OVERVIEW OF COMPUTERS

ASSIGNMENT-1

SUBMITTED BY-
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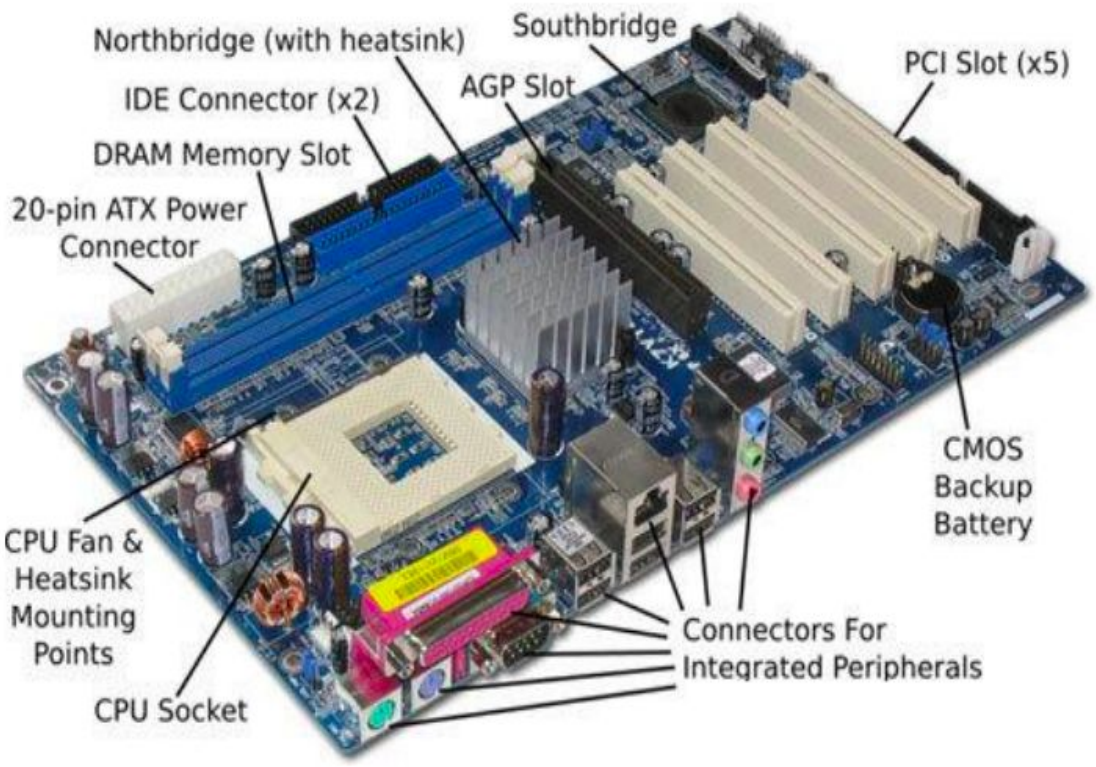
SEC-A
CSE STREAM

Part-1: Working of Motherboard-



Source-Lecture Slides

The motherboard is the most essential part of the computer. It works to tie every device on the computer. It ensures the power among the components. It ensures the whole system to process efficiently.

After the power is turned on, SMPS (Switched Mode Power Supply) distributes the required voltages to all the parts of the motherboard through the ATX connectors. Then there are 3 main tasks to be performed by the CPU before loading operating system-

1. Configuration of hardware components.
2. To know which drive has stored OS!
3. At which part of the drive, OS is stored?

Configuration of hardware components is done by BIOS and processor present on the motherboard. This test is called Power-On Self Test. BIOS has a small memory in machine code which ensures all hardwares are working properly.

BIOS then proceeds to look for storage of OS. By default, first hard-disk is checked. But we can prioritize this according to our requirements. Then the problem arises that at which part of that memory device, OS is stored.

There is a first special sector in each memory device called Master Boot Record (MBR). It contains the location of our OS. It also holds the address of the other files and folders. Removing MBR, BIOS will be unable to locate OS. Then BIOS loads OS and the PC gets started. This is made possible only if motherboard has attached each and every component successfully and there is efficient data transfer between them.

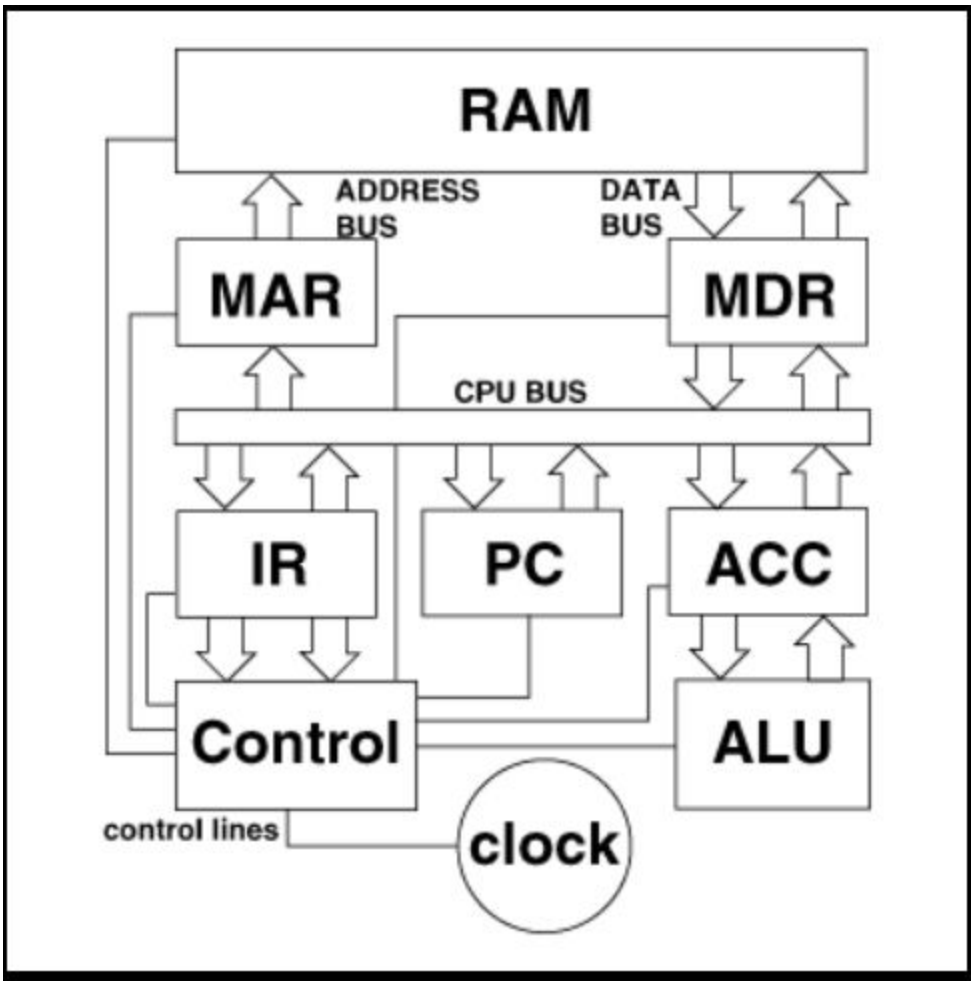
Let me explain the further working of the motherboard and processor with the help of an example.
Suppose we want the addition of 4 and 5.

1. First we enter data through the keyboard. Then this data is converted into binary code by keyboard and is stored by the DRAM (Dynamic Random Access Memory).

2. Now the data is required by CPU to perform the addition task. CPU is connected to DRAM via North bridge. Program counter (PC) holds the address of the data which is stored dynamically in RAM.

3. Then, the Program counter sends this address to MAR (Memory Address Register). Control Unit sends signal to MAR through memory bus to retrieve data from the address specified by program counter.

4. Decoder sends the content to MDR and then with the help of the buses, data is transferred to ALU (arithmetic and logic unit). ALU performs the task and the result 9 is temporarily stored in ACC (accumulator register). This can be better understood with the help of flow-chart displayed below.



Source - Lecture slides

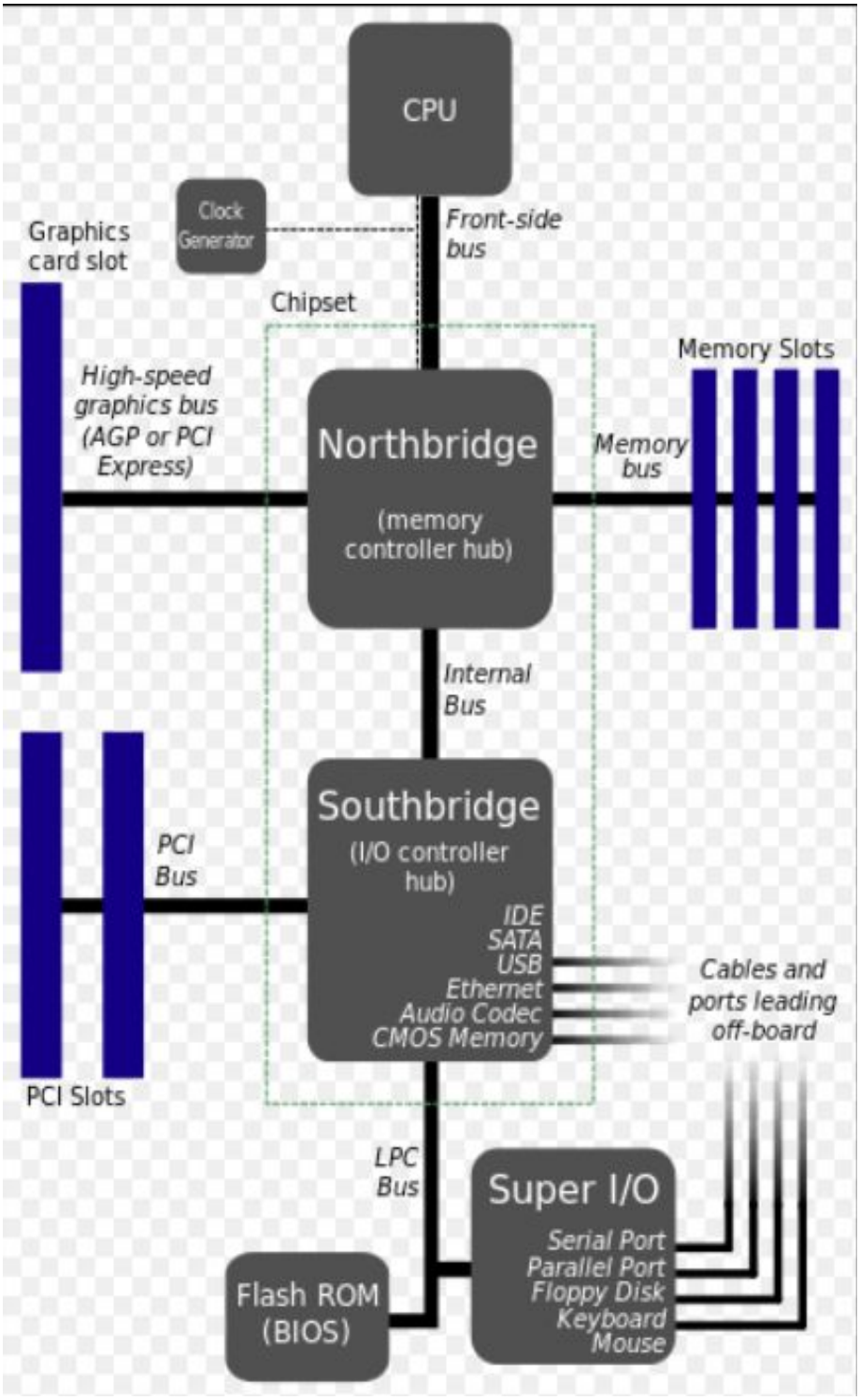
5. The buses which allow the data transfer are parts of motherboard only. Now we have to get output 9 through an output device. North bridge (memory controller hub of the computer) is connected to South bridge (input output controller hub of the computer) through an internal bus. Both these North and South bridge constitutes the chipset.

6. Although the output 9 is in binary form, decoders change it to human understandable form and then this 9 is sent to the monitor via buses and ports. Now finally we have completed our task.

7. If we want to store our data in hard-disk, then we have to specifically give the command of save. This data transfer is done by SATA (Serial Advanced Technology Advancement) which connects hard-disk and the motherboard.

8. There are different special purpose ports connected to motherboard like PCI slots, AGP slots to ensure better audio/visual effects.

The interconnections between various parts of the motherboard is shown below-



Source - Wikipedia

Part-2: Various Components OF Motherboard-

1. BIOS (Basic Input Output System)- BIOS is the operating system for the motherboard. BIOS memory chip stores the BIOS settings which are used to start the system. Depending upon computer architecture, BIOS can be opened through any F2, F8, F9, F10, and F12 keys. BIOS settings are configured in CMOS. When the PC is turned on, BIOS takes the responsibility of hardware configurations. BIOS is present on motherboard.

BIOS
Source - aliexpress.com

2. CMOS (Complementary metal-oxide semiconductor)- CMOS battery is round shaped memory device located on motherboard used to maintain time and data for the PC. It has a life tenure of 1 or 2 years. It can be easily removed and replaced with a new one. It is attached physically on the motherboard.

CMOS
Source- Pic taken during lab

3. RAM (Random Access Memory)- RAM is a memory device that stores data which is currently in use. Once the power is switched off, the data in RAM is lost unless we save it in hard drive. We install RAM in DRAM slots. It is also gold plated at the bottom. Random Access means availability of data on the same time for even different addresses irrespective of their locations.

Source- Pic taken during lab

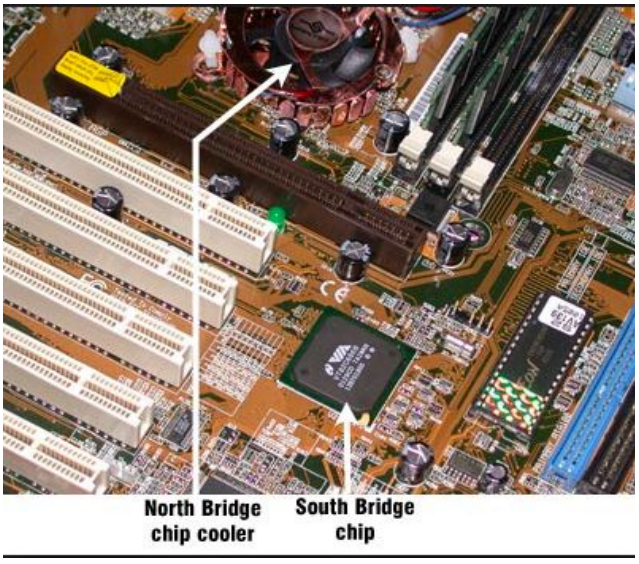
4. SMPS (Switched Mode Power Supply)- This device provides power supply to the whole motherboard through ATX(Advanced Technology Extended). It has a fan located inside at the back to dissipate the internal heat. It comprises of transformer, rectifier, voltage regulator and a filter.

Source- Pic taken during lab

5. Hard disk- Hard disk is secondary storage device which helps in protecting the data. We can buy the hard-disk according to our need. The working of hard-disk is based on the concept of demagnetizing and magnetizing behaviour of magnetic materials. There are circular coils called platters. Each circular plate is further divided into billions of tiny areas. If the region is magnetised, it is represented as 1 and if it's non-magnetised is 0. There are many sectors in each plate and further these sectors are divided into several small regions to store data. Each bit of information stored in hard-disk has a specific address so that the header can easily reach that information. It's speed is not as fast as compared to RAM because it does not work on the principle of random access i.e. it takes different time to access the data placed at different locations. SATA cable helps to transfer data between hard-disk and motherboard.

Hard-disk Source- Pic taken during lab

6. Chipset- Chipsets in motherboard controls and manages the data between processor, RAM and other peripherals. Northbridge is the link between processor and RAM whereas Southbridge controls the input-output operations of the computer.



Source - informIT.com

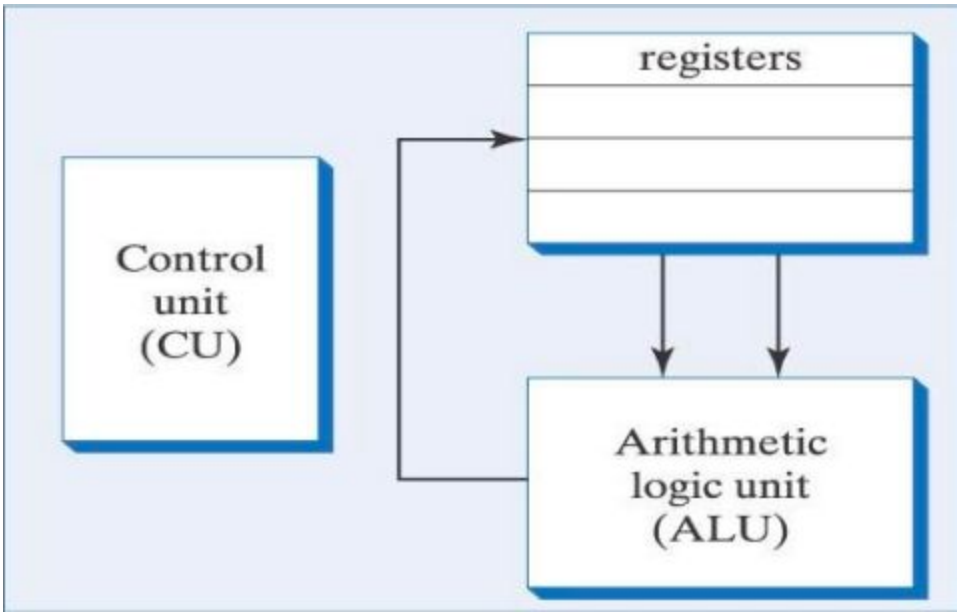
7. Expansion Card Slots-

PCI Slots- The full form of PCI is Peripheral Component Interconnect. The PCI slot is one of the important motherboard components today and is vastly used to install add-on cards on the motherboard. The PCI supports 64-bit high-speed bus.

PCI express- Also known as PCIe, these are the latest and the fastest component of the motherboard to support add-on cards. It supports full duplex serial bus.

AGP slot- Accelerated graphics port(AGP) is specifically used to install a latest graphics card. AGP runs on a 32-bit bus and both PCIe and AGP can be used to install high-end gaming display cards.

8. Processor- A processor is the logic circuitry that performs the basic instructions. The three primary functions of a processor are receiving input, processing the data, and giving outputs. It contains three parts- Control unit, ALU and registers whose workings are explained earlier in the working of the motherboard.



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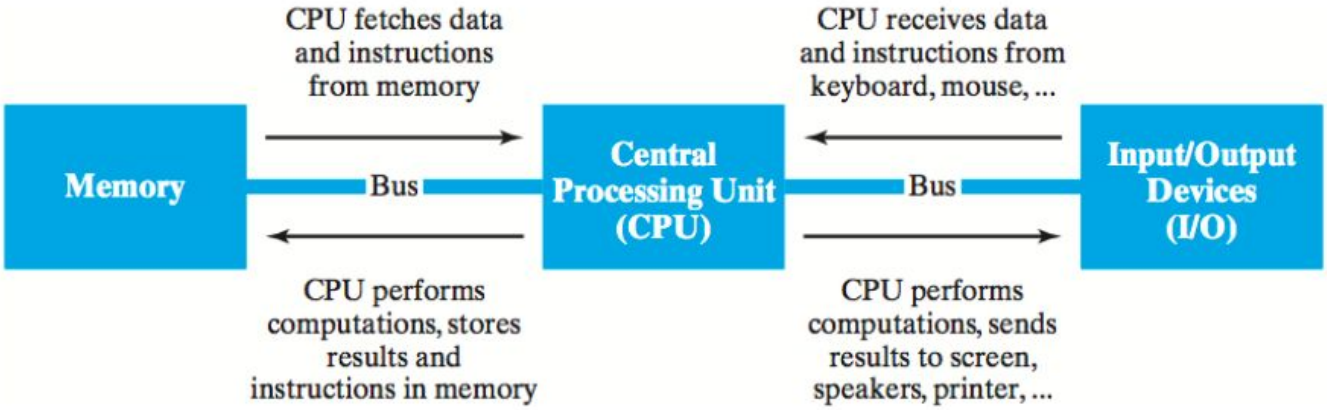
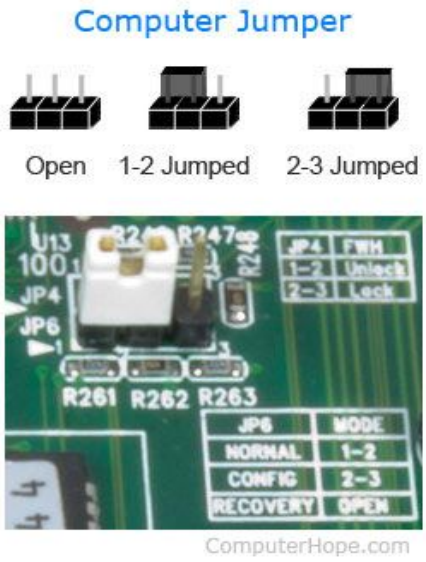
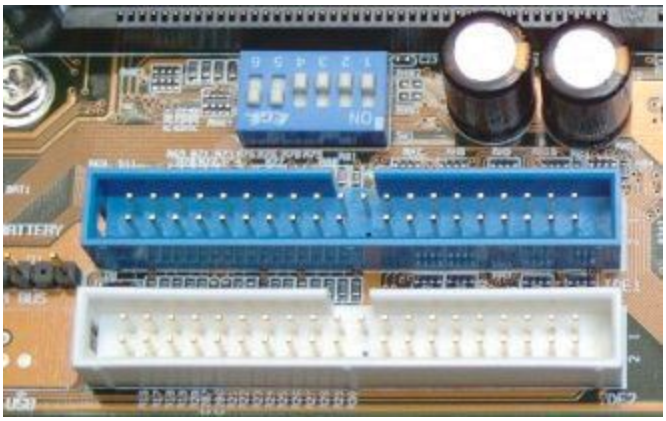


9. <u>Jumpers-</u> Jumpers are used to provide connectivity to computer peripherals such as the hard drives, modems, sound cards, and other components. It also helps in configuring motherboard.



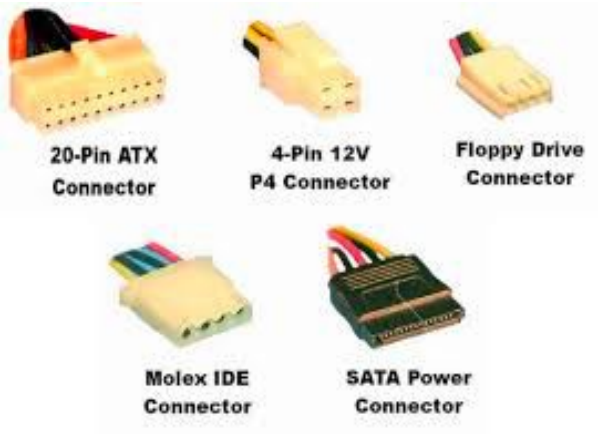
10. SATA connectors- Latest in the series, the connectors, Serial Advanced Technology Attachment(SATA) are 7-pin connectors to interface latest SATA hard disks or optical drives. They are much faster than IDE interface.

11.IDE connectors- The Integrated Drive Electronics (IDE) connectors are used to interface disk drives. The 40-pin male connector is used to connect IDE hard disk drives and the 34-pin male connector connects to Floppy Disk Drive.



12. Heat Sink- A heat sink is a thermal conductive metal device designed to absorb and disperse heat away from computer processor. Usually heat sinks are outfitted with built-in fans to help keep both the CPU and the heat sink at an appropriate temperature.

13. ATX connectors- It is a motherboard configuration specification developed by Intel in 1995 to improve on previous *de facto* standards like the AT design. It was the first major change in desktop computer enclosure, motherboard and power supply design in many years, improving standardization and interchangeability of parts.



Q-1. How does Magnetic disk store data?

Answer The working of hard-disk is based on the concept of demagnetizing and magnetizing behaviour of magnetic materials. There are circular coils called platters. Each circular plate is further divided into billions of tiny areas. If the region is magnetised, it is represented as 1 and if it's non-magnetised is 0. There are many sectors in each plate and further these sectors are divided into several small regions to store data. Each bit of information stored in hard-disk has a specific address so that the header can easily reach that information. It's speed is not as fast as compared to RAM because it does not work on the principle of random access i.e. it takes different time to access the data placed at different locations. SATA cable helps to transfer data between hard-disk and motherboard.

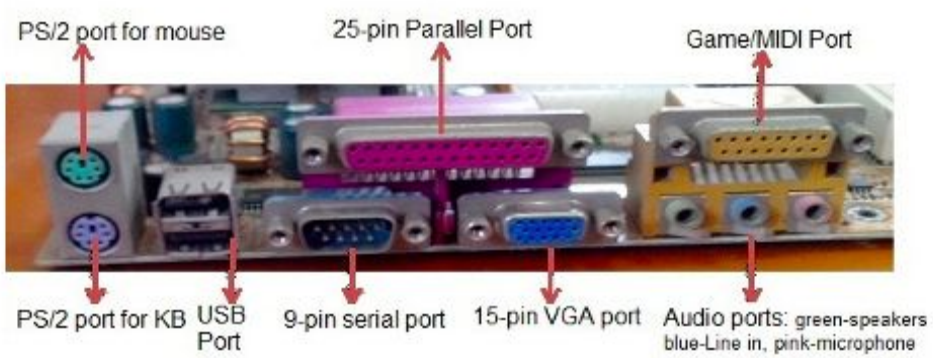
Q-2. How does optical disk store data?

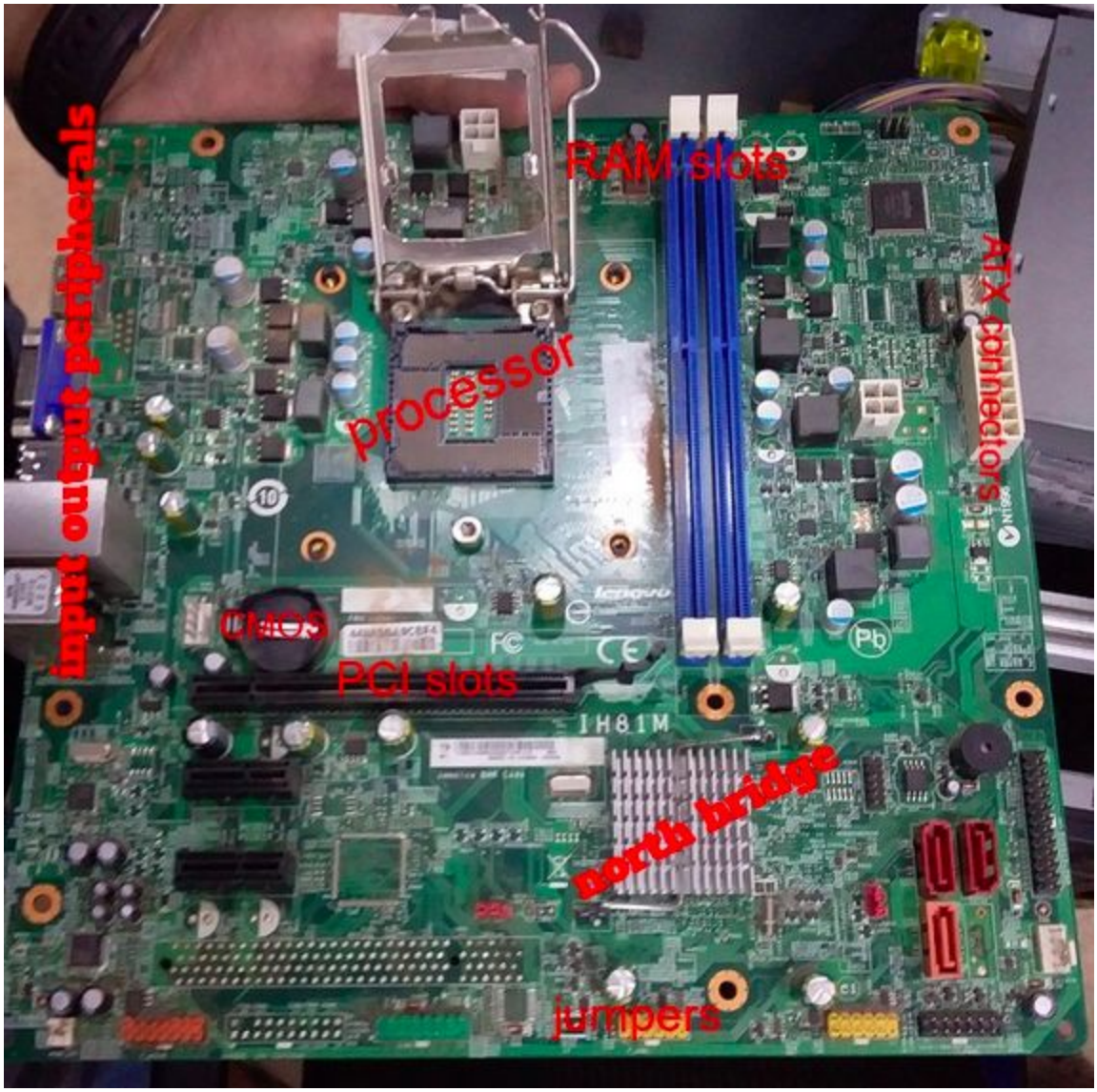
Ans. The optical disk uses laser technology to store data. The surface of the disk is irregular and when the laser from the CD-drivers fall onto it, it gets reflected. If there is a reflection, we indicate this by 1 and if there is no reflection, we indicate this by 0. These irregular pits are small in size so as to store data in form of 0's and 1's.

Q-3. How to increase storage capacity of an optical disk?

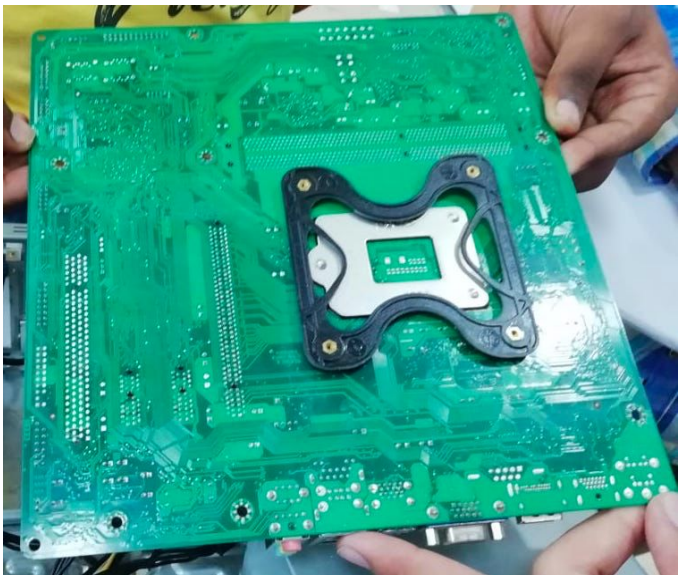
Ans. The optical disk uses laser technology to store data. We can increase the storage by decreasing the size of pits from where the reflection of laser takes place. We can also decrease wavelength of the laser light used, to increase storage so that the laser light gets concentrated on a small area. That's why, DVDs and blu-ray discs have more storage than CDs.

INPUT/OUTPUT Interface Connectors

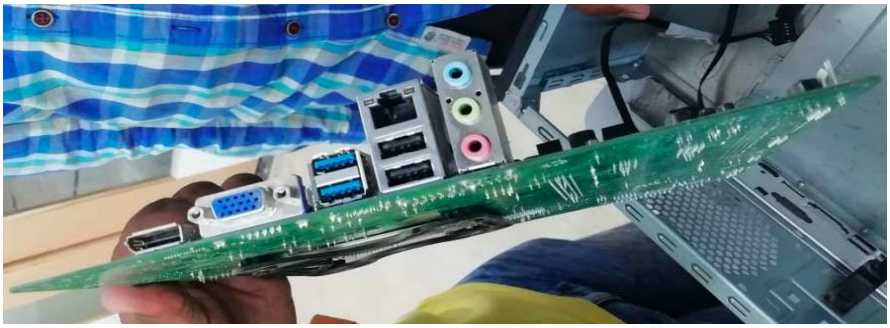


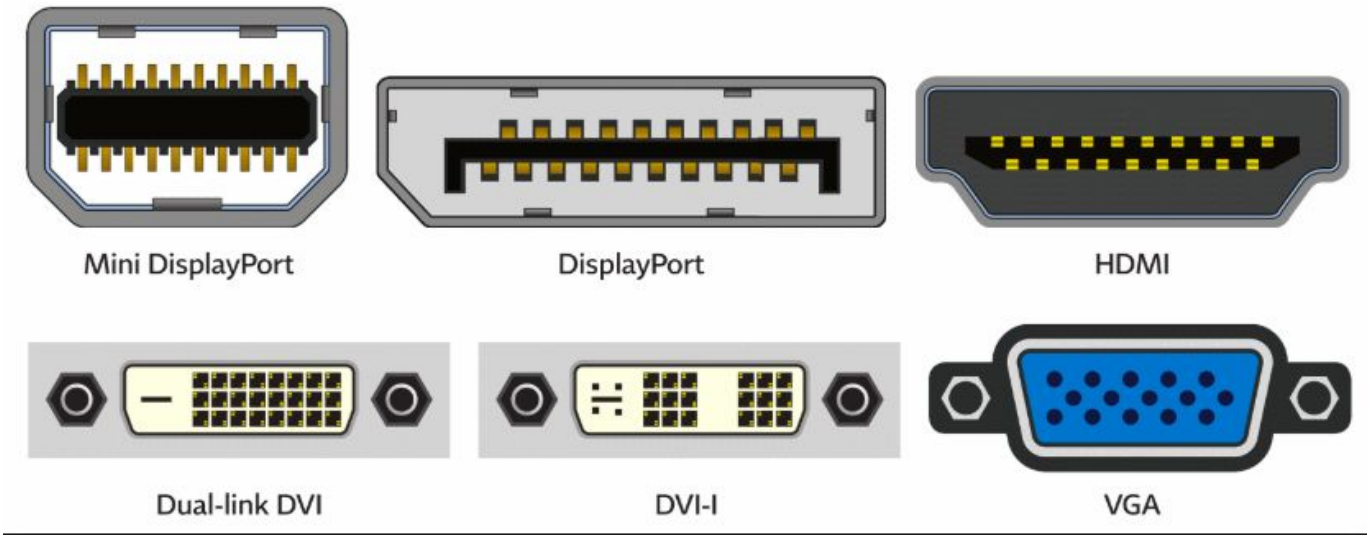


Backside of motherboard-



I/o interface connectors-





Part-3: History of Processors

Architecture of Microprocessor- Microprocessor is a single IC package in which a number of useful functions are integrated and fabricated on a single silicon semiconductor chip. Its architecture consists of a central processing unit, memory modules, a system bus and an input/output unit.

Generation of Microprocessor

1st Generation: This was the period during 1971 to 1973 of microprocessor's history. In 1971, INTEL created the first microprocessor 4004 that would run at a clock speed of 108 KHz. During this period, the other microprocessors in the market including Rockwell international PPS-4, INTEL-8008 and National semiconductors IMP-16 were in use.

2nd Generation: This was the period during 1973 to 1978 in which very efficient 8-bit microprocessors were implemented like Motorola 6800 and 6801, INTEL-8085 and Zilogs-Z80, which were among the most popular ones.

3rd Generation: During this period 16 bit processors were created and designed using HMOS technology. From 1979 to 1980, INTEL 8086/80186/80286 and Motorola 68000 and 68010 were developed. Speeds of those processors were four times better than the 2nd generation processors.

4th Generation: From 1981 to 1995 this generation developed 32 bit microprocessors by using HCMOS fabrication. INTEL-80386 and Motorola's 68020/68030 were the popular processors.

5th Generation: From 1995 to until now this generation has been bringing out high-performance and high-speed processors that make use of 64-bit processors. Such processors include Pentium, Celeron, Dual and Quad core processors.

Intel Celeron

Intel Celeron is introduced in April 1998. It refers to a range of Intel's X86 CPUs for value personal computers. It is based on Pentium 2 and can run on all IA-32 computer programs.

Celeron processors are compatible with IA-32 computer programs, but their performance is typically significantly lower when compared to similar CPUs with higher-priced Intel CPU brands. For example, the Celeron brand will often have less cache memory, or have advanced features purposely disabled. These missing features can have a variable impact on performance, but is often very substantial.

Pentium

Pentium is a brand used for a series of x86 architecture-compatible microprocessors produced by Intel since 1993. In their form as of November 2011, Pentium processors are considered entry-level products that Intel rates as "two stars", meaning that they are above the low-end Atom and Celeron series, but below the faster Core i3, i5, i7, i9, and high-end Xeon series.

Pentium Processor

XEON

Xeon is a brand of x86 microprocessors designed, manufactured, and marketed by Intel, targeted at the non-consumer workstation, server, and embedded system markets. It was introduced in June 1998. Xeon processors are based on the same architecture as regular desktop-grade CPUs, but have some advanced features such as support for ECC memory, higher core counts, support for larger amounts of RAM,and larger cache memory.