Size and Power**

Size wise computers can also be classified into four types-

- Super-computer
- Mainframe Computer
- Mini-computer
- Micro Computer/ Personal Computer

#### **1.1 Super computer:**

They are most expensive of all the computers. These computers are big general purpose computers capable of executing more than 10,000 million instruction per second and have storage capacities of millions of bits per chip. These computers are used to solve the multi-variate mathematical problems such as atomic nuclear and plasma physics seismology, aerodynamics etc.

Super computers are typically capable of handling hundreds of millions of floating points. Operations per second (MFLOPS). The speed of super computers generally measured in “FLOPS” (Floating Point Operations Per Second).

#### **Uses of Supercomputers**

Because of their superiority, supercomputers are not intended for your everyday tasks. They handle exhaustive scientific applications that require complex and real-time processing.

- In the field of science, researchers use these machines to compute and model properties of biological compounds like protein and human blood. They are also used to interpret new diseases and strains and predict illness behaviour and treatment.
- The military use supercomputers to test new aircraft, tanks, and a host of weaponry and camouflage. They also use them to understand the effects they will have on soldiers and wars. These machines are also used to help encrypt and decrypt sensitive data.
- In entertainment, supercomputers are used to help make a flawless online gaming experience. Games like *World of Warcraft* demand intense processing. When thousands of gamers around the world are playing, supercomputers help stabilize the game performance.
- Meteorologists use them to simulate weather behavior. They can also be used to predict earthquakes.
- Scientists use them to simulate and test the effects of nuclear weapon detonation.
- Scientists also use them to simulate the events of the Big Bang and other space related projects.

- Hollywood uses supercomputers to create realistic animations.
- The famous supercomputers Deep Blue and Watson defeated chess Grandmaster Gary Kasparov and quiz expert Ken Jennings respectively.

**Some super computers are** – Cray 1, Cray 2, Cray 3 perform 10 billions operation per second, Param, Cyber 810&830 etc.

## 1.2 Mainframe Computer

They are very big in size and offer the maximum computing power. A large number of peripherals can be attached to them. They are generally used in large networks of computers with the mainframe being model point of the network. They used satellites for networking.

### Uses of Mainframes

They are used in large organizations where thousands of clients have to access data simultaneously.

For examples:

- Performing ATM cash withdrawals and deposits. During the process, communication between the mainframe and remote computer will help accomplish the financial transactions at hand.
- Business transactions that use credit cards or pre-paid cards.
- Online electronic transactions.
- Cloud storage.
- Handling of patient records in major hospitals.
- Making reservations and travel schedules for airline companies.
- Manipulation and tallying of data for census and electoral purposes.

**Some computers are** – Univac 1100/10, Univac 1100/60, Honeywell DSP 88/860, IBM 270/168 etc.

## 1.3 Minicomputer:

They are smaller version of the mainframes. Generally, they offer the same computing power as bigger counterparts. The most important advantage of a minicomputer over the main frame is that it is cheaper in cost smaller in size and reliable. It does not require air conditioning and can be operated in room temperature.

Main use of these systems is in education in local government word processing etc. in business they are being used for involving stock payroll etc. it is generally used as server system on networks with personal computers as nodes.

Minicomputers were intended for several activities listed below:

- Switchboard control.
- Dedicated applications for graphics and computer design.
- Time-sharing, to allow multiple users to interact concurrently on a single system.
- Control and monitoring of manufacturing activities.

- Monitoring and control of laboratory equipment.

**Some typical machines**– TDC 316, PDP 11/70, Honeywell (XPS-100), HCL-4.

## **1.4 Micro Computer of Personal Computers:**

A microcomputer is a computer whose CPU is a microprocessor. A microprocessor is a processor all whose component are on a single integrated circuit chip. Personal computers are a kind of kind of micro-computer. Personal computers are called so because they are designed for personal use of individual or individual small business units' office automation unit or professionals. Pc can be used for variety of applications like computer literacy, fun and games, business applications, programming etc.

### **Types of Micro Computer or personal computers:**

- Desktop Computer
- Laptop Computer
- Palmtop Computer, Digital Diary ,Notebook ,PDAs.

**Some typical machines are**– DCM Tandy, Apple- II, BBC Acorn, IBM-PC , Pentium.

## **2.0 Processor:**

A processor is an integrated electronic circuit that performs the calculations that run a computer. A processor performs arithmetical, logical, input/output (I/O) and other basic instructions that are passed from an operating system (OS). Most other processes are dependent on the operations of a processor.

The terms processor, CPU and microprocessor are commonly linked.

## **3.0 Memory:**

### **3.1 RAM (random access memory):**

RAM (Random Access Memory) is the internal memory of the CPU for storing data, program, and program result. It is a read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased.

Access time in RAM is independent of the address, that is, each storage location inside the memory is as easy to reach as other locations and takes the same amount of time. Data in the RAM can be accessed randomly but it is very expensive.

RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence, a backup Uninterruptible Power System (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

RAM is of two types –

- Static RAM (SRAM)
- Dynamic RAM (DRAM)



### **Static RAM (SRAM)**

The word **static** indicates that the memory retains its contents as long as power is being supplied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not be refreshed on a regular basis.

There is extra space in the matrix, hence SRAM uses more chips than DRAM for the same amount of storage space, making the manufacturing costs higher. SRAM is thus used as cache memory and has very fast access.

### **Characteristic of Static RAM**

- Long life
- No need to refresh
- Faster
- Used as cache memory
- Large size
- Expensive
- High power consumption

### **Dynamic RAM (DRAM)**

DRAM, unlike SRAM, must be continually **refreshed** in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory as it is cheap and small. All DRAMs are made up of memory cells, which are composed of one capacitor and one transistor.

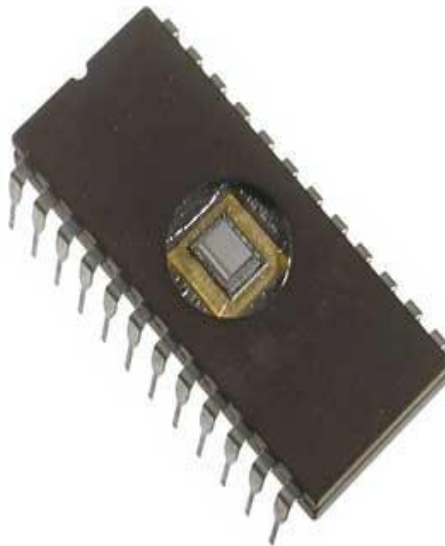
### **Characteristics of Dynamic RAM**

- Short data lifetime

- Needs to be refreshed continuously
- Slower as compared to SRAM
- Used as RAM
- Smaller in size
- Less expensive
- Less power consumption

### 3.2 ROM (read only memory):

ROM stands for **Read Only Memory**. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM stores such instructions that are required to start a computer. This operation is referred to as **bootstrap**. ROM chips are not only used in the computer but also in other electronic items like washing machine and microwave oven.



Let us now discuss the various types of ROMs and their characteristics.

#### **MROM (Masked ROM)**

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kind of ROMs are known as masked ROMs, which are inexpensive.

#### **PROM (Programmable Read Only Memory)**

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM program. Inside the PROM chip, there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

#### **EPROM (Erasable and Programmable Read Only Memory)**

EPROM can be erased by exposing it to ultra-violet light for a duration of up to 40 minutes. Usually, an EPROM eraser achieves this function. During programming, an electrical charge

is trapped in an insulated gate region. The charge is retained for more than 10 years because the charge has no leakage path. For erasing this charge, ultra-violet light is passed through a quartz crystal window (lid). This exposure to ultra-violet light dissipates the charge. During normal use, the quartz lid is sealed with a sticker.

### **EEPROM (Electrically Erasable and Programmable Read Only Memory)**

EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of reprogramming is flexible but slow.

### **Advantages of ROM**

The advantages of ROM are as follows –

- Non-volatile in nature
- Cannot be accidentally changed
- Cheaper than RAMs
- Easy to test
- More reliable than RAMs
- Static and do not require refreshing
- Contents are always known and can be verified

## **4.0 Storage Devices:**

Digital data storage is essentially the recording of digital information in a storage medium, typically by electronic means. The storage device usually enables a user to store large amounts of data in a relatively small physical space, and makes sharing that information with others easy. The device may be capable of holding the data either temporarily or permanently.

Digital data storage devices have many uses. For example, computers usually depend upon information storage to function. Storage media can also be used to back up important information (storing digital data can involve durability and reliability issues, so making independent copies of the information is normally a wise precaution). Some storage devices are also portable, meaning that they can be used to transfer information from one computer to another.

### **Data Storage Devices: Examples**

1. Hard Drive Disk
2. Floppy Disk
3. Tape
4. Compact Disc (CD)
5. DVD and Blu-ray Discs
6. USB Flash Drive

7. Secure Digital Card (SD Card)
8. Solid State Drive (SSD)
9. Punch Card

## **1. Hard Disk Drive**

A hard disk drive (also known as a hard drive, HD, or HDD) can be found installed in almost every desktop computer and laptop. It stores files for the operating system and software programs, as well as user documents, such as photographs, text files, and audio. The hard drive uses magnetic storage to record and retrieve digital information to and from one or more fast-spinning disks.

## **2. Floppy Disk**

Also known as a diskette, floppy, or FD, the floppy disk is another type of storage medium that uses magnetic storage technology to store information. Floppy disks were once a common storage device for computers and lasted from the mid-1970's through to the start of the 21st century. The earliest floppies were 8-inch (203 mm) in size, but these were replaced by 5 1/4-inch (133 mm) disk drives, and finally a 3 1/2 inch (90 mm) version.

## **3. Tape**

In the past, magnetic tape was often used for digital data storage, because of its low cost and ability to store large amounts of data. The technology essentially consisted of a magnetically thin coated piece of plastic wrapped around wheels. Its relative slowness and unreliability compared to other data storage solutions has resulted in it now being largely abandoned as a media.

## **4 Compact Disc (CD)**

The compact disc, known for short as a CD, is a form of optical storage, a technology which employs lasers and lights to read and write data. Initially compact discs were used purely for music audio, but in the late 1980's they began to be also used for computer data storage. Initially, the compact discs that were introduced were CD-ROM's (read only), but this was followed by CD-R's (writable compact discs) and CD-RW's (re-writable compact discs).

## **5 DVD and Blu-ray Discs**

The DVD (digital versatile disc) and Blu-ray disc (BD) are formats of digital optical disc data storage which have superseded compact discs, mainly because of their much greater storage capacity. A Blu-ray disc, for example, can store 25 GB (gigabytes) of data on a single-layer disc and 50 GB on a dual-layer disc. In comparison, a standard CD is the same physical size, but only holds 700 MB (megabytes) of digital data.

## **6 USB Flash Drive**

Also known as a thumb drive, pen drive, flash-drive, memory stick, jump drive, and USB stick, the USB flash drive is a flash memory data storage device that incorporates an integrated USB interface. Flash memory is generally more efficient and reliable than optical media, being smaller, faster, and possessing much greater storage capacity, as well as being more durable due to a lack of moving parts.

## **7 Secure Digital Card (SD Card)**

A common type of memory card, SD cards are used in multiple electronic devices, including digital cameras and mobile phones. Although there are different sizes, classes, and capacities available, they all use a rectangular design with one side "chipped off" to prevent the card from being inserted into the camera or other device the wrong way.

## **8 Solid State Drive (SSD)**

A solid state drive uses flash memory to store data and is sometimes used in devices such as netbooks, laptop, and desktop computers instead of a traditional hard disk drive. The advantages of an SSD over a HDD include a faster read/write speed, noiseless operation, greater reliability, and lower power consumption. The biggest downside is cost, with an SSD offering lower capacity than an equivalently priced HDD.

## **9 Punch Card**

Punch cards (or punched cards) were a common method of data storage used in the early computers. Basically, they consisted of a paper card with punched or perforated holes that have been created by hand or machine. The cards were entered into the computer to enable the storage and accessing of information. This form of data storage media pretty much disappeared as new and better technologies were developed.

### **4.1 Why is storage needed in a computer?**

Without a storage device, a computer cannot save or remember any settings or information and would be considered a dumb terminal. Although a computer can run with no storage device, it would only be able to view information, unless it was connected to another computer that had storage capabilities. Even a task, such as browsing the Internet, requires information to be stored on your computer.

### **4.2 Why so many different storage devices?**

As computers advance, the technologies used to store data do too, right along with higher requirements for storage space. Because people need more and more space, want it faster, cheaper, and want to take it with them, new technologies must be invented. When new storage devices are designed, as people upgrade to those new devices, the older devices are no longer needed and stop being used.

For example, when punch cards were first used in early computers, the magnetic media used for floppy disks was not available. After floppy diskettes were released, they were replaced by CD-ROM drives, which were replaced by DVD drives, which have been replaced by flash drives. The first hard disk drive from IBM cost \$50,000, was only 5 MB, big, and cumbersome. Today, we have smartphones that have hundreds of times the capacity at a much smaller price that we can carry in our pocket. Each advancement of storage devices gives a computer the ability to store more data, as well as save and access data faster.

## **5.0 Desktop Computer Architecture:**

In a desktop computer, the CPU and storage devices are normally built inside a system unit which consists of a metal chassis enclosed in a flat desktop or a tower shaped case. Other peripherals are attached to the system unit by cables. Each peripheral uses its own driver card or controller.



An expansion card that is plugged into special expansion slots in the system unit. Expansion cards contain the electronics required to communicate with and control the device. e.g. video or graphics cards are used for monitors, sound cards are used for audio input/output and NICs (network interface cards) are used for connecting to other computers in a network. Extra memory can also be added to the computer using special memory expansion slots inside the computer.

## **6.0 Portable Computer:**

A Portable computer is a computer that comes with a keyboard and display and one which can be easily relocated or transported, although less convenient compared to a notebook. They have lower specifications and are not well suited for full-time usage as they are less ergonomic. However, they take less space than desktop computers and come with most features found on a desktop.

- Compared to other mobile computing device or laptop, portable computer makes use of standard motherboards and also provide plug in slots for add in cards.
- Portability and flexibility to use is a definite advantage for portable computer over desktop computers.
- Portable computers use less space than desktop computers and are smaller in size.
- Compared to a desktop computer, the power consumed is less in case of portable computer and can help in power and cost savings.
- Compared to desktop computers, immediacy is more pronounced in the case of portable computers.

## **7.0 Computer power:**

When referring to a computer processor or CPU, GHz is a clock frequency, also known as a clock rate or clock speed, representing a cycle of time. An oscillator circuit supplies a small amount of electricity to a crystal each second that is measured in kHz, MHz, or GHz. "Hz" is an abbreviation of Hertz, and "k" represents Kilo (thousand), "M" represents Mega (million), and "G" represents Giga (thousand million).

The first computers processors (CPU's) operated in kHz. For example, the first processor, the Intel 4004 operated at 740 kHz. Later processors operated in MHz, for example, the Intel Pentium processor was available in speeds of 60 MHz to 300 MHz. Today's processors operate in the GHz range.

The higher the GHz number for a processor, the faster the processor can run and process data. The first 1 GHz processors for consumer computers were released in March 2000 by AMD and Intel. Today, processors are reaching 3.8 GHz or higher speeds with multiple cores.

## **8.0 Computer Specification:**

Computer hardware specifications are technical descriptions of the computer's components and capabilities. Processor speed, model and manufacturer. Processor speed is typically indicated in gigahertz (GHz). The higher the number, the faster the computer. Random Access Memory (RAM), This is typically indicated in gigabytes (GB). The more RAM in a computer the more it can do simultaneously. Hard disk (sometimes called ROM) space. This is typically indicated in gigabytes (GB) and refers generally to the amount of information (like documents, music

and other data) your computer can hold. Other specifications might include network (ethernet or wi-fi) adapters or audio and video capabilities.

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- Monitor resolution describes the visual dimensions of any given display. Expressed in terms of width and height, monitor resolution is comprised of a specific number of pixels. In the case of a monitor with an industry standard Full HD 1080p resolution, this display has a resolution of 1920 x 1080. This means that the screen will have a width of 1,920 pixels while the height of the screen will be 1,080 pixels. This results in a grand total of 2,073,600 pixels on-screen. The higher a monitor's resolution is, the more detailed an image can be because a higher resolution monitor will be made up of more pixels than a lower resolution monitor.
- The memory of a graphics card is used to draw graphics or pictures of game, image editor on monitor according to their resolutions with game, editor settings like graphics, textures, etc. The great the memory of the graphics card, higher resolution graphics it can draw for your game.
- Other specifications might include network (ethernet or wi-fi) adapters or audio and video capabilities.

## **9.0 Operating System:**

The Operating System is a program with the following features –

- An operating system is a program that acts as an interface between the software and the computer hardware.
- It is an integrated set of specialized programs used to manage overall resources and operations of the computer.
- It is a specialized software that controls and monitors the execution of all other programs that reside in the computer, including application programs and other system software.

### **9.1 Objectives of Operating System**

The objectives of the operating system are –

- To make the computer system convenient to use in an efficient manner.
- To hide the details of the hardware resources from the users.
- To provide users a convenient interface to use the computer system.
- To act as an intermediary between the hardware and its users, making it easier for the users to access and use other resources.
- To manage the resources of a computer system.

- To keep track of who is using which resource, granting resource requests, and mediating conflicting requests from different programs and users.
- To provide efficient and fair sharing of resources among users and programs.

-----END OF PART 1-----

## **Part 2:**

### **1.0 Academic Dishonesty**

Students are expected to know, understand, and comply with the ethical standards of the University. In addition, students have an obligation to inform the appropriate official of any acts of academic dishonesty by other students of the University. Academic dishonesty is defined as a student's use of unauthorized assistance with intent to deceive an instructor or other such person who may be assigned to evaluate the student's work in meeting course and degree requirements. Examples of academic dishonesty include, but are not limited to, the following:

#### **1.1 Plagiarism**

Plagiarism is the use of another person's distinctive ideas or words without acknowledgment. The incorporation of another person's work into one's own requires appropriate identification and acknowledgment, regardless of the means of appropriation. The following are considered to be forms of plagiarism when the source is not noted:

- Word-for-word copying of another person's ideas or words.
- The mosaic (the interspersing of one's own words here and there while, in essence, copying another's work).
- The paraphrase (the rewriting of another's work, yet still using their fundamental idea or theory).
- Fabrication of references (inventing or counterfeiting sources).
- Submission of another's work as one's own.
- Neglecting quotation marks on material that is otherwise acknowledged.
- Acknowledgment is not necessary when the material used is common knowledge.

#### **1.2 Cheating**

Cheating involves the possession, communication, or use of information, materials, notes, study aids or other devices not authorized by the instructor in an academic exercise, or communication with another person during such an exercise. Examples of cheating are:

- Copying from another's paper or receiving unauthorized assistance from another during an academic exercise or in the submission of academic material.
- Using a calculator when its use has been disallowed.

- Collaborating with another student or students during an academic exercise without the consent of the instructor.

### **1.3 Fabrication and Falsification**

Fabrication involves inventing or counterfeiting information, i.e., creating results not obtained in a study or laboratory experiment. Falsification, on the other hand, involves deliberately altering or changing results to suit one's needs in an experiment or other academic exercise.

### **1.4 Multiple Submissions**

This is the submission of academic work for which academic credit has already been earned, when such submission is made without instructor authorization.

### **1.5 Misuse of Academic Materials**

The misuse of academic materials includes, but is not limited to, the following:

- Stealing or destroying library or reference materials or computer programs.
- Stealing or destroying another student's notes or materials, or having such materials in one's possession without the owner's permission.
- Receiving assistance in locating or using sources of information in an assignment when such assistance has been forbidden by the instructor.
- Illegitimate possession, disposition, or use of examinations or answer keys to examinations.
- Unauthorized alteration, forgery, or falsification.
- Unauthorized sale or purchase of examinations, papers, or assignments

## **2.0 How to Avoid Academic Dishonesty**

Many incidents of academic dishonesty occur because students do not know the correct way to do something, for example how to cite sources or how to work with information from a website. In other situations, students simply make a poor decision. Here are some suggestions on how to avoid academic dishonesty:

- Cite your resources. If it isn't your idea, give the person who came up with that idea some credit for their hard work. Just imagine: someday, you will want to get credit for what you've done and you will want students citing your research in their papers.
- Be cautious about where you sit in a large exam. Cover your answers and don't sit directly in front, next to, or behind another person. Distance yourself from others to reduce temptation to look.
- Don't bring extra materials to class, or if you do, make sure they are zipped in your bag so the professor knows you won't be riffling through your stack of note cards in the middle of the exam.
- Organize study groups before exams. Students that feel more prepared are less likely to be insecure about the information and less likely to try to cheat. Plus, if your friends in class cooperate and combine their resources to prepare for an exam, it will foster

respect. If everyone is on the same page to start with, it won't do any good to cheat during the exam: you all know an equal amount!

- Don't lend out assignments. If a class mate has a question, try to help them, but copying your assignment won't teach them anything, and if they don't know the information in the middle of the semester, just think what they will try to get out of you when the final exam comes around!
- Don't post your papers on websites that offer them to other students for a price, or even for free. It's not worth compromising your integrity: a professor finds out you post your papers, do you think he or she won't extra-triple check YOUR paper for plagiarism the next time?
- Don't USE websites that offer pre-prepared papers for your own assignments.
- Read the syllabus for each course and learn each instructor's expectations.
- Submit ONLY your own work on papers, reports, projects and tests.
- Clarify what is expected of you when you are working on a team project, in a study group or collaborative research project. Learn what you are able to submit as your own.
- Comply with honor statements that might be required in particular classes.
- Protect your computer files so that other cannot copy your work.

### **3.0 University Policy:**

If any student is caught cheating during any exam, he or she will have to face the disciplinary committee of AIUB.

- First the student is required to fill up a form with his/her parent's contact number & address so that the committee can call the parents & send a letter to that address.
- Then the student will get a chance to defend himself/herself by writing an application to the committee.
- Later on the Disciplinary Committee shall decide whether the student should get F grade or another chance by seating for a Set B exam.

The university reserves the right to take any appropriate disciplinary action in the case of any student who conducts anything by himself/ herself which is contrary to the standards of the university.

-----**END OF PART 2**-----

