Types of Main Memory(Primary Memory);

Main memory is **physical device** holds **the data** and **instructions** that the **CPU** needs. There are **two types of Main memory** includes **ROM and RAM** , and is located close to the CPU on the computer motherboard enabling the CPU to read data from main memory **very quickly**

1- Read Only Memories (ROM):

ROMs **stand for Read –Only Memory** allow only read operation to be performed. This memory is **non-volatile**, which means it can **retain data even without power** Most ROMs are **programmed** and **cannot be altered.**

This type of memory **is cheap** to manufacture. The program that **controls the standard I/O functions (called BIOS)** and **configuration software** are kept in **ROM,.**

Other types of ROM include:

A- Programmable Read only memory (PROM).

It is read only memory . It can be programmed only once by the user . Once programmed , the data and instructions in it cannot be changed ,which means is not erasable .

B- Erasable Programmable Read Only Memory (EPROM)

It is read only memory that can be reprogrammed. To erase data from it , expose it to ultra violet light . To reprogram it , erase all the previous data .

C- Electrically Erasable Programmable Read Only Memory(EEPROM)

It is read only memory that can be reprogrammed. To erase data from it by applying electric field ,no need of ultra violet light . To reprogram it , erase only portions of data .

H.W compare between PROM ,EPROM AND EEPROM (BY using table)

2- Random Access Memory(RAM):-

It is also called as read /write memory .The program and data that the CPU requires during execution of a program are stored in this memory . It is a **volatile memory** (**Temporary Memory**) as data loses when the power is turned off .

RAM is classified into two types :

1- Static RAM (SRAM):

SRAM is constructed of **circuits similar to flip-flops** . SRAM requires a **constant power** flow in order to function . So it **does not need to be refreshed** to hold its contents

This is why SRAM is called Static

SRAM is **volatile memory** ,which means that all the data had been stored become lost once the power is cut off .

SRAM uses Less power .

SRAM is faster access speed than DRAM .

SRAM is expensive

SRAM is lesser memory capacity than DRAM.

Because of these **characteristics** , SRAM is used in **cache memory** and used for implementing **CPU registers.**

2-Dynamic RAM (DRAM):

DRAM is constructed of **tiny capacitors** that leak electricity . DRAM requires a **recharge every few mill seconds** . So it **need refreshing power** to holds its contents. This is **why** DRAM is called **Dynamic**

DRAM is **volatile memory** ,which means that all the data had been stored become lost once the power is cut off .

DRAM is inexpensive .

DRAM is greater memory capacity than SRAM .

DRAM is slower access speed than SRAM

DRAM uses more power

Because of these **characteristics** , DRAM used for **main memory** .

H.W What are the differences between SRAM and DRAM (using table)

The differences between RAM AND ROM

RAM	ROM
1-Stand foe Random - Access Memory	1- Stand for Read Only Memory
2- Read /Write memory	2-Read Only Memory
3-Sending data (writing) to RAM memory address is called destructive write because the new data erases whatever was there before	3-Sending data to ROM memory address is ineffective because the contents of ROM can not changed (write not allowed) because this memory for read only
4-form of primary storage(main memory) for holding temporary data and instruction	4-form of primary storage(main memory) for holding permanent data and instruction
5- Volatile : program and data are erased when the power is off	5-Permanent : program and data are intact even power is off
6- Type of RAM is a- Static RAM b- Dynamic RAM	6-Type of ROM is a- PROM b-EPROM c- EEPROM

NOTE: The Main Memory is called also primary memory , primary storage OR internal memory .

Other type of memory

1--Cache Memory:

It is a **very high speed memory** placed between **RAM and CPU** . It is storage buffer that stores the data that is used more and make them available to CPU when needed at fast rate . **Cache memory** stores copies of the data that used frequently by cpu from main memory (Ram)locations ,so that they are immediately available to the CPU when needed.

Cache memory is **faster** than **RAM,** so **cache memory** increases the **speed of processor.** Cache memory is **costlier** than **Ram** , so it is **smaller** in size than **Ram.** Generally computer have cache memory of sizes 265 KB To 2MB

H.W : **What are the differences between Cache Memory and Main Memory**(Ram)

2- Virtual Memory:

If your computer **lacks** the random access memory **(RAM)** needed to run more program or operation at the same time, windows uses virtual memory to compensate. Virtual memory **combines** your **computer's RAM** with **temporary space** on your **hard disk.**

So Virtual memory is feature of an operating system that enables a computer to be able to compensate shortages of physical memory by transferring pages of data from RAM to hard disk . This means that when RAM runs low, virtual memory moves data from RAM to a space called a ***paging file on the hard disk*** **.** Moving data to and from the paging file frees up RAM to complete its work.

NOTE : The **more RAM** your computer has, **the faster your programs** will generally run. If a **lack of RAM** is **slowing your computer**, you might be tempted to increase virtual memory to compensate. However, your computer can read data from RAM **more quickly** than from a **hard disk**, so **adding RAM** is a better solution.

Motherboard (System Board)

. It contains the processor, main memory, connectors, and expansion slots for optional cards. The slots and connectors provide access to such components as ROM, RAM, hard disk, CD-ROM drive, additional memory, video unit, keyboard, mouse, parallel and serial device, sound adapter and cache memory . A bus is attached to the system board and connects the components of system board with each other. It transfers data between the processor, memory and external devices.

Bios:: Short for **(Basic Input / Output System),** Bios is ROM Chip located on computer motherboard and contain instructions on how your system should boot up and how it operate . The frist program to be lunched when a computer strat run is BIOS . The CPU accesses the BIOS even before the operating system is loaded . The BIOS include a test referred to as a POST(Power –On Self - Test) that check all your hardware connections and to verify whether the device meets the needs of booting correctly . If the POST is not passed(fail) , the computer produce different forms of beeps to show the error type . If the POST test is passed , the BIOS load the operating system into the computer's memory and finishes the boot up process .

In most PCs, the BIOS have four main functions:-

1-POST: - The first task of BIOS is used to test computer hardware, ensuring hardware is properly functioning before starting process of loading operation system. If the POST is **not** passed(fail) , the computer produce different forms of beeps to show the error type . If the POST test is **passed** , then it continues boot.

3- **Bootstrap Loader:-** After successful test of POST ,the BIOS **locates and recognize** the **operating system**. If operation system located, BIOS will pass the control to it. This process is called **Booting .**

3-BIOS drivers :-The BIOS driver are a collection of programs that as i**nterface** between the operating system and your hardware. When running DOS or Windows you are using **complete BIOS support.**

4-BIOS/CMOS Setup:- Configuration program that allows you to **configure hardware setting** including system setting such as computer password, time, and date. BIOS setup is also called a **CMOS setup .**

المحاضرة الرابعة

تقنيات الحاسبة

المرحلة الاولى

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