KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established Under Section 3 of UGC Act 1956)

Coimbatore - 641021.

(For the candidates admitted from 2018 onwards)

DEPARTMENT OF CS, CA & IT

Semester – I

18ITU103 COMPUTER FUNDAMENTALS 4H – 4C

Instruction Hours / week:L: 4 T: 0 P: 0 **Marks:**Int :**40** Ext : **60** Total: **100**

SCOPE

This course provides student with a comprehensive study of the fundamentals of computers.

COURSE OBJECTIVES

- To identify types of computers, how they process information and how individual computers interact with other computing systems and devices.
- To identify the function of computer hardware components.
- To identify the factors that goes into an individual or organizational decision on how to purchase computer equipment.
- To identify how to maintain computer equipment and solve common problems relating to computer hardware.
- To identify how software and hardware work together to perform computing tasks and how software is developed and upgraded.
- To identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.
- To identify fundamental concepts relating to database applications.
- To identify what an operating system is and how it works, and solve common problems related to operating systems.
- To manipulate and control the Windows desktop, files and disks.
- To Identify how to change system settings, install and remove software.

COURSE OUTCOMES

- Understand the meaning and basic components of a computer system,
- Define and distinguish Hardware and Software components of computer system,
- Explain and identify different computing machines during the evolution of computer system,

- Gain knowledge about five generations of computer system,
- Explain the functions of a computer,
- Identify and discuss the functional units of a computer system,
- Identify the various input and output units and explain their purposes
- Understand the role of CPU and its components,
- Understand the concept and need of primary and secondary memory,
- Discuss the advantages, limitations and applications of computers,
- Understand the classification of computers,
- Distinguish the computers on the basis of purpose, technology and size

UNIT I

Introduction: Introduction to computer system, uses, types. **Data Representation:** Number systems and character representation, binary arithmetic. **Human Computer Interface:** Types of software, Operating system as user interface, utility programs.

UNIT II

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter.

UNIT III

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.

UNIT IV

Computer Organization and Architecture: C.P.U., registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

UNIT V

Overview of Emerging Technologies: Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

SUGGESTED READINGS

1. Goel,A. (2010). Computer Fundamentals.New Delhi: Pearson Education.
2. Aksoy, P., &DeNardis,L. (2006).Introduction to Information Technology. New Delhi: Cengage Learning
3. Sinha, P. K., &Sinha, P. (2007).Fundamentals of Computers.New Delhi: BPB Publishers.

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Pollachi Main Road, Eachanari Post, Coimbatore - 641021
(For the candidates admitted from 2016 onwards)
DEPARTMENT OF INFORMATION TECHNOLOGY

SUBJECT : COMPUTER FUNDAMENTALS
SEMESTER : I
SUBJECT CODE: 18ITU103 **CLASS : I B.Sc (IT)**

LECTURE PLAN

S.NO	LECTURE DURATION (Hour)	TOPICS TO BE COVERED	SUPPORT MATERIALS
		UNIT I	
1	1	**Introduction to Computer System** : Characteristics of Computer	S1-Pg: 1-4
2	1	History of Computer	S1-Pg: 1-4
3	1	Generation of Computer - First, Second, Third, Fourth Genaration	S1-Pg: 1-8
4	1	Types of Computer	S1-Pg: 1-10
5	1	**Data Representation:** Number System and character representation, binary arithmetic	S1-Pg: 2-4
6	1	Human Computer Interface: Types of Software, System software	S2-Pg: 173,174
7	1	Application Software, Operating System as User Interface	S2-Pg: 175,251
8	1	Utility Programs	S3-Pg:167-171
9	1	Backup and Recovery , Compactability	S2-180,183
10	1	**Recapitulation of Unit I** **Discussion of Important Questions**	
		Total no. of Hours Planned for Unit – I	**10 Hrs**
		UNIT – II	
1	1	**Devices - Input and Output**	S2-Pg: 149
2	1	Keyboard, Mouse	S2-Pg: 149
3	1	Joystick, Scanner	S2-Pg: 150,153
4	1	OCR, OMR, Bar code Reader	S2-Pg: 154,155
5	1	Web camera	S2-Pg: 159

6	**1**	Monitor	S2-Pg: 164
7	1	Printer, Plotter	S2-Pg: 167,169
8	1	**Recapitulation of Unit II**	
9	1	**Discussion of Important Questions**	
		Total no. of Hours Planned for Unit – II	**9 Hrs**
		UNIT III	
1	1	**Memory:** Primary, Secondary	S2-Pg: 108
2	1	Auxiliary Memory, RAM	S2-Pg: 112,W3
3	1	ROM, PROM	W3
4	1	EPROM, EEPROM	W3
5	1	Cache Memory	S2-Pg: 113
6	1	Hard Disks	S2-Pg: 124
7	1	Optical Disks	S2-Pg: 134
8	1	CD, DVD, Players	S2-Pg: 135
9	1	**Recapitulation of Unit II and Discussion of Important Questions**	
		Total no. of Hours Planned for Unit – III	**9 Hrs**
		UNIT IV	
1	1	**Computer Organisation and Architecture :** CPU	S2-Pg: 101
2	1	Registers, System Bus	S2-Pg: 103,108
3	1	Main memory Unit, Cache Memory	S2-Pg: 109,113
4	1	Inside a Computer, SMPS	S1-Pg: 1-28
5	1	Motherboard	S1-Pg: 1-28
6	1	Ports and Interfaces	S1-Pg: 1-30
7	1	Expansion Cards	S1-Pg: 1-34
8	1	Ribbon cables	S1-Pg: 1-38
9	1	Memory Chips, Processor	S1-Pg: 1-32
10	1	**Recapitulation of Unit II and Discussion of Important Questions**	
		Total no. of Hours Planned for Unit – IV	**10 Hrs**
		UNIT V	
1	1	**Overview of Emerging Technologies**	W1

2	1	Bluetooth	W1
3	1	Cloud Computing,	W2
4	1	Big Data	W2
5	1	Data Mining - KDD Process	W4
6	1	Mobile Computing,	W5
7	1	Embedded Systems	W5
8	1	**Recapitulation of Unit II and Discussion of Important Questions**	
9	1	**Previous Year ESE Questions Discussion**	
10	1	**Previous Year ESE Questions Discussion**	
		Total no. of Hours Planned for Unit - V	**10 Hrs**
		Total Planned Hours	**48 Hrs**

SUPPORTING MATERIAL

1. A-Goel, 2010,Computer Fundamentals, Pearson Education,New Delhi.
2. P-K-Sinha, P-Sinha,2007 ,Fundamentals of Computers, BPB Publishers, New delhi.
3. P-Aksoy, L-DeNardis,2006, Introduction to Information Technology, Cengage Learning, New delhi.

Websites

www.slideshare.net/

www.en-wikipedia-org

www.in.pcmag.com/networking-communications-software

www.tutorialspoint.com/data_mining/

www.electronicsforu.com/

KARPAGAM ACADEMY OF HIGHER EDUCATION

SUBJECT NAME : COMPUTER FUNDAMENTALS **CLASS : III B.Sc. (IT)**
SUBJECT CODE :18ITU103 **UNIT I** **SEMESTER : I**
BATCH (2018-2021)

UNIT-I

Introduction: Introduction to computer system, uses, types. **Data Representation:** Number systems and character representation, binary arithmetic. **Human Computer Interface:** Types of software, Operating system as user interface, utility programs.

Introduction to Computer

What is computer?

A computer is an electronic machine that accepts data, stores and processes data into information. The computer is able to work because there are instructions in its memory directing it.

The parts of the computer that you can see and touch, such as the keyboard, monitor and the mouse are called hardware. The instructions that direct the computer are called software or computer program.

Data which is raw facts that you the user enter into the computer is called input. This includes; words, numbers, sound and pictures. When the data is entered into the computer, the computer processes the data to produce information which is output. For example, you enter 2+2 into the computer as data, the computer processes it and the result is 4 which is information.

Computers are usually categories into three general categories:

1. Supercomputer – The fastest, largest, most powerful and most expensive computer.

2. Mainframe Computer – This is a little smaller and less powerful than the supercomputer, but, like the supercomputer it is also expensive.

3. Personal Computer (PC) - This is the computer that most people use in their daily lives. This computer is much smaller, less powerful and less expensive than the supercomputer and the mainframe computer. There are two main types of personal

computers. Macintosh (Macs) and the PC compatibles (PC). The main differences between the two are the operating systems and the processor they use. This category of computer has two additional types of computers. These are mobile computer and handheld computer. The most popular type of mobile computer is the notebook or laptop computer, and the handheld computer is a very small PC that you can hold in your hand.

It is important to note that, any computer; regardless of its size have an input device, output device and a system unit.

History of Computers:

Until the development of the first generation computers based on vacuum tubes, there had been several developments in the computing technology related to the mechanical

computing devices. The key developments that took place till the first computer was developed are as follows—

- ***Calculating Machines*** ABACUS was the first mechanical calculating device for counting of large numbers. The word ABACUS means calculating board. It consists of bars in horizontal positions on which sets of beads are inserted. The horizontal bars have 10 beads each, representing units, tens, hundreds, etc. An abacus is shown in **Figure**

- ***Napier's Bones*** was a mechanical device built for the purpose of multiplication in 1617 **AD**. by an English mathematician John Napier.

- ***Slide Rule*** was developed by an English mathematician Edmund Gunter in the 16th century. Using the slide rule, one could perform operations like addition, subtraction, multiplication and division. It was used extensively till late 1970s. **Figure** shows a slide rule.

- ***Pascal's Adding and Subtraction Machine*** was developed by Blaise Pascal. It could add and subtract. The machine consisted of wheels, gears and cylinders.

- ***Leibniz's Multiplication and Dividing Machine*** was a mechanical device that could both multiply and divide. The German philosopher and mathematician Gottfried Leibniz built it around 1673.

- ***Punch Card System*** was developed by Jacquard to control the power loom in 1801. He invented the punched card reader that could recognize the presence of hole in the punched card as binary one and the absence of the hole as binary zero. The 0s and 1s are the basis of the modern digital computer. A punched card is shown in **Figure**.

Figure: Punched card

- ***Babbage's Analytical Engine*** An English man Charles Babbage built a mechanical machine to do complex mathematical calculations, in the year 1823. The machine was called as difference engine. Later, Charles Babbage and Lady Ada Lovelace developed a general-purpose calculating machine, the analytical engine. Charles Babbage is also called the father of computer.

- ***Hollerith's Punched Card Tabulating Machine*** was invented by Herman Hollerith. The machine could read the information from a punched card and process it electronically.

The developments discussed above and several others not discussed here, resulted in the development of the first computer in the 1940s.

Generations of Computer:

The computer has evolved from a large-sized simple calculating machine to a smaller but much more powerful machine. The evolution of computer to the current state is defined in terms of the generations of computer. Each generation of computer is designed based on a new technological development, resulting in better, cheaper and smaller computers that are more powerful, faster and efficient than their predecessors. Currently, there are five generations of computer. In the following subsections, we will discuss the generations of computer in terms of—

i. the technology used by them (hardware and software),

ii. computing characteristics (speed, i.e., number of instructions executed per second),

iii. physical appearance, and

iv. their applications.

First Generation (1940 to 1956): Using Vacuum Tubes

- ***Hardware Technology*** The first generation of computers used vacuum tubes (**Figure**) for circuitry and magnetic drums for memory. The input to the computer was through punched cards and paper tapes. The output was displayed as printouts.

- ***Software Technology*** The instructions were written in machine language. Machine language uses 0s and 1s for coding of the instructions. The first generation computerscould solve one problem at a time.

- ***Computing Characteristics*** The computation time was in milliseconds.

- ***Physical Appearance*** These computers were enormous in size and required a large room for installation.

- ***Application*** They were used for scientific applications as they were the fastest computing device of their time.

- ***Examples*** UNIVersal Automatic Computer (UNIVAC), Electronic Numerical Integrator And Calculator (ENIAC), and Electronic Discrete Variable Automatic Computer (EDVAC).

The first generation computers used a large number of vacuum tubes and thus generated a lot of heat. They consumed a great deal of electricity and were expensive to operate. The machines were prone to frequent malfunctioning and required constant maintenance. Since first generation computers used machine language, they were difficult to program.

Second Generation (1956 to 1963): Using Transistors

- ***Hardware Technology*** Transistors (**Figure**) replaced the vacuum tubes of the first generation of computers. Transistors allowed computers to become smaller, faster, cheaper, energy efficient and reliable. The second generation computers used *magnetic core technology* for primary memory. They used magnetic tapes and magnetic disks for secondary storage. The input was still through punched cards and the output using printouts. They used the concept of a stored program, where instructions were stored in the memory of computer.

- ***Software Technology*** The instructions were written using the *assembly language*. Assembly language uses mnemonics like ADD for addition and SUB for subtraction for coding of the instructions. It is easier to write instructions in assembly language, as compared to writing instructions in machine language. High-level programming languages, such as early versions of COBOL and FORTRAN were also developed during this period.

- ***Computing Characteristics*** The computation time was in microseconds.

- ***Physical Appearance*** Transistors are smaller in size compared to vacuum tubes, thus, the size of the computer was also reduced.

- ***Application*** The cost of commercial production of these computers was very high, though less than the first generation computers. The transistors had to be assembled manually in second generation computers.

- ***Examples*** PDP-8, IBM 1401 and CDC 1604.

Second generation computers generated a lot of heat but much less than the first generation computers. They required less maintenance than the first generation computers.

Third Generation (1964 to 1971): Using Integrated Circuits

- ***Hardware Technology*** The third generation computers used the *Integrated Circuit (IC)* chips. **Figure** shows IC chips. In an IC chip, multiple transistors are placed on a silicon chip. Silicon is a type of semiconductor. The use of IC chip increased the speed and the efficiency of computer, manifold. The keyboard and monitor were used to interact with the third generation computer, instead of the punched card and printouts.

- ***Software Technology*** The keyboard and the monitor were interfaced through the*operating system*. Operating system allowed different applications to run at the same time. *High-level languages* were used extensively for programming, instead of machine language and assembly language.

- ***Computing Characteristics*** The computation time was in nanoseconds.

- ***Physical Appearance*** The size of these computers was quite small compared to the second generation computers.

- ***Application*** Computers became accessible to mass audience. Computers were produced commercially, and were smaller and cheaper than their predecessors.

- ***Examples*** IBM 370, PDP 11.

The third generation computers used less power and generated less heat than the second generation computers. The cost of the computer reduced significantly, as individual

components of the computer were not required to be assembled manually. The maintenance cost of the computers was also less compared to their predecessors.

Fourth Generation (1971 to present): Using Microprocessors

- ***Hardware Technology*** They use the *Large Scale Integration (LSI)* and the *Very Large Scale Integration (VLSI)* technology. Thousands of transistors are integrated on a small silicon chip using LSI technology. VLSI allows hundreds of thousands of components to be integrated in a small chip. This era is marked by the development of microprocessor. *Microprocessor* is a chip containing millions of transistors and components, and, designed using LSI and VLSI technology. A microprocessor chip is shown in **Figure**. This generation of computers gave rise to Personal Computer (PC). Semiconductor memory replaced the earlier magnetic core memory, resulting in fast random access to memory. Secondary storage device like magnetic disks became smaller in physical size and larger in capacity. The *linking of computers* is another key development of this era. The computers were linked to form networks that led to the emergence of the Internet. This generation also saw the development of pointing devices like mouse, and handheld devices.

- ***Software Technology*** Several new operating systems like the MS-DOS and MS-Windows developed during this time. This generation of computers supported *Graphical User Interface* (*GUI*). GUI is a user-friendly interface that allows user to interact with the computer via menus and icons. High-level programming languages are used for the writing of programs.

- ***Computing Characteristics*** The computation time is in picoseconds.

- ***Physical Appearance*** They are smaller than the computers of the previous generation. Some can even fit into the palm of the hand.

- ***Application*** They became widely available for commercial purposes. Personal computers became available to the home user.

- ***Examples*** The Intel 4004 chip was the first microprocessor. The components of the computer like Central Processing Unit (CPU) and memory were located on a single chip. In 1981, IBM introduced the first computer for home use. In 1984, Apple introduced the Macintosh.

The microprocessor has resulted in the fourth generation computers being smaller and cheaper than their predecessors. The fourth generation computers are also portable and more reliable. They generate much lesser heat and require less maintenance compared to their predecessors. GUI and pointing devices facilitate easy use and learning on the computer. Networking has resulted in resource sharing and communication among different computers.

Fifth Generation (Present and Next): Using Artificial Intelligence

The goal of fifth generation computing is to develop computers that are capable of learning and self-organization. The fifth generation computers use *Super Large Scale Integrated (SLSI)* chips that are able to store millions of components on a single chip. These computers have large memory requirements.

This generation of computers uses *parallel processing* that allows several instructions to be executed in parallel, instead of serial execution. Parallel processing results in faster processing speed. The Intel dual-core microprocessor uses parallel processing.

The fifth generation computers are based on *Artificial Intelligence (AI)*. They try to simulate the human way of thinking and reasoning. Artificial Intelligence includes areas like Expert System (ES), Natural Language Processing (NLP), speech recognition, voice recognition, robotics, etc.

ORGANIZATION OF COMPUTER SYSTEM COMPONENTS:

A computer is a fast and accurate symbol manipulating system that is organized to accept, store, and process data and produce output results under the direction of a stored program of instructions.

INPUT DEVICES Computer systems use many devices for input purpose.

CENTRAL PROCESSING UNIT The heart of any computer system is the central processing unit (CPU). The primary storage section, the arithmetic logic section, and the control section. But these three sections aren't unique to personal computer: They are found in CPUs of all sizes.

OUTPUT DEVICES Like input units, output devices are instruments of interpretation and communication between humans and computer systems of all sizes. These devices take output results from the CPU in machine coded form and convert them into a form

that can be used (a) by people (e. g. a printed and/or displayed report) or (b) as machine input in another processing cycle.

Computer Languages:

The different types of computer languages can be broadly classified into two types; assembly level language and high level language.

An **assembly language** is a low-level programming language for a computer, or other programmable device, in which there is a very strong (generally one-to-one) correspondence between the language and the architecture's machine code instructions. Each assembly language is specific to particular computer architecture, in contrast to most high-level programming languages, which are generally portable across multiple architectures, but require interpreting or compiling.

Assembly language is converted into executable machine code by a program referred to as an *assembler*; the conversion process is referred to as *assembly*, or *assembling* the code.

A **High level language** enables a programmer to write programs that are more or less independent of a particular type of computer. Such languages are considered high-level because they are closer to human languages and further from machine languages. In contrast, languages are considered low-level because they are very close to machine languages.

The main advantage of high-level languages over low-level languages is that they are easier to read, write, and maintain. Ultimately, programs written in a high-level language must be translated into machine language by a compiler or interpreter.

The first high-level programming languages were designed in the 1950s. Now there are dozens of different languages, including Ada, Algol, BASIC, COBOL, C, C++, FORTRAN, LISP, Pascal, and Prolog.

What is Hardware and Software?

Hardware refers to the physical parts of a computer system. Some basic computer **hardware** includes the motherboard, CPU, RAM, hard drive, etc.

Software means *computer instructions or data*. Anything that can be stored electronically is software, in contrast to storage devices and display devices which are called hardware.

Types of Software:

Computer software can be put into categories based on common function, type, or field of use. There are three broad classifications:

- *Application software* is the general designation of computer programs for performing user tasks. Application software may be general purpose (word processing, web browsers ...) or have a specific purpose (accounting, truck scheduling ...). Application software contrast with system software. Applications software includes programs that do real work for users. For example, word processors, spreadsheets, and database management systems fall under the category of applications software.
- *System software* is a generic term referring to the computer programs used to start and run computer systems and networks. Systems software includes the operating system and all the utilities that enable the computer to function.

Processing of a computer program:

Program is a set of instructions given in a particular sequence and having a predefined meaning which gives to computer to achieve a desired output.

Suppose, **c = a + b** is to be performed. It requires some input and gives a desired output. In between there will be some calculations. So the some unit will be required that performs calculations. The values of a, b and c will need to be stored, the storage unit will be required to do this. To co-ordinate between these units, a control unit is required. Thus, to execute a program, hardware is also required.

Processing Instructions

The instructions are written in the form of code. To write these instructions, a programming language is used. It is a language understood by the computer.

A computer has two inseparable parts-hardware and software. The instructions are the software and the physical components of a computer that are used in the process are the hardware.

The instructions in this case will be-to read two numbers, perform addition, and then display the result.Thus,some input will be required which will be processed and the end result will be the desired output.

Input and output are the inherent parts of interaction with a computer system.

Let's say, the entire system can be shown to work as **Input →Process→Output.**

The components of a computer system, involved in this process are-

- **Input devices**- keyboard, mouse, scanner, joystick, camera, etc...
- **Central Processing Unit**- Control unit, ALU, Primary storage unit.
- **Output devices**- monitor, printer, speakers, headphones, etc...

The data which is input by the user is temporarily stored in the Random Access Memory (primary storage unit) before processing it. The Central Processing Unit(CPU) processes the data. It is then either displayed to the user through the output or stored on the secondary storage device.

RAM: RAM is a temporary storage device. So, to store data permanently, it is stored on the hard disk which is also called the secondary storage device.

What is Operating System?

The interaction between hardware and software is called operating system. Example Windows, UNIX, LINUX, etc…

Classification of computers:

The digital computers that are available nowadays vary in their sizes and types. The computers are broadly classified into four categories (**Figure**) based on their size and type—(1) Microcomputers, (2) Minicomputers, (3) Mainframe computers, and (4) Supercomputer.

Figure: Classification of computers based on size and type

Microcomputers

Microcomputers are small, low-cost and single-user digital computer. They consist of CPU, input unit, output unit, storage unit and the software. Although microcomputers are stand-alone machines, they can be connected together to create a network of computers that can serve more than one user. IBM PC based on Pentium microprocessor and Apple Macintosh is some examples of microcomputers. Microcomputers include desktop computers, notebook computers or laptop, tablet computer, handheld computer, smart phones and netbook, as shown in **Figure**

Figure : Microcomputers

- ***Desktop Computer or Personal Computer (PC)*** is the most common type of microcomputer. It is a stand-alone machine that can be placed on the desk. Externally, it consists of three units—keyboard, monitor, and a system unit containing the CPU, memory, hard disk drive, etc. It is not very expensive and is suited to the needs of a single user at home, small business units, and organizations. Apple, Microsoft, HP, Dell and Lenovo are some of the PC manufacturers.

- ***Notebook Computers or Laptop*** resembles a notebook. They are portable and have all the features of a desktop computer. The advantage of the laptop is that it is small in size (can be put inside a briefcase), can be carried anywhere, has a battery backup and has all the functionality of the desktop. Laptops can be placed on the lap while working (hence the name). Laptops are costlier than the desktop machines.

- ***Netbook*** These are smaller notebooks optimized for low weight and low cost, and are designed for accessing web-based applications. Starting with the earliest netbook in late 2007, they have gained significant popularity now. Netbooks deliver the performance needed to enjoy popular activities like streaming videos or music, emailing, Web surfing or instant messaging. The word *netbook* was created as a blend of Inter*net* and note*book*.

- ***Tablet Computer*** has features of the notebook computer but it can accept input from a stylus or a pen instead of the keyboard or mouse. It is a portable computer. Tablet computer are the new kind of PCs.

- ***Handheld Computer or Personal Digital Assistant (PDA)*** is a small computer that can be held on the top of the palm. It is small in size. Instead of the keyboard, PDA uses a pen or a stylus for input. PDAs do not have a disk drive. They have a limited memory and are less powerful. PDAs can be connected to the Internet via a wireless connection. Casio and Apple are some of the manufacturers of PDA. Over the last few years, PDAs have merged into mobile phones to create smart phones.

- ***Smart Phones*** are cellular phones that function both as a phone and as a small PC. They may use a stylus or a pen, or may have a small keyboard. They can be connected to the Internet wirelessly. They are used to access the electronic-mail, download music, play games, etc. Blackberry, Apple, HTC, Nokia and LG are some of the manufacturers of smart phones.

Minicomputers

Minicomputers (**Figure**) are digital computers, generally used in multi-user systems. They have high processing speed and high storage capacity than the

microcomputers. Minicomputers can support 4–200 users simultaneously. The users can access the minicomputer through their PCs or terminal. They are used for real-time

applications in industries, research centers, etc. PDP 11, IBM (8000 series) are some of the widely used minicomputers.

Figure: Minicomputer

Mainframe Computers

Mainframe computers (**Figure**) are multi-user, multi-programming and high performance computers. They operate at a very high speed, have very large storage capacity and can handle the workload of many users. Mainframe computers are large and powerful systems generally used in centralized databases. The user accesses the mainframe computer via a terminal that may be a dumb terminal, an intelligent terminal or a PC. A *dumb terminal* cannot store data or do processing of its own. It has the input and output device only. An *intelligent terminal* has the input and output device, can do processing, but, cannot store data of its own. The dumb and the intelligent terminal use the processing power and the storage facility of the mainframe computer. Mainframe computers are used in organizations like banks or companies, where many people require frequent access to the same data. Some examples of mainframes are CDC 6600 and IBM ES000 series.

Figure: Mainframe computer

Supercomputers

Supercomputers (**Figure**) are the fastest and the most expensive machines. They have high processing speed compared to other computers. The speed of a supercomputer is generally measured in FLOPS (FLoating point Operations Per Second). Some of the faster supercomputers can perform trillions of calculations per second. Supercomputers are built by interconnecting thousands of processors that can work in parallel.

Figure: Supercomputer

Supercomputers are used for highly calculation-intensive tasks, such as, weather forecasting, climate research (global warming), molecular research, biological research, nuclear research and aircraft design. They are also used in major universities, military agencies and scientific research laboratories. Some examples of supercomputers are IBM Roadrunner, IBM Blue gene and Intel ASCI red. PARAM is a series of supercomputer assembled in India by C-DAC (Center for Development of Advanced Computing), in Pune. PARAM Padma is the latest machine in this series. The peak computing power of PARAM Padma is 1 Tera FLOP (TFLOP).

According to functionality, computers are classified as:

Analog Computer

An analog computer (spelt analogue in British English) is a form of computer that uses *continuous* physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved

Digital Computer

A computer that performs calculations and logical operations with quantities represented as digits, usually in the binary number system

Hybrid Computer (Analog + Digital)

A combination of computers those are capable of inputting and outputting in both digital and analog signals. A hybrid computer system setup offers a cost effective method of performing complex simulations.

Computer - Number System

When we type some letters or words, the computer translates them in numbers as computers can understand only numbers.

A computer can understand positional number system where there are only a few symbols called digits and these symbols represent different values depending on the position they occupy in the number.

A value of each digit in a number can be determined using:

- The digit
- The position of the digit in the number
- The base of the number system (where base is defined as the total number of digits available in the number system).

Decimal Number System

The number system that we use in our day-to-day life is the decimal number system. Decimal number system has base 10 as it uses 10 digits from 0 to 9. In decimal number system, the successive positions to the left of the decimal point represent units, tens, hundreds, thousands and so on.

Each position represents a specific power of the base (10). For example, the decimal number 1234 consists of the digit 4 in the units position, 3 in the tens position, 2 in the hundreds position, and 1 in the thousands position, and its value can be written as

(1x1000)+ (2x100)+ (3x10)+ (4xl)

$(1x10^3)+ (2x10^2)+ (3x10^1)+ (4xl0^0)$

1000 + 200 + 30 + 4

1234

As a computer programmer or an IT professional, you should understand the following number systems, which are frequently used in computers.

S.N.	Number System & Description
1	**Binary Number System** Base 2. Digits used: 0, 1
2	**Octal Number System** Base 8. Digits used: 0 to 7
4	**Hexa Decimal Number System** Base 16. Digits used: 0 to 9, Letters used: A- F

Binary Number System

Characteristics

- Uses two digits, 0 and 1.
- Also called base 2 number system.
- Each position in a binary number represents a 0 power of the base (2). Example, 2^0.
- Last position in a binary number represents a x power of the base (2). Example, 2^x where x represents the last position - 1.

Example

Binary Number: 10101_2

Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	10101_2	$((1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0))_{10}$
Step 2	10101_2	$(16 + 0 + 4 + 0 + 1)_{10}$
Step 3	10101_2	21_{10}

Note: 10101_2 is normally written as 10101.

Octal Number System

Characteristics

- Uses eight digits: 0, 1, 2, 3, 4, 5, 6, 7.
- Also called base 8 number system.
- Each position in a octal number represents a 0 power of the base (8). Example, 8^0.
- Last position in a octal number represents a x power of the base (8). Example, 8^x where x represents the last position - 1.

Example

Octal Number: 12570_8

Calculating Decimal Equivalent:

Step	Octal Number	Decimal Number
Step 1	12570_8	$((1 \times 8^4) + (2 \times 8^3) + (5 \times 8^2) + (7 \times 8^1) + (0 \times 8^0))_{10}$
Step 2	12570_8	$(4096 + 1024 + 320 + 56 + 0)_{10}$
Step 3	12570_8	5496_{10}

Note: 12570_8 is normally written as 12570.

Hexadecimal Number System

Characteristics

- Uses 10 digits and 6 letters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F.
- Letters represent numbers starting from 10. A = 10. B = 11, C = 12, D = 13, E = 14, F = 15.
- Also called base 16 number system.
- Each position in a hexadecimal number represents a 0 power of the base (16). Example, 16^0.
- Last position in a hexadecimal number represents a x power of the base (16). Example, 16^x where x represents the last position - 1.

Example

Hexadecimal Number: $19FDE_{16}$

Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	$19FDE_{16}$	$((1 \times 16^4) + (9 \times 16^3) + (F \times 16^2) + (D \times 16^1) + (E \times 16^0))_{10}$
Step 2	$19FDE_{16}$	$((1 \times 16^4) + (9 \times 16^3) + (15 \times 16^2) + (13 \times 16^1) + (14 \times 16^0))_{10}$
Step 3	$19FDE_{16}$	$(65536 + 36864 + 3840 + 208 + 14)_{10}$
Step 4	$19FDE_{16}$	106462_{10}

Note: $19FDE_{16}$ is normally written as 19FDE.

Computer - Number Conversion

There are many methods or techniques, which can be used to convert numbers from one base to another. We'll demonstrate here the following:

- Decimal to Other Base System
- Other Base System to Decimal
- Other Base System to Non-Decimal
- Shortcut method - Binary to Octal
- Shortcut method - Octal to Binary
- Shortcut method - Binary to Hexadecimal
- Shortcut method - Hexadecimal to Binary

Decimal to Other Base System

Steps

- **Step 1** - Divide the decimal number to be converted by the value of the new base.
- **Step 2** - Get the remainder from Step 1 as the rightmost digit (least significant digit) of new base number.
- **Step 3** - Divide the quotient of the previous divide by the new base.
- **Step 4** - Record the remainder from Step 3 as the next digit (to the left) of the new base number.

Repeat Steps 3 and 4, getting remainders from right to left, until the quotient becomes zero in Step 3.

The last remainder thus obtained will be the most significant digit (MSD) of the new base number.

Example

Decimal Number: 29_{10}

Calculating Binary Equivalent:

Step	Operation	Result	Remainder
Step 1	29 / 2	14	1
Step 2	14 / 2	7	0
Step 3	7 / 2	3	1
Step 4	3 / 2	1	1
Step 5	1 / 2	0	1

As mentioned in Steps 2 and 4, the remainders have to be arranged in the reverse order so that the first remainder becomes the least significant digit (LSD) and the last remainder becomes the most significant digit (MSD).

Decimal Number: 29_{10} = Binary Number: 11101_2.

Other base system to Decimal System

Steps

- **Step 1** - Determine the column (positional) value of each digit (this depends on the position of the digit and the base of the number system).
- **Step 2** - Multiply the obtained column values (in Step 1) by the digits in the corresponding columns.
- **Step 3** - Sum the products calculated in Step 2. The total is the equivalent value in decimal.

Example

Binary Number: 11101_2

Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	11101_2	$((1 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0))_{10}$
Step 2	11101_2	$(16 + 8 + 4 + 0 + 1)_{10}$
Step 3	11101_2	29_{10}

Binary Number: 11101_2 = Decimal Number: 29_{10}

Other Base System to Non-Decimal System

Steps

- **Step 1** - Convert the original number to a decimal number (base 10).
- **Step 2** - Convert the decimal number so obtained to the new base number.

Example

Octal Number: 25_8

Calculating Binary Equivalent:

Step 1: Convert to Decimal

Step	Octal Number	Decimal Number
Step 1	25_8	$((2 \times 8^1) + (5 \times 8^0))_{10}$
Step 2	25_8	$(16 + 5)_{10}$

Step 3	25_8	21_{10}

Octal Number: 25_8 = Decimal Number: 21_{10}
Step 2: Convert Decimal to Binary

Step	Operation	Result	Remainder
Step 1	21 / 2	10	1
Step 2	10 / 2	5	0
Step 3	5 / 2	2	1
Step 4	2 / 2	1	0
Step 5	1 / 2	0	1

Decimal Number: 21_{10} = Binary Number: 10101_2

Octal Number: 25_8 = Binary Number: 10101_2

Shortcut method - Binary to Octal

Steps

- **Step 1** - Divide the binary digits into groups of three (starting from the right).
- **Step 2** - Convert each group of three binary digits to one octal digit.

Example

Binary Number: 10101_2

Calculating Octal Equivalent:

Step	Binary Number	Octal Number
Step 1	10101_2	010 101
Step 2	10101_2	2_8 5_8

Step 3	10101_2	25_8

Binary Number: 10101_2 = Octal Number: 25_8

Shortcut method - Octal to Binary

Steps

- **Step 1** - Convert each octal digit to a 3-digit binary number (the octal digits may be treated as decimal for this conversion).
- **Step 2** - Combine all the resulting binary groups (of 3 digits each) into a single binary number.

Example

Octal Number: 25_8

Calculating Binary Equivalent:

Step	Octal Number	Binary Number
Step 1	25_8	2_{10} 5_{10}
Step 2	25_8	010_2 101_2
Step 3	25_8	010101_2

Octal Number: 25_8 = Binary Number: 10101_2

Shortcut method - Binary to Hexadecimal

Steps

- **Step 1** - Divide the binary digits into groups of four (starting from the right).
- **Step 2** - Convert each group of four binary digits to one hexadecimal symbol.

Example

Binary Number: 10101_2

Calculating hexadecimal Equivalent:

Step	Binary Number	Hexadecimal Number
Step 1	10101_2	0001 0101
Step 2	10101_2	1_{10} 5_{10}
Step 3	10101_2	15_{16}

Binary Number: 10101_2 = Hexadecimal Number: 15_{16}

Shortcut method - Hexadecimal to Binary

Steps

- **Step 1** - Convert each hexadecimal digit to a 4-digit binary number (the hexadecimal digits may be treated as decimal for this conversion).
- **Step 2** - Combine all the resulting binary groups (of 4 digits each) into a single binary number.

Example

Hexadecimal Number: 15_{16}

Calculating Binary Equivalent:

Step	Hexadecimal Number	Binary Number
Step 1	15_{16}	1_{10} 5_{10}
Step 2	15_{16}	0001_2 0101_2

Step 3	15_{16}	00010101_2

Hexadecimal Number: 15_{16} = Binary Number: 10101_2

User Interface

As mentioned above, users generally use either the command line interface or the GUI to interact with the operating system. The user interface or *human–machine interface* is the part of the machine that handles the human–machine interaction. Membrane switches, rubber keypads and touchscreens are examples of the physical part of the Human Machine Interface which we can see and touch.

In complex systems, the human–machine interface is typically computerized. The term *human–computer interface* refers to this kind of system. In the context of computing the term typically extends as well to the software dedicated to control the physical elements used for human-computer interaction.

The engineering of the human–machine interfaces is enhanced by consideringergonomics (human factors). The corresponding disciplines are human factors engineering (HFE) and usability engineering(UE), which is part of systems engineering.

Tools used for incorporating human factors in the interface design are developed based on knowledge of computer science, such as computer graphics, operating systems, programming languages. Nowadays, we use the expression graphical user interface for human–machine interface on computers, as nearly all of them are now using graphics.

Command Interpreter

Some operating systems include the command interpreter in the kernel. Some, such as the popular Windows and Linux operating systems, use the command interpreter as a special program that runs when a user logs on or a job is initiated.

- in Windows, this is the MS-DOS prompt.

- Linux has more options. The command interpreter in Linux is known as a shell. The most commonly used shell is the Bash shell, but others such as the Korn shell, C shell, and Bourne shell exist. Most shells provide similar functionality, personal preference usually dictates which shell is best.
- The main function of the command utility is to receive and execute the next user generated command.
    - Many commands are intended to manipulate files.
    - Operating systems such as UNIX implements commands through system programs. Often these programs are stored as text files, which allows programmers to add additional functionality to the utility.

Graphical User Interfaces

- A GUI provides a mouse-based windows and menu system as an interface.
- Users of Windows are more likely to use the GUI rather than the command line interface of MS-DOS, while UNIX users generally prefer using the command line interface of the shell rather than the GUI.

1945–1968: Batch interface

the batch era, computing power was extremely scarce and expensive. User interfaces were rudimentary. Users had to accommodate computers rather than the other way around; user interfaces were considered overhead, and software was designed to keep the processor at maximum utilization with as little overhead as possible.

The input side of the user interfaces for batch machines were mainly punched cardsor equivalent media like paper tape. The output side added line printers to these media. With the limited exception of the system operator's console, human beings did not interact with batch machines in real time at all.

Early batch systems gave the currently running job the entire computer; program decks and tapes had to include what we would now think of as operating system code to talk to I/O devices and do whatever other housekeeping was needed. Midway through the batch period, after 1957, various groups began to experiment with so-called "load-and-go" systems. These used a monitor program which was always resident on the computer.

Programs could call the monitor for services. Another function of the monitor was to do better error checking on submitted jobs, catching errors earlier and more intelligently and generating more useful feedback to the users. Thus, monitors represented a first step towards both operating systems and explicitly designed user interfaces.

Operating system - The operating system is the software which directly controls the hardware and provides an environment in which to run applications software.

The operating system is the main item of system software and without it no computer will work. All applications software runs within the operating system and does not directly interface with the hardware.

Purpose of an Operating System[edit]

The operating system controls the system's hardware and stores and retrieves information from the system's memory. All hardware operates in a slightly different way and it is the operating system that hides this complexity from the applications software. Without this buffer between the hardware and applications every application would need to be written to work with all possible hardware combinations. Instead the applications are written to work with a particular operating system, which works with the hardware.

The operating system:

- Provides an interface between the computer and the Human user.
- Manages the system's resources, such as memory, processing capacity, etc.
- Controls input and output devices.
- Writes and reads data to and from disk.
- Provides an environment in which applications software can be run.
- Controls user access rights.
- Hides the complexities of the hardware from the user.

Types of Operating System

Operating systems can be categorised by how they process data: either in **real-time** or in **batches** as well by whether they are **single-user** of **multi-user**. Whether or not an operating system allows for **multi-tasking** is also an important attribute of an operating system. For managing networks containing many machines it is also necessary to have another type of operating system; a **network** operating system.

The big advantage of computers is that they are fast. They are not clever or magical but often appear to be because they can do so many simple things in a very short amount of time. Even a quite basic modern processor can perform several billion operations per second. The slowest part of any computer system is the Human operating it. In reality this means that a computer spends much of its time waiting for instructions from a Human. In the early days of computers when computer systems were more expensive this inefficiency was a big problem. Batch-processing was used as a means to overcome it.

Batch processing operating system - A batch processing operating system is one where processing requests are grouped together in batches to be run all at once.

By grouping processing requests together into batches computers can be used more efficiently by removing the slowest part of the system; the user. These days when computers are cheaper it is sometimes more desirable for operating systems to run in real-time.

Real-time operating system - A real-time operating system is one in which processing requests made by the user are executed immediately.

Batch processing is still used in computer systems where there are large amounts of data to be processed, such as in bank mainframes which process millions of customer records. Real-time processing is more common in systems where responsiveness is important such as when running simulations.

A **single-user** operating system is one which allows a single user to access it at any one time. Although there may be different users with different access rights only one user can use the system at once. The desktop PCs, laptops, tablets and so on that you will be used to using operate this kind of operating system. By contrast a **multi-user** operating system allows several users to access it simultaneously. An example of this type of operating system is known as a thin client system, which consists of a single powerful computer and several dumb terminals. The dumb terminals simply provide an interface with the server which is where all processing takes place.

User interface - The features of a computer system which allows the user to interact with it.

A user interface, also sometimes called a human-computer interface, comprises both hardware and software components. It handles the interaction between the user and the system.

There are different ways of interacting with computer systems which have evolved over the years. There are five main types of user interface:

- command line
- graphical user interface (GUI)
- menu driven
- form based
- natural language

Command Line Interface

Command line interfaces are the oldest of the interfaces discussed here. It involves the computer responding to commands typed by the operator. This type of interface has the drawback that it requires the operator to remember a range of different commands and is not ideal for novice users.

Graphical User Interface

Graphical user interfaces (GUI) are sometimes also referred to as WIMP because they use Windows, Icons, Menus and Pointers. Operators use a pointing device (such as a mouse, touchpad or trackball) to control a pointer on the screen which then interacts with other on-screen elements. It allows the user to interact with devices through graphical icons and visual indicators such as secondary notations. The term was created in the 1970s to distinguish graphical interfaces from text-based ones, such as command line interfaces. However, today nearly all digital interfaces are GUIs. The first commercially available GUI, called "PARC," was developed by Xerox. It was used by the Xerox 8010 Information System, which was released in 1981. After Steve Jobs saw the interface during a tour at Xerox, he had his team at Apple develop an operating system with a similar design. Apple's GUI-based OS was included with the Macintosh, which was released in 1984. Microsoft released their first GUI-based OS, Windows 1.0, in 1985.

Menu Driven

A menu driven interface is commonly used on cash machines (also known as automated teller machines (ATM's), ticket machines and information kiosks (for example in a museum). They provide a simple and easy to use interface comprised of a series of menus and sub-menus which the user accesses by pressing buttons, often on a touch-screen device.preferably if one has knowledge on UML modeling can be a good example to design architecture of the machine.

Form Based

A form-based interface uses text-boxes, drop-down menus, text areas, check boxes, radio boxes and buttons to create an electronic form which a user completes in order to enter data into a system. This is commonly used on websites to gather data from a user, or in call centres to allow operators to quickly enter information gathered over the phone.

Natural language

A natural language interface is a spoken interface where the user interacts with the computer by talking to it. Sometimes referred to as a 'conversational interface', this interface simulates having a conversation with a computer. Made famous by science fiction (such as in Star Trek), natural language systems are not yet advanced enough to be in wide-spread use. Commonly used by telephone systems as an alternative to the user pressing numbered buttons the user can speak their responses instead.

This is the kind of interface used by the popular iPhone application called Siri and Cortana in Windows.

Utility software

Utility software includes programs which perform functions which help operate and maintain a computer system. This includes disk formatters, automated backup software, hardware device drivers, anti-virus software, firewall software and other similar types of software.

Computer Software & Categories of software:

Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.

There are two types of software

- System Software
- Application Software

System Software

The system software is collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. System software are generally prepared by computer manufactures. These software products comprise of programs written in low-level languages which interact with the hardware at a very basic level. System software serves as the interface between hardware and the end users.

Some examples of system software are Operating System, Compilers, Interpreter, Assemblers etc.

Features of system software are as follows:

- Close to system
- Fast in speed
- Difficult to design
- Difficult to understand

- Less interactive

- Smaller in size
- Difficult to manipulate
- Generally written in low-level language

Application Software

Application software products are designed to satisfy a particular need of a particular environment. All software applications prepared in the computer lab can come under the category of Application software.

Application software may consist of a single program, such as a Microsoft's notepad for writing and editing simple text. It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package.

Examples of Application software are following:

- Payroll Software
- Student Record Software
- Inventory Management Software
- Income Tax Software
- Railways Reservation Software
- Microsoft Office Suite Software
- Microsoft Word
- Microsoft Excel
- Microsoft Powerpoint

Features of application software are as follows:

- Close to user
- Easy to design
- More interactive

- Slow in speed

- Generally written in high-level language
- Easy to understand
- Easy to manipulate and use
- Bigger in size and requires large storage space

KARPAGAM ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF COMPUTER SCIENCE

I B.Sc IT (Batch 2018-2021)

COMPUTER FUNDAMENTALS

PART - A OBJECTIVE TYPE/MULTIPLE CHOICE QUESTIONS

ONLINE EXAMINATIONS ONE MARKS QUESTIONS

UNIT I

S.No	Questions	Option1	Option2	Option3	Option4	Answer
1	Computer come from the word	compute	calculate	create	device	**compute**
2	Processing data using a Computer is called	computing	data processing	information	output	**data processing**
3	An _____ machine works by itself	computer	Auto	Automatic	human	**Automatic**
4	Characteristics of computer	Speed	Memory	Disks	Cables	Speed
5	A computer is a very fast device. It can perform in	few minutes	few hours	few days	few seconds	**few seconds**
6	Computer are very fast and	Accurate	error	Human	correct	**Accurate**
7	A Computer is free from tiredness	Speed	Diligence	Accurate	Automatic	**Diligence**

8	_____ is one of the most wonderful thing about a computer	Versatility	data processing	Speed	None	**Versatility**
9	A computer can store and recall any amount of Information of its	Primary memory	Secondary memory	storage	memory	**Secondary memory**
10	Computer has	intelligance	no intelligence	decision	None	**no intelligence**
11	Computers are _____ of emotions	devoid	void	feelings	fast	**devoid**
12	_____ is father of modern digital computers	Blaise Pascal	Baron Gottfried	Charles Babbage	John Von Neumann	**Charles Babbage**
13	_____ also known as Automatic Sequenced Controlled calculator	Mark I	IBM	ENIAC	UNIVAC	**Mark I**
14	The Electronic Numerical Integrator and Calculator was the first	calculator	digital computer	electronic computer	Mechanical	**electronic computer**
15	stored programs are used in	EDVAC	Mark I	IBM	ENIAC	**EDVAC**
16	The machine executed its first program	Mark I	IBM	EDSAC	ENIAC	**EDSAC**
17	The UNIVAC I was the first _____ computer	Digital	Electronic	Mechanical	Automatic	**Digital**
18	_____ is used in First Generation Computers.	Vacuum Tubes	Transistors	IC Chips	None	**Vacuum Tubes**
19	Power consumption of First Generation Computers are	low	High	large	wide	High
20	_____ is required for First Generation Computers	constant maintenance	low maintenance	no maintenance	less maintenance	**constant maintenance**

21	Second Generation Computers used _____	Transistor	Vacuum Tubes	IC Chips	Filaments	**Transistor**
22	Second Generation Computers are _____	Small	reliable	Medium	Portable	reliable
23	Second Generation Computers have _____	Primary memory/Secondary memory	RAM	ROM	Processors	Primary memory/Secondary
24	SCI means	small scale Integration	smart scale Integration	super scale Integration	sub scale Integration	**small scale Integration**
25	MSI means	Modern scale Integration	Medium scale Integration	Multi scale Integration	None	**Medium scale Integration**
26	IC technology was also known as	microelectronics	minielectronics	silicon chip	None	**microelectronics**
27	Performance of one million instructions per second in	first Generation	second Generation	Third Generation	fourth Generation	**Third Generation**
28	Random Access Memory is in	first Generation	second Generation	Third Generation	fourth Generation	**Third Generation**
29	FORTRAN and COBOL were in	first Generation	second Generation	Third Generation	fourth Generation	**Third Generation**
30	Timesharing is allowed in	first Generation	second Generation	Third Generation	fourth Generation	**Third Generation**
31	Microprocessor is used in _____ Generation	Third Generation	Fourth Generation	Fifth Generation	Recent Generation	**Fourth Generation**
32	GUI in introduced during_____ Generation	Third Generation	Fourth Generation	Fifth Generation	Recent Generation	**Fourth Generation**
33	In_____ multiple people work on Single Project.	groupware	peopleware	Software	Middleware	**groupware**

34	VLSI used in _____ Generation.	Third Generation	Fourth Generation	Fifth Generation	Recent Generation	**Fourth Generation**
35	ULSI used in _____ Generation	Third Generation	Fourth Generation	Fifth Generation	Recent Generation	**Fifth Generation**
36	CDROM used in _____ Generations	Third Generation	Fourth Generation	Fifth Generation	Recent Generation	**Fifth Generation**
37	WWW used in _____ Generations	Third Generation	Fourth Generation	Fifth Generation	Recent Generation	**Fifth Generation**
38	Binary Number consists of	0,1	0 to 9	0- 7	0- 8	0,1
39	Octal number consists of	0,1	0 to 9	0- 7	0- 8	0- 7
40	Hexa Decimal Number consists of	0,1	0 to 9	0- 7	0- 9, A-Z	**0- 9, A-Z**
41	for Convertion of Binary to Decimal	Multiply by 2	Divide by 2	ADD by 2	Multiply by 2 power	**Multiply by 2 power**
42	for Convertion of Octal to Decimal	Multiply by 8	Divide by 8	ADD by 8	Multiply by 8 power	**Multiply by 8 power**
43	for Convertion of Hexa to Decimal	Multiply by 16	Divide by 16	ADD by 16	Multiply by 16 power	**Multiply by 16 power**
44	for convertion of Decimal to Binary	Multiply by 2	Divide by 2	ADD by 2	Multiply by 2 power	**Divide by 2**
45	Convertion of (11010011)2 is	(D3)16	(2345)8	(78934)10	(45678)7	**(D3)16**
46	Convertion of fraction number is	Possible	Not Possible	Not Allowed	None	**Possible**

47	Binary Arithmatic means	Binary Addition	Binary Subtraction	Binary Multyplication	All the Above	**All the Above**
48	In Binary Addition 1+1 =	1	10	0 with carry 1	1 with carry 0	**0 with carry 1**
49	In Binary Subtraction 1-1 =	1	0	Borrow 1	carry 1	0
50	In Binary Subtraction 0-1 =	1	0	Borrow 1	carry 1	Borrow 1
51	Types of Software are _____	System Software/Application software	C++	Program	O/S	System Software/Application
52	System Software support for the Development of	System Software	Application Software	Program	Both A and B	**Application Software**
53	Application Software is a set of one or more programs	specific problems	General problems	Operating Systems	translator	**specific problems**
54	Example of System Software are _____	Operating Systems	C++	JAVA	Backup	Operating Systems
55	Example of Application Software are	Linux	Unix	C++	Network	C++
56	Operating System support for _____	User Interface	Manage Resources	Process Management	All the Above	**All the Above**
57	_____ is the amount of work that a System is able to do per unit time.	Throughput	Turnaround time	Response Time	None	**Throughput**
58	_____ are the function of OS	Process Management	Memory	Controls	Processor	Process Management
59	Process Management are done to a Job	Minimize idle time	Scheduling	sharing	Batch Processing	**Minimize idle time**

60	Multiprogramming is _____.	Batch Processing	Load Balancing	Execution of many programs	more Processor	**Execution of many programs**

KARPAGAM ACADEMY OF HIGHER EDUCATION

SUBJECT NAME : COMPUTER FUNDAMENTALS **CLASS : III B.Sc. (IT)**
SUBJECT CODE :18ITU103 **UNIT II** **SEMESTER : I**
BATCH (2018-2021)

UNIT-II

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter.

Some of the important input devices which are used in a computer −

- Keyboard
- Mouse
- Joy Stick
- Light pen
- Track Ball
- Scanner
- Graphic Tablet
- Microphone
- Magnetic Ink Card Reader(MICR)
- Optical Character Reader(OCR)
- Bar Code Reader
- Optical Mark Reader(OMR)

MOUSE

WIRELESS MOUSE:

The Mouse without wire or cord is called wireless mouse or cordless mouse. Most wireless mice use radiofrequency (RF) technology to communicate information to your computer. Since RF devices require two main components: a transmitter and a receiver,thats why wireless mouse also requires it.

Working:

• The transmitter is housed in the mouse. It sends an electromagnetic (radio) signal that encodes the information about the mouse's movements and the buttons you click.

• The receiver, which is connected to your computer, accepts the signal, decodes it and passes it on to the mouse driver software and your computer's operating system.

• The receiver can be a separate device that plugs into your computer, a special card that you place in an expansion slot, or a built-in component.

GSTICK MOUSE:

Gordon Stewart designed the Stick to add a more authentic and natural feel to artistic manipulations on both Macs and PCs. These mice are Wireless and pocket-sized. It looks like a pencil. gStick mouse is like a pencil. It can be used for web browsing, office work or whatever you do with your traditional mouse, with more comfort. It also features a scroll wheel that can be manipulated with a finger or thumb a button on either side of the wheel. It's claimed that a single AAA battery will power the gStick for between three and five months.

OPTICALMOUSE:

An optical mouse is an computer pointing device that uses a light-emitting diode an optical sensor, and digital

signal processing (DSP).This mouse doesn't have mouse ball and electromechanical transducer. Movement is detected by sensing changes in reflected light, instead of interpreting the motion of a rolling sphere. an optical mouse does not have moving parts thats why there is no need of cleaning .Also there is no mechanical fatigue and failure in this type of mice. The optical mouse takes microscopic snapshots of the working surface at a rate of more than 1,000 images per second. If the mouse is moved, the image changes. The best surfaces reflect but scatter light; an example is a blank sheet of white drawing paper. Some surfaces do not allow the sensor and DSP to function properly because the irregularities are too small to be detected. An example of a poor optical-mousing surface is unfrosted glass.

ATRACKBALLMOUSE:

A trackball mouse is a pointing device. It consists of a ball held by a socket containing sensors to detect a rotation of the ball. The user rolls the ball with the thumb, fingers, or the palm of the hand to move a pointer. the operator just continues rolling with trackball but a mouse would have to be lifted and re-positioned. Some trackballs, such as Logitech's optical-pickoff types, have notably low friction, as well as being dense (glass), so they can be spun to make them coast. Large trackballs are common on CAD workstations.

MECHANICAL MOUSE OR BALL MOUSE:

In 1972, Bill English (builder of Engelbart's original mouse) invented the ball mouse, while working for Xerox PARC. In this, a single mouse was replaced by the external wheels, which could roll in any direction.

Mechanical mouse is a device integrated with an internal metal or rubber ball, which can spin in all directions (left, right, up and down). Thus, the display cursor moves as the mouse detects the direction. The ball in the mechanical mouse spins when it comes in contact with surface on which it is placed.

JOYSTICK

A **joystick** is an input device that allows the user to control a character or machine in a computer program, such as a plane in a flight simulator. They look similar to the control device you would find on an arcade game, but nearly always include extra buttons for additional functionality. The picture shows the Logitech Freedom 2.4, an example of a joystick.

When was the first joystick invented?

The first joystick was invented at the U.S. Naval Research Laboratory by C. B. Mirick and patented in1926. It was a two-axis electronic joystick, similar to the joysticks in use today, and was original designed for remotely piloting aircraft.

Computer joystick ports

Today, most computer joysticks connect to the computer using a USB port. Below is a listing of all of the type of ports that have accepted a joystick.

- Bluetooth
- Game port
- Serial Port
- USB

Work on joystick

A joystick is connected to two potentiometers. Each potentiometer is used to record for left and right and forward and backward movements. When a joystick is moved these two potentiometers sends the details of the y and x co=ordinates to the Central Processing Unit and the required movement is achieved.

2 .the second methods are based on the reflection of light. the light is surfaced on the paper .when lesser amount of light is transmitted through the dot the filled box can be recognized .OMR can evaluate only those documents, which are printed with the marked positions in the specified areas.

BAR CODE READER

Bar-code readers, **price scanner**, **point-of-sale (POS) scanner** or **barcode scanners**are generally found in supermarkets and large departmental stores. It is a type of scanner which is used for reading printed barcodes.

Barcode Reader (BCR) definition

A barcode reader is a hand-held or stationary input device used to capture and read information contained in a barcode.

A bar-code reader consists of a a lens, light source and a light sensor which translates optical impulses into electrical ones. Moreover, nearly all barcode readers consists of a decoder circuitry that analyzes the barcode's image data provided by the sensor and sends the barcode's content to the scanner's output port.

There are currently four different types of barcode scanners available. Each uses a slightly different technology for reading and decoding a barcode. There are pen type readers (i.e. barcode wands), laser scanners, CCD readers and camera based readers.

Pen Type Readers and Laser Scanners

Pen type readers consist of a light source and a photo diode that are placed next to each other in the tip of a pen or wand. To read a barcode, you drag the tip of the pen across all the bars in a steady even motion. The photo diode measures the intensity of the light reflected back from the light source and generates a waveform that is used to measure the widths of the bars and spaces in the barcode. Dark bars in the barcode absorb light and white spaces reflect light so that the voltage waveform generated by the photo diode is an exact duplicate of the bar and space pattern in the barcode. This waveform is decoded by the scanner in a manner similar to the way Morse code dots and dashes are decoded.

Laser scanners work the same way as pen type readers except that they use a laser beam as the light source and typically employ either a reciprocating mirror or a rotating prism to scan the laser beam back and forth across the barcode. Just the same as with the pen type reader, a photo diode is used to measure the intensity of the light reflected back from the barcode

Pen type readers and laser scanners can be purchased with different resolutions to enable them to read barcodes of different sizes. The scanner resolution is measured by the size of the dot of light emitted by the reader. The dot of light should be equal to or slightly smaller than the narrowest element width ("X" dimension).

CCD Readers

CCD (Charge Coupled Device) readers use an array of hundreds of tiny light sensors lined up in a row in the head of the reader. Each sensor can be thought of as a single photo diode that measures the intensity of the light immediately in front of it. Each individual light sensor in the CCD reader is extremely small and because there are hundreds of sensors lined up in a row, a voltage pattern identical to the pattern in a barcode is generated in the reader by sequentially measuring the voltages across each sensor in the row.

Monitors

Monitors, commonly called as **Visual Display Unit** (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Flat-Panel Display

Cathode-Ray Tube (CRT) Monitor

The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity or resolution. It takes more than one illuminated pixel to form a whole character, such as the letter 'e' in the word help.

A finite number of characters can be displayed on a screen at once. The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed. Most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically.

There are some disadvantages of CRT −

- Large in Size
- High power consumption

Flat-Panel Display Monitor

The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the CRT. You can hang them on walls or wear them on your wrists. Current uses of flat-panel displays include calculators, video games, monitors, laptop computer, and graphics display.

The flat-panel display is divided into two categories −

- **Emissive Displays** − Emissive displays are devices that convert electrical energy into light. For example, plasma panel and LED (Light-Emitting Diodes).
- **Non-Emissive Displays** − Non-emissive displays use optical effects to convert sunlight or light from some other source into graphics patterns. For example, LCD (Liquid-Crystal Device).

Printers

Printer is an output device, which is used to print information on paper.

There are two types of printers −

- Impact Printers
- Non-Impact Printers

Impact Printers

Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper.

Characteristics of Impact Printers are the following −

- Very low consumable costs
- Very noisy
- Useful for bulk printing due to low cost
- There is physical contact with the paper to produce an image

These printers are of two types −

- Character printers
- Line printers

Character Printers

Character printers are the printers which print one character at a time.

These are further divided into two types:

- Dot Matrix Printer(DMP)
- Daisy Wheel

Dot Matrix Printer

In the market, one of the most popular printers is Dot Matrix Printer. These printers are popular because of their ease of printing and economical price. Each character printed is in the form of pattern of dots and head consists of a Matrix of Pins of size (5*7, 7*9, 9*7 or 9*9) which come out to form a character which is why it is called Dot Matrix Printer.

Advantages

- Inexpensive
- Widely Used
- Other language characters can be printed

Disadvantages

- Slow Speed
- Poor Quality

Daisy Wheel

Head is lying on a wheel and pins corresponding to characters are like petals of Daisy (flower) which is why it is called Daisy Wheel Printer. These printers are generally used for word-processing in offices that require a few letters to be sent here and there with very nice quality.

Advantages

- More reliable than DMP

- Better quality
- Fonts of character can be easily changed

Disadvantages

- Slower than DMP
- Noisy
- More expensive than DMP

Line Printers

Line printers are the printers which print one line at a time.

These are of two types −

- Drum Printer
- Chain Printer

Drum Printer

This printer is like a drum in shape hence it is called drum printer. The surface of the drum is divided into a number of tracks. Total tracks are equal to the size of the paper, i.e. for a paper width of 132 characters, drum will have 132 tracks. A character set is embossed on the track. Different character sets available in the market are 48 character set, 64 and 96 characters set. One rotation of drum prints one line. Drum printers are fast in speed and can print 300 to 2000 lines per minute.

Advantages

- Very high speed

Disadvantages

- Very expensive
- Characters fonts cannot be changed

Chain Printer

In this printer, a chain of character sets is used, hence it is called Chain Printer. A standard character set may have 48, 64, or 96 characters.

Advantages

- Character fonts can easily be changed.
- Different languages can be used with the same printer.

Disadvantages

- Noisy

Non-impact Printers

Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page Printers.

These printers are of two types −

- Laser Printers
- Inkjet Printers

Characteristics of Non-impact Printers

- Faster than impact printers
- They are not noisy
- High quality
- Supports many fonts and different character size

Laser Printers

These are non-impact page printers. They use laser lights to produce the dots needed to form the characters to be printed on a page.

Advantages

- Very high speed
- Very high quality output
- Good graphics quality
- Supports many fonts and different character size

Disadvantages

- Expensive
- Cannot be used to produce multiple copies of a document in a single printing

Inkjet Printers

Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features.

They make less noise because no hammering is done and these have many styles of printing modes available. Color printing is also possible. Some models of Inkjet printers can produce multiple copies of printing also.

Advantages

- High quality printing
- More reliable

Disadvantages

- Expensive as the cost per page is high
- Slow as compared to laser printer

plotter

The **plotter** is a computer printer for printing vector graphics. In the past, plotters were used in applications such as computer-aided design, though they have generally been replaced with wide-format conventional printers. A plotter gives a hard copy of the output. It draws pictures on a paper using a pen. Plotters are used to print designs of ships and machines,

Overview

Digitally controlled plotters evolved from earlier fully analog **XY-writers** used as output devices for measurement instruments and analog computers.

Pen plotters print by moving a pen or other instrument across the surface of a piece of paper. This means that plotters are vector graphics devices, rather than raster graphics as with other printers. Pen plotters can draw complex line art, including text, but do so slowly because of the mechanical movement of the pens. They are often incapable of efficiently creating a solid region of color, but can hatch an area by drawing a number of close, regular lines.

Plotters offered the fastest way to efficiently produce very large drawings or color high-resolution vector-based artwork when computer memory was very expensive and processor power was very limited, and other types of printers had limited graphic output capabilities.

Pen plotters have essentially become obsolete, and have been replaced by large-format inkjet printers and LED toner based printers. Such devices may still understand vector languages originally designed for plotter use, because in many uses, they offer a more efficient alternative to raster data.

Electrostatic plotters

Electrostatic plotters used a dry toner transfer process similar to that in many photocopiers. They were faster than pen plotters and were available in large formats, suitable for reproducing engineering drawings. The quality of image was often not as good as contemporary pen plotters. Electrostatic plotters were made in both flat-bed and drum types.

Cutting plotters

Cutting plotters use knives to cut into a piece of material that is lying on the flat surface area of the plotter. It is achieved because the cutting plotter is connected to a computer, which is equipped with specialized cutting design or drawing computer software programs. Those computer software programs are responsible for sending the necessary cutting dimensions or designs in order to command the cutting knife to produce the correct project cutting needs.[1]

In recent years the use of cutting plotters (generally called die-cut machines) has become popular with home enthusiasts of paper crafts such as card making and scrap booking. Such tools allow desired card shapes to be cut out very precisely, and repeated perfectly identically.

POSSIBLE QUESTIONS

Section B
(5X2=10 Marks)

1. What are Input Devices?

2. Differentiate CLI and CUI.

3. List the Printer types.

4. List the key types in keyboard.

5. What is Digitizer?

Section C

(5X6=30 Marks)

6. Discuss about the Output Devices with a neat diagram.

7. What are the key characteristics of Plotters? Explain.

8. Discuss about the Input Devices with neat diagram.

9. What are the key characteristics of speech Recognition Devices? Explain.

10. What is Scanner? Explain.

11. Explain in detail about Printers.

12. Elaborate on Keyboard and Mouse.

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PART - A OBJECTIVE TYPE/MULTIPLE CHOICE QUESTIONS

ONLINE EXAMINATIONS ONE MARKS QUESTIONS

UNIT II

S.No	Questions	Option1	Option2	Option3	Option4	Answer
1	Input data from External world is	Input Devices	CPU	Memory	Output Devices	**Input Devices**
2	Input data coded in Internal form by	Input Devices	CPU	Memory	Output Devices	**Input Devices**
3	Processed data in Internal form is passed to	Input Devices	CPU	Memory	Output Devices	**Output Devices**
4	Result of Processing in Human acceptable form	Input Devices	CPU	Memory	Output Devices	**Output Devices**
5	Input Devices are _____	Monitor	Keyboard	Plotter	Projector	Keyboard
6	Data Enty is done through _____.	Keyboard	Scanner	Digitizer	All the Above	**Keyboard**
7	GUI means	Graphical User Interface	Screen	Graphical user Implementation	Graphics Card	**Graphical User Interface**
8	_____ is most popular point and draw device.	Keyboard	Mouse	Trackball	Joystick	**Mouse**

9	_____ is displayed as a vaiety of symbols such as arrow.	cursor	Mouse	Trackball	Joystick	**cursor**
10	_____ is the cursor positioned on the screen	hot -spot	Mouse	Trackball	Joystick	**hot -spot**
11	_____ is a pointing device ball similar to a roller ball mouse	Trackball	hot -spot	Mouse	Joystick	**Trackball**
12	Mouse and Light Pen can be used create graphic elements like_____	lines	curves	shapes	All the Above	**All the Above**
13	_____ is a device of choice in CAD/CAM area.	Trackball	hot -spot	Mouse	Mouse	**Trackball**
14	Joystick is pointing device and can be moved in _____	forward	backward	left or Right	All the Above	**All the Above**
15	Joystick used in _____	video games	Printer	Scanner	Network	video games
16	_____ is a pen based point and and Draw device.	mouse	Electronic Pen	Trackball	Joystick	**Electronic Pen**
17	_____ is the most simple and easiest to use of all input devices.	Touch screen	mouse	Trackball	Joystick	**Touch screen**
18	_____ are often used in information kiosks	Touch screen	mouse	Trackball	Joystick	**Touch screen**
19	kiosks are located in _____ to provide information	airport	System	Network	Earth	airport
20	_____Devices are used for direct data entry into computer	Joystick	Flatbed Scanner	mouse	OCR	Flatbed Scanner
21	In flatbed scanner light beam moves horizontally one line after another	TRUE	page Scan	scan one line	image	**TRUE**

22	A _____ scanner has a set of light emitting diodes.	Hand Held	Flatbed Scanner	Scanner	Printer	**Hand Held**
23	_____is similar to mouse	Touch screen	OCR	MICR	Trackballs	**Trackballs**
24	A touch screen is recommended for _____	Pressure-sensitive drawing and painting	Projects and track users	day-to-day computer work	programs involving public input and simple	**programs involving public input and simple**
25	A graphics tablet is recommended for _____	drawing & painting	dat-to-day computer work	Scan graphics	Read the content	**drawing & painting**
26	A barcode reader can	Scan graphics into a computer	Read Universal Product Code Patterns	Provide pressure-sensitive input.	recognize spoken words when trained	**Read Universal Product Code Patterns**
27	_____also called desktop scanners	Drum scanners	Flat-bed scanners	Film scanners	Hand scanners	**Flat-bed scanners**
28	_____is special equipment for scanning negative and positive films	Drum scanners	Flat-bed scanners	Film scanners	Hand scanners	**Film scanners**
29	In Optical Character Recognition bitmap images are converted into	ASCII	OCR	Scan copy	none	**ASCII**
30	in _____ prespecified type of mark made by pencil and Pen	OCR	OMR	Pen	None	**OMR**
31	Data coded in the form of small lines are known as	bar codes	OCR	OMR	None	**bar codes**
32	_____ is a device used for reading bar coded data	Bar code Reader	OCR	OMR	None	**Bar code Reader**
33	Universal Product Code decoded as	10 Digits	5 Digits	10 Digits	12 Digits	**10 Digits**
34	MICR has identification code and cheque number_____	iron oxide	encoded	preprinted	All the Above	**All the Above**

35	MICR used in banks as_____	Paper	identification codes	Writer	typing	identification codes
36	Digitizer is an input device used for converting _____ into digital form.	pictures	Letters	Character	word	pictures
37	result of Processing in Human acceptable form	Digitizer	MICR	OCR	OMR	**Digitizer**
38	_____are often issed by banks to customers	ATM	Card	passport	pass	**ATM**
39	_____ allow a person to input data to a compurer system by speaking	speech Recognition devices	mike	speaker	voice	**speech Recognition devices**
40	_____ allows a computer to accept input by seeing an object	Vision Input System	camera	image	Digitized	**Vision Input System**
41	_____ is an electromechanical device that accepts data from a Computer	Output Devices	Input Devices	Monitors	Printers	**Output Devices**
42	Content displayed on a terminal Screen	Soft copy	Hard Copy	Print out	Paper	**Soft copy**
43	A output is produced on a paper	Soft copy	Hard Copy	Print out	Paper	**Hard Copy**
44	CRT means	Cathode ray tube	Common Ray tube	color ray tube	Code Ray tube	**Cathode ray tube**
45	LCD means	Liquid Crystal Display	Light Crystal Display	Large Crystal Display	Long crystal Display	**Liquid Crystal Display**
46	Printers are the most popular _____	output devices	inputdevice	USB	Processor	output devices
47	_____ are character printers that print one character at a time	Dot Matrix	Inkjet	DRUM	Laser	**Dot Matrix**

48	Inkjet printers are character printers	spraying	strike	heats	chain	**spraying**
49	Drum printers that print _____ at a time	character	line	images	graphs	**line**
50	Chain printers are line printers	character	line	images	graphs	**line**
51	laser printers are ____ printers	character	line	page	heat	**page**
52	Plotters are an ideal output device for _____	architects	engineering	planners	All the Above	**All the Above**
53	Drum plotter used to create	color image	single color	multicolor	black and white	**multicolor**
54	flatbed plotter plots	design	graph	on a paper	All the Above	**All the Above**
55	Screen Image Projector is an	Output Devices	Input Devices	Monitors	Printers	**Output Devices**
56	voice response systems produces	audio	voice	video	All the Above	**audio**
57	Speech synthesizer converts text information into	spoken sentences	phonemes	speech	All the Above	**All the Above**
58	Translation system that convert an entered text into language	speech synthesizer	spoken sentences	phonemes	speech	**speech synthesizer**
59	Text can be converted to any language	speech synthesizer	spoken sentences	phonemes	speech	**speech synthesizer**

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COMPUTER FUNDAMENTALS

PART - A OBJECTIVE TYPE/MULTIPLE CHOICE QUESTIONS

ONLINE EXAMINATIONS ONE MARKS QUESTIONS

UNIT III

S.No	Questions	Option1	Option2	Option3	Option4	Answer
1	_____memory is a volatile memory	ROM	RAM	Optical read-only memory	CD-ROM	**RAM**
2	_____is made of flexible Mylar plastic coated with a very thin layer of special magnetic material.	Hard disk	RAM	Floppy disk	RAM	**Hard disk**
3	The type of memory that is not erased when power is shut off to it is called_____	ROM	RAM	JAZ	Syquest	**ROM**
4	Primary storage of a computer system_____	CD	Pendrive	main memory	Tape	main memory
5	Secondary storage is	non volatile	volatile	less memory	main memory	**non volatile**
6	Secondary storage is _____	Permanent	RAM	Buffer	Cache	Permanent
7	Secondary storage is _____	magnetic disk	RAM	ROM	Buffer	magnetic disk
8	Magnetic Disks like_____	pendrive	Hard disks	Buffer	Tape	Hard disks

9	Optical Disks like_____	Hard disk	DVD	pendrive	Tape	DVD
10	Memory Storage Devices are _____	Processor	Memory card	Joystick	Chip	Memory card
11	Hard Disks like_____	Zip Disk	Disk Pack	Winchester Disk	all the above	**all the above**
12	Secondary storage which has sequential Access is	Magnetic Tape	Magnetic Disks	Floppy	Hard disks	**Magnatic Tape**
13	Direct Access Device_____	Magnetic Disks	optical disk	Memory storage Devices	all the above	**all the above**
14	Magnetic Tape medium is a	plastic ribbon	iron oxide	both a and b	none	**both a and b**
15	A tape divided into vertical columns	frames	channels	tracks	none	**frames**
16	A tape divided into horizontal rows	frames	channels	tracks	none	**channels**
17	A _____ bit is used to detect errors.	Parity	Left	Last	Boolean	Parity
18	Parity bit are	odd parity/even parity	Last bit	Boolean	none	odd parity/even parity
19	IRG means	Inter record Gaps	Inner record Gaps	In record Gaps	none	**Inter record Gaps**
20	IBG means	Inter block gap	Inner block Gaps	In block Gaps	none	**Inter block gap**
21	Blocking factor depends on	block	record length	both a and b	none	both a and b

22	storage capacity of a tape = density * Length	TRUE	FALSE	bytes	records	**TRUE**
23	_____ density refer to the amount of data that can be stored on a given length of tape.	Data recording	bytes per inch	raw	IBGs	**Data recording**
24	Data transfer rate for a tape refers to the number of characters transmitted per	second	Bytes	both a and b	none	**both a and b**
25	A magnetic tape drive is used for _____ and retrieval of data on tape.	storage	read	write	none	**storage**
26	A magnetic tape is said to be.	online	off line	both a and b	none	**both a and b**
27	A tape drive is connected to and controlled by a	tape controller	interprets	commands	none	**tape controller**
28	Data recording density and data transfer rate of magnetic tapes depend on	data organization	data storage	data volume	data density	**data organization**
29	A half inch tape reel uses _____ tape ribbon.	1/2 inch	1/4 inch	4-mm	3/4 inch	**1/2 inch**
30	storing data in adjacent bit configuration is known as	write	assembly	read	parallel representation	**parallel representation**
31	Magnetic tape consist of _____	supply reel	Plates	Circle	Boxes	supply reel
32	Magnetic tape is sealed inside the	reel	cartridge	vacuum	cover	**cartridge**
33	Magnetic tape is to serve as back up storage medium	Disk	tape	drives	none	**Disk**
34	_____ are so called they read/write data serially as streams of bits.	QIC standard	computer	streamer	exchange	**streamer**

35	QIC means	Quarter Inch Cartridge	Quarter In Cartridge	Quarter Input Cartridge	Quarter Inter Cartridge	**Quarter Inch Cartridge**
36	4mm Digital Audio Tape	High Density	4 mm	60 meters	all the above	**all the above**
37	Magnetic tapes can have	unlimited storage	low cost	high densities	all the above	**all the above**
38	Magnetic tapes can have limitations like	sequential	must be dust free	labelled	all the above	**all the above**
39	uses of Magnetic tapes	sequential data Processing	Backing up	Archiving of data	all the above	**all the above**
40	In Magnetic Disks	read once	read many	write many	both b and c	**both b and c**
41	Disk is divided in to	tracks	sectsor	both a and b	none	**both a and b**
42	storage capacity of a disk system_____	Buffer	Ram	sectors	Rom	sectors
43	Data are recorded on the tracks of a spinning disk surface by _____.	read	write	read/write head	head	**read/write head**
44	A head crash is	head touch the disk	destroys the Data	destroy read/ write head	all the above	**all the above**
45	Seek time is	position read write head	100 milli seconds	zero some times	all the above	**all the above**
46	Latency time is	spin sector	rotational delay	varying	both a and b	**both a and b**
47	Transfer Rate is	read from	written to disk	location	both a and b	**both a and b**

48	Magnetic Disk come in different sizes_____	14 inch	Fixed	Large	Small	14 inch
49	FAT means	File Allocation Table	formatt Table	Flat table	None	**File Allocation Table**
50	A floppy disk is a	flat	circular	magnetic oxide	all the above	**all the above**
51	A floppy disk drive is used to _____ floppy disk.	Read/Write	Faster	Reader	Compactable	Read/Write
52	Disk pack has	Hard disk	same speed	loading/ unloading	all the above	**all the above**
53	Optical Disks are_____	READ	optical laser disks	Sound	Processor	optical laser disks
54	CD ROM Stands for	Compact Disk Read Only Memory	CD read only memory	read only memory	Disk read only memory	**Compact Disk Read Only Memory**
55	DVD is	Digital video Disk	Digital voice Disk	Direct Video Disk	Direct Voice Disk	**Digital video Disk**
56	Advantage of Optical Disks	low cost	ideal storage	long life	all the above	**all the above**
57	Flash Drive is a	compact	various shape	USB	all the above	all the above
58	SD/MMC	FLASH Memory	flash Drive	USB	RAID	**FLASH Memory**
59	RAID means	Redundant array of Inexpensive Disks	Random array of Inexpensive Disks	Repeat array of Inexpensive Disks	Recall array of Inexpensive Disks	**Redundant array of Inexpensive Disks**

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SUBJECT NAME : COMPUTER FUNDAMENTALS **CLASS : III B.Sc. (IT)**
SUBJECT CODE :18ITU103 **UNIT III** **SEMESTER : I**
BATCH (2018-2021)

UNIT-III

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.

Memory

What is Memory?

- It is used to store data and instructions.
- Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored.
- The memory is divided into large number of small parts called cells.
- Each location or cell has a unique address, which varies from zero to memory size minus one.

Memory is required in computers to store data and instructions. Memory is physically organized as a large number of cells that are capable of storing one bit each. Logically they are organized as groups of bits called **words** that are assigned an address. Data and instructions are accessed through this memory address. The speed with which these memory addresses can be accessed determines the cost of the memory. Faster the memory speeds, higher the price.

Based on this criteria memory is of two types – **primary** and **secondary**. Here we will look at primary memory in detail.

Primary Memory (Main Memory)

Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.

The main features of primary memory,

- It is accessed directly by the processor
- It is the fastest memory available
- Each word is stored as well as
- It is volatile, i.e. its contents are lost once power is switched off
-

Characteristics of Main Memory

- These are semiconductor memories.
- It is known as the main memory.
- Usually volatile memory.

- Data is lost in case power is switched off.
- It is the working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without the primary memory.

RAM

RAM stands for **Random Access Memory**. The processor accesses all memory addresses directly, irrespective of word length, making storage and retrieval fast. RAM is the fastest memory available and hence most expensive. These two factors imply that RAM is available in very small quantities of up to 1GB. RAM is volatile but my be of any of these two types

DRAM (Dynamic RAM)

Each memory cell in a DRAM is made of one transistor and one capacitor, which store one bit of data. However, this cell starts losing its charge and hence data stored in less than thousandth of a second. So it needs to be refreshed thousand times a second, which takes up processor time. However, due to small size

of each cell, one DRAM can have large number of cells. Primary memory of most of the personal computers is made of DRAM.

SRAM (StaticRAM)

Each cell in SRAM is made of a flip flop that stores one bit. It retains its bit till the power supply is on and doesn't need to be refreshed like DRAM. It also has shorter read-write cycles as compared to DRAM. SRAM is used in specialized applications.

ROM

ROM stands for **Read Only Memory**. As the name suggests, ROM can only be read by the processor. New data cannot be written into ROM. Data to be stored into ROM is written during the manufacturing phase itself. They contain data that does not need to be altered, like booting sequence of a computer or algorithmic tables for mathematical applications. ROM is slower and hence cheaper than RAM. It retains its data even when power is switched off, i.e. it is non-volatile. ROM cannot be altered the way RAM can be but technologies are available to program these types of ROMs −

PROM (Programmable ROM)

PROM can be programmed using a special hardware device called PROM programmer or PROM burner.

EPROM (Erasable Programmable ROM)

EPROM can be erased and then programmed using special electrical signals or UV rays. EPROMs that can be erased using UV rays are called UVEPROM and those that can be erased using electrical signals are called EEPROM. However, handling electric signals is easier and safer than UV rays.

EEPROM (electrically erasable programmable read-only memory)

EEPROM (electrically erasable programmable read-only memory) is user-modifiable read-only memory (ROM) that can be erased and reprogrammed (written to) repeatedly through the application of higher than normal electrical voltage. Unlike EPROM chips, EEPROMs do not need to be removed from the computer to be modified. However, an EEPROM chip has to be erased and reprogrammed in its entirety, not selectively. It also has a limited life - that is, the number of times it can be reprogrammed is limited to tens or hundreds of thousands of times.

Cache Memory

Small piece of high speed volatile memory available to the processor for fast processing is called **cache memory**. Cache may be a reserved portion of main memory, another chip on CPU or an independent high speed storage device. Cache memory is made of fast speed SRAMs. The process of keeping some data and instructions in cache memory for faster access is called**caching**. Caching is done when a set of data or instructions is accesses again and again.

Secondary Memory

Alternatively referred to as external memory, secondary memory, a secondary storage device is a non-volatile device that holds data until it is deleted or overwritten. Secondary storage is about two orders of magnitude cheaper than primary storage. The faster primary memory is also volatile. If we need to store large amount of data or programs permanently, we need a cheaper and permanent memory. Such memory is called secondary memory. Here we will discuss secondary memory devices that can be used to store large amount of data, audio, video and multimedia files.

Characteristics of Secondary Memory

These are some characteristics of secondary memory, which distinguish it from primary memory −

- It is non-volatile, i.e. it retains data when power is switched off
- It is large capacities to the tune of terabytes
- It is cheaper as compared to primary memory

Depending on whether secondary memory device is part of CPU or not, there are two types of secondary memory – fixed and removable.

Let us look at some of the secondary memory devices available.

Hard Disk Drive

Hard disk drive is made up of a series of circular disks called **platters** arranged one over the other almost ½ inches apart around a **spindle**. Disks are made of non-magnetic material like aluminum alloy and coated with 10-20 nm of magnetic material.

Standard diameter of these disks is 14 inches and they rotate with speeds varying from 4200 rpm (rotations per minute) for personal computers to 15000 rpm for servers. Data is stored by magnetizing or demagnetizing the magnetic coating. A magnetic reader arm is used to read data from and write data to the disks. A typical modern HDD has capacity in terabytes (TB).

CD Drive

CD stands for **Compact Disk**. CDs are circular disks that use optical rays, usually lasers, to read and write data. They are very cheap as you can get 700 MB of storage space for less than a dollar. CDs are

inserted in CD drives built into CPU cabinet. They are portable as you can eject the drive, remove the CD and carry it with you. There are three types of CDs −

- **CD-ROM (Compact Disk – Read Only Memory)** − The data on these CDs are recorded by the manufacturer. Proprietary Software, audio or video are released on CD-ROMs.
- **CD-R (Compact Disk – Recordable)** − Data can be written by the user once on the CD-R. It cannot be deleted or modified later.
- **CD-RW (Compact Disk – Rewritable)** − Data can be written and deleted on these optical disks again and again.

DVD Drive

DVD stands for **digital versatile disc** or **digital video Display**. DVD are optical devices that can store 15 times the data held by CDs. They are usually used to store rich multimedia files that need high storage capacity. DVDs also come in three varieties – read only, recordable and rewritable.

Pen Drive

Pen drive is a portable memory device that uses solid state memory rather than magnetic fields or lasers to record data. It uses a technology similar to RAM, except that it is nonvolatile. It is also called USB drive, key drive or flash memory.

Blu Ray Disk

Blu Ray Disk (BD) is an optical storage media used to store high definition (HD) video and other multimedia filed. BD uses shorter wavelength laser as compared to CD/DVD. This enables writing arm to focus more tightly on the disk and hence pack in more data. BDs can store up to 128 GB data.

CACHE MEMORY

Cache memory, also called CPU memory, is random access memory (RAM) that a computer microprocessor can access more quickly than it can access regular RAM. This memory is typically integrated directly with the CPU chip or placed on a separate chip that has a separate bus interconnect with the CPU.

Cache memory is a small-sized type of volatile computer memory that provides high-speed data access to a processor and stores frequently used computer programs, applications and data. It stores and retains data only until a computer is powered up.

Cache memory provides faster data storage and access by storing an instance of programs and data routinely accessed by the processor. Thus, when a processor requests data that already has an instance in the cache memory, it does not need to go to the main memory or the hard disk to fetch the data.

Cache memory can be primary or secondary cache memory, where primary cache memory is directly integrated or closest to the processor. In addition to hardware-based cache, cache memory also can be a disk cache, where a reserved portion on a disk stores and provide access to frequently accessed data/applications from the disk.

The cache memory lies in the path between the processor and the memory. The cache memory therefore, has lesser access time than memory and is faster than the main memory. A cache memory have an access time of 100ns, while the main memory may have an access time of 700ns.

The cache memory is very expensive and hence is limited in capacity. Earlier cache memories were available separately but the microprocessors contain the cache memory on the chip itself.

The need for the cache memory is due to the mismatch between the speeds of the main memory and the CPU. The CPU clock as discussed earlier is very fast, whereas the main memory access time is comparatively slower. Hence, no matter how fast the processor is, the processing speed depends more on the speed of the main memory (the strength of a chain is the strength of its weakest link). It is because of this reason that a cache memory having access time closer to the processor speed is introduced.

The cache memory stores the program (or its part) currently being executed or which may be executed within a short period of time. The cache memory also stores temporary data that the CPU may frequently require for manipulation.

The cache memory works according to various algorithms, which decide what information it has to store. These algorithms work out the probability to decide which data would be most frequently needed. This probability is worked out on the basis of past observations.

It acts as a high speed buffer between CPU and main memory and is used to temporary store very active data and action during processing since the cache memory is faster then main memory, the processing speed is increased by making the data and instructions needed in current processing available in cache. The cache memory is very expensive and hence is limited in capacity.

Auxiliary memory

Is also known as auxiliary storage, secondary storage, secondary memory or external memory, is a non-volatile memory (does not lose stored data when the device is powered down) that is not directly accessible by the CPU, because it is not accessed via the input/output channels (it is an external device). In RAM devices (as flash memory) data can be directly deleted or changed.

The most common forms of auxiliary memory are flash memory, discs, magnetic and magnetic tape . The latest addition to the auxiliary memory family is flash memory. This form is much faster as compared to its predecessors, as this form of auxiliary memory does not involve any moving parts.

Flash memory: An electronic non-volatile computer storage device that can be electrically erased and reprogrammed, and works without any moving parts. Examples of this are flash drives, memory cards . A version of this is implemented in many notebook and some desktop computers.

Optical disc: A storage medium from which data is read and written by lasers. Optical disks can store much more data — up to 6 gigabytes more than most portable magnetic media, such as floppies. There are three basic types of optical disks: CD/DVD/BD-ROM (read-only), WORM (write-once read-many) & EO (erasable optical disks).

Magnetic Disk: A magnetic disk is a circular plate constructed of metal or plastic coated with magnetized material. Both sides of the disk are used and several disks may be stacked on one spindle with read/write heads available on each surface. Bits are stored on the magnetized surface in spots along concentric circles called tracks. Tracks are commonly divided into sections called sectors. Disk that are permanently attached and cannot be removed by the occasional user are called hard disks. A disk drive with removable disks is called a floppy disk drive.

Magnetic tapes: A magnetic tape transport consists of electric, mechanical and electronic components to provide the parts and control mechanism for a magnetic tape unit. The tape itself is a strip of plastic coated with a magnetic recording medium. Bits are recorded as magnetic spots on tape along several tracks. Seven or nine bits are recorded to form a character together with a parity bit. R/W heads are mounted in each track so that data can be recorded and read as a sequence of characters.

Hard Disk Drive

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RANDOM ACCESS MEMORY (RAM)

RAM (random access memory) is memory in which all areas can be written to or read from within the same amount of time. The operating system, application programs and data in current use are kept in RAM, specifically in the chip-on-card main memory, for quick access by the computer's processor.

The data in RAM generally stays there only as long as your computer is running; as such, it is termed volatile memory. Unlike the aforementioned storage devices, when you turn the computer off, RAM loses its data. When you turn your computer on again, your operating system and other files are once again loaded into RAM, usually from your hard disk.

RAM can be compared to a person's short-term memory and the hard disk to the long-term memory. The short-term memory focuses on work at hand, but can only keep so many facts in view at one time. If short-term memory fills up, the least-used information is generally forgotten. If required information is not in short-term memory your brain is sometimes able to refresh it from facts stored in long-term memory. A computer works similarly.

Briefly How RAM Works

There is an *address line* for each row and each column in the set of boxes. If data is being read, the bits that are read flow back on a separate *data line*. In describing a RAM chip or module, a notation such as 256Kx16 means 256 thousand columns of cells standing 16 rows deep.

In the most common form of RAM, dynamic RAM, each cell has a charge or lack of charge held in something similar to an electrical capacitor. A transistor acts as a gate in determining whether the value in the capacitor can be read or written. In static RAM, instead of a capacitor-held charge, the transistor itself is a positional *flip/flop* switch, with one position meaning 1 and the other position meaning 0.

Externally, RAM is a chip that comes embedded in a personal computer motherboardwith a variable number of additional modules plugged into motherboard sockets. To add memory to your computer, you simply add more RAM modules in a prescribed configuration. These are single in-line memory modules (SIMMs) or dual in-line memory modules (DIMMs).

How Data Is Accessed?

When the processor or CPU gets the next instruction it is to perform, the instruction may contain the address of some memory or RAM location from which data is to be read (brought to the processor for further processing). This address is sent to the RAM controller. The RAM controller organizes the request and sends it down the appropriate address lines so that transistors along the lines open up the cells so that each capacitor value can be read. A capacitor with a charge over a certain voltage level represents the binary value of 1 and a capacitor with less than that charge represents a 0.

For dynamic RAM, before a capacitor is read, it must be power-refreshed to ensure that the value read is valid. Depending on the type of RAM, the entire line of data may be read that the specific address happens to be located at or, in some RAM types, a unit of data called a page is read. The data that is read is transmitted along the data lines to the processor's nearby data buffer known as level-1 cache and another copy may be held in level-2 cache.

For video RAM, the process is similar to DRAM except that, in some forms of video RAM, while data is being written to video RAM by the processor, data can simultaneously be read from RAM by the video controller (for example, for refreshing the display image).

How RAM Effectiveness is measured

RAM is marketed in speeds in MHz and based on its maximum theoretical bandwidth. The format is prefixed by PC then the number of the generation and finally the number for the bandwidth in MB/s. For Example PC3 12800 is DDR3. Bandwidth here is calculated roughly by multiplying the frequency in MHz by eight. However, that number is not attainable as it does not account for timings.

DRAM (Dynamic RAM)

Each memory cell in a DRAM is made of one transistor and one capacitor, which store one bit of data. However, this cell starts losing its charge and hence data stored in less than thousandth of a second. So it needs to be refreshed thousand times a second, which takes up processor time. However, due to small size of each cell, one DRAM can have large number of cells. Primary memory of most of the personal computers is made of DRAM.

SRAM (Static RAM)

Each cell in SRAM is made of a flip flop that stores one bit. It retains its bit till the power supply is on and doesn't need to be refreshed like DRAM. It also has shorter read-write cycles as compared to DRAM. SRAM is used in specialized applications.

READ ONLY MEMORY(ROM)

ROM stands for **Read Only Memory**. As the name suggests, ROM can only be read by the processor. New data cannot be written into ROM. Data to be stored into ROM is written during the manufacturing phase itself. They contain data that does not need to be altered, like booting sequence of a computer or algorithmic tables for mathematical applications. ROM is slower and hence cheaper than RAM.

How ROM Work?

ROM chips (Figure 1) contain a grid of columns and rows. But where the columns and rows intersect, ROM chips are fundamentally different from RAM chips. While RAM uses transistorsto turn on or off access to a capacitor at each intersection, ROM uses a **diode** to connect the lines if the value is 1. If the value is 0, then the lines are not connected at all.

A diode normally allows current to flow in only one direction and has a certain threshold, known as the **forward breakover**, that determines how much current is required before the diode will pass it on. In silicon-based items such as processors and memory chips, the forward breakover voltage is approximately 0.6 volts.

By taking advantage of the unique properties of a diode, a ROM chip can send a charge that is above the forward breakover down the appropriate column with the selected row grounded to connect at a specific cell. If a diode is present at that cell, the charge will be conducted through to the ground, and, under the binary system, the cell will be read as being "on" (a value of 1). The neat part of ROM is that if the cell's value is 0, there is no diode at that intersection to connect the column and row. So the charge on the column does not get transferred to the row.

It retains its data even when power is switched off, i.e. it is non-volatile. ROM cannot be altered the way RAM can be but technologies are available to program these types of ROMs −

PROM (Programmable ROM)

PROM can be programmed using a special hardware device called PROM programmer or PROM burner.

Figure 2

Creating ROM chips totally from scratch is time-consuming and very expensive in small quantities. For this reason, mainly, developers created a type of ROM known as **programmable read-only**

memory (PROM). Blank PROM chips can be bought inexpensively and coded by anyone with a special tool called a **programmer**.

PROM chips (Figure 2) have a grid of columns and rows just as ordinary ROMs do. The difference is that every intersection of a column and row in a PROM chip has a **fuse** connecting them. A charge sent through a column will pass through the fuse in a cell to a grounded row indicating a value of 1. Since all the cells have a fuse, the initial (**blank**) state of a PROM chip is all 1s. To change the value of a cell to 0, you use a programmer to send a specific amount of current to the cell. The higher voltage breaks the connection between the column and row by **burning** out the fuse. This process is known as **burning the PROM**.

EPROM

Working with ROMs and PROMs can be a wasteful business. Even though they are inexpensive per chip, the cost can add up over time. **Erasable programmable read-only memory** (EPROM) addresses this issue. EPROM chips can be rewritten many times. Erasing an EPROM requires a special tool that emits a certain frequency of ultraviolet (UV) light. EPROMs are configured using an EPROM programmer that provides voltage at specified levels depending on the type of EPROM used.

Once again we have a grid of columns and rows. In an EPROM, the cell at each intersection has two transistors. The two transistors are separated from each other by a thin oxide layer. One of the transistors is known as the **floating gate** and the other as the **control gate**. The floating gate's only link to the row (**wordline**) is through the control gate. As long as this link is in place, the cell has a value of 1. To change the value to 0 requires a curious process called **Fowler-Nordheim tunneling**. **Tunneling** is used to alter the placement of electrons in the floating gate. An electrical charge, usually 10 to 13 volts, is applied to the floating gate. The charge comes from the column (**bitline**), enters the floating gate and drains to a ground.

EEPROMs and Flash Memory

Though EPROMs are a big step up from PROMs in terms of reusability, they still require dedicated equipment and a labor-intensive process to remove and reinstall them each time a change is necessary. Also, changes cannot be made incrementally to an EPROM; the whole chip must be erased. **Electrically erasable programmable read-only memory** (EEPROM) chips remove the biggest drawbacks of EPROMs.

OPTICAL DISKS

An optical disc is an electronic data storage medium that can be written to and read using a low-powered laser beam. Originally developed in the late 1960s, the first optical disc, created by James T. Russell, stored data as micron-wide dots of light and dark. A laser read the dots, and the data was converted to an electrical signal, and finally to audio or visual output. However, the technology didn't appear in the marketplace until Philips and Sony came out with the compact disc (CD) in 1982. Since then, there has been a constant succession of optical disc formats, first in CD formats, followed by a number of DVD formats

Alternatively referred to as **optical media**, **optical storage**, **Optical disc drive** (**ODD**), and **optical disk**, an **optical disc** is any media read using a laser assembly. The most common types of optical media

are Blu-ray, CDs, and DVDs. Computers can read and write to CDs and DVDs using a CD Writer or DVD

Writer drive, and a Blu-ray is read with a Blu-ray drive. Drives such as a CD-R and DVD-R drive that can read and write information to discs are known as magneto-optic (MO).

There are three main types of optical media: CD, DVD, and Blu-ray disc. CDs can store up to 700 megabytes (MB) of data and DVDs can store up to 8.4 GB of data. Blu-ray discs, which are the newest type of optical media, can store up to 50 GB of data. This storage capacity is a clear advantage over the floppy disk storage media (a magnetic media), which only has a capacity of 1.44 MB. Another advantage that optical media have over the floppy disk is that it can last up to 7 times longer, due to its improved durability.

CD-ROM

Short for **Compact Disc-Read Only Memory**, a **CD-ROM**(shown right) is an optical disc which contains audio or software data whose memory is read only. A **CD-ROM Drive**or **optical drive** is the device used to read them. CD-ROM drives have speeds ranging from 1x all the way up to 72x, meaning it reads the CD roughly 72 times faster than the 1x version. As you would imagine, these drives are capable playing audio CDs and reading data CDs. Below is a picture of the front and back of a standard CD-ROM drive.

Opening and Closing a CD-ROM drive

A CD-ROM drive can be opened by pressing the tray eject button on the front of the drive, as shown in the picture above and to the right. To close the CD-ROM drive, press the tray or the eject button again.

R/W may refer to any of the following:

1. Short for **Read/Write**, R/W is a file attribute or permission that can be given to files and directories that allows them to be read or written. These attributes can also be taken away to prevent that file from being read or modified.

2

2.Short for **Read/Write**, **R/W** is a drive and CD media that was first introduced in 1997 that is capable of being written to and read. Unlike a traditional CD-R disc that can only be written to once, these discs allow data to be erased and re-written multiple times.

The CD-R technology uses a photosensitive dye, CD-RW discs use an active layer of Ag-In-Sb-Te (silver-indium-antimony-tellurium) alloy that, in its original state, has a polycrystalline structure that makes it reflective. When the CD-RW drive writes to the disc, the laser uses its highest power setting known as Pwrite. At this temperature, which is usually between 500 and 700 degrees Celsius, the chemical structure will liquefy. In its liquid state, the molecules of the active material flow freely, losing their polycrystalline structure and taking on an amorphous state. When the material solidifies in this amorphous state, it loses its reflectivity. By selectively firing the laser, the drive leaves parts of the disc in its polycrystalline state, forming the lands, and parts in the amorphous state forming the pits.

To reverse the phase of a specific area on a disc, the laser operates at a lower power setting and heats the active material to approximately 200 degrees Celsius. By heating the disc it reverts back from its amorphous to its polycrystalline state and then becomes reflective again.

The drawback with CD-RW discs is with the lower reflectivity of the disc itself can limit the readability. In the 1980s, the CD standards specified that on a compact disc the lands should have a minimum of 70% and the pits should have a reflectance of 28%. However, on a CD-RW disc, the reflectance of a land is approximately 15% to 25%. The low reflectance can cause certain CD-RWs discs to be unreadable in some older CD-ROM drives and CD players.

HARD DISK

The hard disk drive is the main, and usually largest, data storage hardware device in a computer. The operating system, software titles, and most other files are stored in the hard disk drive.The hard drive is sometimes referred to as the "C drive" due to the fact that Microsoft Windows designates the "C" drive letter to the primary partition on the primary hard drive in a computer by default.

How a hard drive works

In your computer's hard drive, there aren't really any iron nails. There's just a large shiny, circular "plate" of magnetic material called a **platter**, divided into billions of tiny areas. Each one of those areas can be independently magnetized (to store a 1) or demagnetized (to store a 0). Magnetism is used in computer storage because it goes on storing information even when the power is switched off. If you magnetize a nail, it stays magnetized until you demagnetize it

A hard drive has only a few basic parts. There are one or more shiny silver platters where information is stored magnetically, there's an arm mechanism that moves a tiny magnet called a **read-write head** back and forth over the platters to record or store information, and there's an electronic circuit to control everything and act as a link between the hard drive and the rest of your computer.

After a hard-drive crash last year, I was left with an old drive that no longer worked. I took a peek inside, and here's what I found...

1. Actuator that moves the read-write arm. In older hard drives, the actuators were stepper motors. In most modern hard drives, **voice coils** are used instead. As their name suggests, these are simple electromagnets, working rather like the moving coils that make sounds in loudspeakers. They

position the read-write arm more quickly, precisely, and reliably than stepper motors and are less sensitive to problems such as temperature variations.

2. Read-write arm swings read-write head back and forth across platter.
3. Central spindle allows platter to rotate at high speed.
4. Magnetic platter stores information in binary form.
5. Plug connections link hard drive to circuit board in personal computer.
6. Read-write head is a tiny magnet on the end of the read-write arm.
7. Circuit board on underside controls the flow of data to and from the platter.
8. Flexible connector carries data from circuit board to read-write head and platter.
9. Small spindle allows read-write arm to swing across platter.

The platters are the most important parts of a hard drive. As the name suggests, they are disks made from a hard material such as glass or aluminum, which is coated with a thin layer of metal that can be magnetized or demagnetized. A small hard drive typically has only one platter, but each side of it has a magnetic coating. Bigger drives have a series of platters stacked on a central spindle, with a small gap in between them. The platters rotate at up to 10,000 revolutions per minute (rpm) so the read-write heads can access any part of them.

There are two read-write heads for each platter, one to read the top surface and one to read the bottom, so a hard drive that has five platters (say) would need ten separate read-write heads. The read-write heads are mounted on an electrically controlled arm that moves from the center of the drive to the outer edge and back again. To reduce wear and tear, they don't actually touch the platter: there's a layer of fluid or air between the head and the platter surface.

Reading and writing data

When your computer stores data on its hard drive, it doesn't just throw magnetized nails into a box, all jumbled up together. The data is stored in a very orderly pattern on each platter. Bits of data are arranged in concentric, circular paths called **tracks**. Each track is broken up into smaller areas called **sectors**. Part of

the hard drive stores a map of sectors that have already been used up and others that are still free. (In Windows, this map is called the **File Allocation Table** or **FAT**.) When the computer wants to store new information, it takes a look at the map to find some free sectors. Then it instructs the read-write head to move across the platter to exactly the right location and store the data there. To read information, the same process runs in reverse.

There is an interface (a connecting piece of equipment) between them called a **controller**. This is a small circuit that operates the actuators, selects specific tracks for reading and writing, and converts parallel streams of data going from the computer into serial streams of data being written to the disk (and vice versa). Controllers are either built into the disk drive's own circuit board or part of the computer's main board (motherboard).

That brings benefits (such as being able to store 500 CDs on your iPod)—but drawbacks too. One of them is that hard drives can go wrong if they get dirt or dust inside them. A tiny piece of dust can make the read-write head bounce up and down, crashing into the platter and damaging its magnetic material. This is known as a **disk crash** (or **head crash**) and it can (though it doesn't always) cause the loss of all the information on a hard drive. A disk crash usually occurs out of the blue, without any warning. That's why you should always keep backup copies of your important documents and files, either on another hard drive, on a compact disc (CD) or DVD, or on a flash memory stick.

Photo: The read-write head on a hard-drive. 1) The actuator arm swings the head back and forth so it's in the right position on the drive. 2) Only the tiny extreme end part of the hard drive actually reads from and writes to the platter. Bear in mind that half of what you're seeing in the second photo is a reflection in the shiny hard drive surface!

POSSIBLE QUESTIONS

Section B
(5X2=10 Marks)

1. Define Cache memory.

2. Define Secondary Storage Devices, Give an example

3. Differentiate Volatile and Non-Volatile memory.

4. What is the use of cache memory?

5. Define Main Memory.

Section C
(5X6=30 Marks)

6. Explain in detail about Magnetic Tape.

7. Elaborate Magnetic Disk with an neat Diagram.

8. Explain the Types of Optical Disks.

9. Elaborate the Flash Drive.

10. What are the Secondary Storage Devices?

11. Compare and contrast RAM and ROM.

12. Compare and contrast Auxiliary memory with cache memory.

13. What are Optical Disks? Explain.

14. List out the basic features of Random Access Memory.

15. Enlighten on the Types of Read Only Memory.

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed University Established Under Section 3 of UGC Act 1956)

Coimbatore - 641021.

(For the candidates admitted from 2017 onwards)

DEPARTMENT OF CS, CA, & IT

SUBJECT : COMPUTER FUNDAMENTALS	**SEMESTER**: I	**L T P C**
SUBJECT CODE: 18ITU103	**CLASS** : I B.Sc. IT	**4 0 0 4**

UNIT-IV

Computer Organization and Architecture: C.P.U., registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

Suggested Readings:

1. Goel A. (2010). Computer Fundamentals. New Delhi: Pearson Education.

2. Aksoy P & DeNardis, L. (2006).Introduction to Information Technology. New Delhi:

Cengage Learning

3. Sinha P. K.& Sinha, P. (2007). Fundamentals of Computers. New Delhi: BPB Publishers.

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2. www.in.pcmag.com/networking-communications-software
3. www.slideshare.net/
4. www.tutorialspoint.com/data_mining/
5. www.electronicsforu.com/

COMPUTER ORGANIZATION AND ARCHITECTURE

1. Central Processing Unit(CPU)
2. Registers
3. System bus
4. Main memory unit
5. Cache memory
6. Inside a computer
7. SMPS
8. Motherboard
9. Ports and interfaces
10. Expansion cards
11. Ribbon cables
12. Memory chips
13. Processors

1. Central Processing Unit (CPU)

Every things computer does is controlled by its **Central Processing Unit**(**CPU**). The CPU is the **brains of the computer**. Sometimes referred to simply as the **central processor** or **Nerve Centre** or **heart**, but more commonly called **processor**, the CPU is where most calculations take place.

In terms of computing power, the CPU is the most important element of a computer system. It add and compare its data in cpu chip. A CPU or Processors of all computers, whether micro, mini or mainframe must have three element or parts primary storage, arithmetic logic unit (ALU), and control unit. *Control Unit* (CU) - *decodes* the *program instruction. CPU chip used in a computer is partially made out of Silica. on other words silicon chip used for data processing are called Micro Processor.*

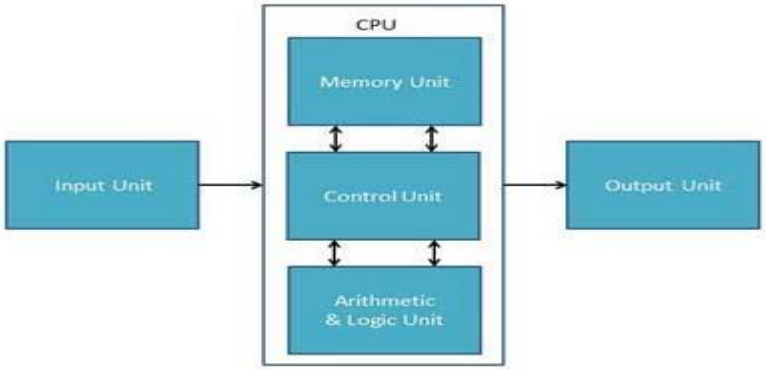
Central processing unit (CPU) is the central component of the Pc. Sometimes it is called as processor. It is the brain that runs the show inside the Pc. All work that is done on a computer is performed directly or indirectly by the processor. Obviously, it is one of the most important components of the Pc. It is also, scientifically, not only one of the most amazing parts of the PC, but one of the most amazing devices in the world of technology. The processor plays a significant role in the following important aspects of your computer system.

Central Processing Unit (CPU) consists of the following features −

- CPU is considered as the brain of the computer.
- CPU performs all types of data processing operations.
- It stores data, intermediate results, and instructions (program).
- It controls the operation of all parts of the computer.

CPU itself has following three components.

- Memory or Storage Unit
- Control Unit
- ALU(Arithmetic Logic Unit)



Memory or Storage Unit

This unit can store instructions, data, and intermediate results. This unit supplies information to other units of the computer when needed. It is also known as internal storage unit or the main memory or the primary storage or Random Access Memory (RAM).

Its size affects speed, power, and capability. Primary memory and secondary memory are two types of memories in the computer. Functions of the memory unit are −

- It stores all the data and the instructions required for processing.
- It stores intermediate results of processing.
- It stores the final results of processing before these results are released to an output device.
- All inputs and outputs are transmitted through the main memory.

Control Unit

This unit controls the operations of all parts of the computer but does not carry out any actual data processing operations.

Functions of this unit are −

- It is responsible for controlling the transfer of data and instructions among other units of a computer.
- It manages and coordinates all the units of the computer.
- It obtains the instructions from the memory, interprets them, and directs the operation of the computer.
- It communicates with Input/Output devices for transfer of data or results from storage.
- It does not process or store data.

ALU (Arithmetic Logic Unit)

This unit consists of two subsections namely,

- Arithmetic Section
- Logic Section

Arithmetic Section

Function of arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication, and division. All complex operations are done by making repetitive use of the above operations.

Logic Section

Function of logic section is to perform logic operations such as comparing, selecting, matching, and merging of data.

Performance: The processor is probably the most important single determinant of system performance in the Pc. While other components also playa key role in determining performance, the processor's capabilities dictate the maximum performance of a system. The other devices only allow the processor to reach its full potential.

Software Support: Newer, faster processors enable the use of the latest software. In addition, new processors such as the Pentium with MMX Technology, enable the use of specialized software not usable on earlier machines.

Reliability and Stability: The quality of the processor is one factor that determines how reliably your system will run. While most processors are very dependable, some are not. This also depends to some extent on the age of the processor and how much energy it consumes.

Energy Consumption and Cooling: Originally processors consumed relatively little power compared to other system devices. Newer processors can consume a great deal of power. Power consumption has an impact on everything from cooling method selection to overall system reliability.

Motherboard Support: The processor that decides to use in your system will be a major determining factor in what sort of chipset we must use, and hence what motherboard you buy. The motherboard in turn dictates many facets of. The system's capabilities and performance.

2. Register

Register are used to quickly accept, store, and transfer data and instructions that are being used immediately by the CPU, there are various types of Registers those are used for various purpose. Among of the some Mostly used Registers named as AC or **Accumulator**, Data Register or DR, the AR or **Address Register**, **program counter** (PC), **Memory Data Register**(MDR) ,**Index register**,***Memory Buffer Register***.

These Registers are used for performing the various Operations. While we are working on the System then these Registers are used by the **CPU for Performing the Operations**. When We Gives Some Input to the System then the I**nput will be Stored into the Registers** and When the System will gives us the Results after Processing then the Result will also be from the Registers. So that they are used by the **CPU for Processing the Data** which is given by the User. Registers Perform:-

1) **Fetch**: The Fetch Operation is used for taking the instructions those are given by the user and the Instructions those are stored into the Main Memory will be fetch by using Registers.

2) **Decode**: The Decode Operation is used for interpreting the Instructions means the Instructions are decoded means the CPU will find out which Operation is to be performed on the Instructions.

3) **Execute**: The Execute Operation is performed by the CPU. And Results those are produced by the CPU are then Stored into the Memory and after that they are displayed on the user Screen.

Types of Registers are as Followings

MAR stand for *Memory Address Register*

This register holds the memory addresses of data and instructions. This register is used to access data and instructions from memory during the execution phase of an instruction. **Suppose CPU wants to store some data in the memory or to read the data from the memory. It places the address of the-required memory location in the MAR**.

Program Counter

The **program counter (PC)**, commonly called the **instruction pointer** (IP) in Intel x86 microprocessors, and sometimes called the **instruction address register**, or just part of the instruction sequencer in some computers, is a processor register

It is a 16 bit special function register in the 8085 microprocessor. It keeps track of the the **next memory address** of the instruction that is to be executed once the execution of the current instruction is completed. **In other words, it holds the address of the memory location of the next instruction when the current instruction is executed by the microprocessor.**

Accumulator Register

This Register is used for storing the Results those are produced by the System. When the CPU will generate Some Results after the Processing then all the Results will be Stored into the **AC Register**.

Memory Data Register (MDR)

MDR is the register of a computer's control unit that contains the **data to be stored in the computer storage** (e.g. RAM), or the **data after a fetch from the computer storage**. It acts **like a buffer** and holds anything that is copied from the memory ready for the processor to use it. **MDR hold the information before it goes to the decoder.**

MDR which contains the data to be written into or readout of the addressed location. For example, to retrieve the contents of cell 123, we would load the value 123 (in binary, of course) into the MAR and perform a fetch operation. When the operation is done, a copy of the contents of cell 123 would be in the MDR. To store the value 98 into cell 4, we load a 4 into the MAR and a 98 into the MDR and perform a store. When the operation is completed the contents of cell 4 will have been set to 98, by discarding whatever was there previously.

The MDR is a two-way register. When data is fetched from memory and placed into the MDR, it is written to in one direction. When there is a write instruction, the data to be written is placed into the MDR from another CPU register, which then puts the data into memory.

The Memory Data Register is half of a minimal interface between a micro program and computer storage, the other half is a memory address register.

Index Register

A hardware element which holds a number that can be added to (or, in some cases, subtracted from) the address portion of a computer instruction to form an effective address. Also known as **base register**. An index register in a computer's CPU is a processor register used for modifying operand addresses during the run of a program.

Memory Buffer Register

MBR stand for ***Memory Buffer Register***. This register holds the contents of data or instruction read from, or written in memory. It means that this register is used to store data/instruction coming from the memory or going to the memory.

Data Register

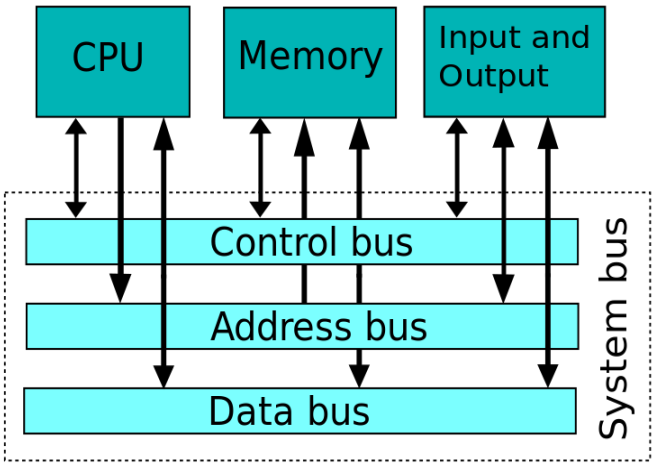
A register used in microcomputers to temporarily store data being transmitted to or from a peripheral device.

3. System bus

A **bus**, in computing, is a set of physical connections (cables, printed circuits, etc.) which can be shared by multiple hardware components in order to communicate with one another.

The purpose of buses is to reduce the number of "pathways" needed for communication between the components, by carrying out all communications over a single data channel. This is why the metaphor of a "data highway" is sometimes used.

If only two hardware components communicate over the line, it is called a **hardware port** (such as a [contents/415-serial-port-and-parallel-port serial port] or parallel port).



Characteristics

A bus is characterized by the amount of information that can be transmitted at once. This amount, expressed in bits, corresponds to the number of physical lines over which data is sent simultaneously. A 32-wire ribbon cable can transmit 32 bits in parallel. The term "**width**" is used to refer to the number of bits that a bus can transmit at once.

Additionally, the bus speed is also defined by its **frequency** (expressed in Hertz), the number of data packets sent or received per second. Each time that data is sent or received is called a **cycle**.

This way, it is possible to find the maximum **transfer speed** of the bus, the amount of data which it can transport per unit of time, by multiplying its width by its frequency. A bus with a width of 16 bits and a frequency of 133.

Architecture

In reality, each bus is generally constituted of 50 to 100 distinct physical lines, divided into three subassemblies:

- The **address bus** (sometimes called the *memory bus*) transports memory addresses which the processor wants to access in order to read or write data. It is a unidirectional bus.
- The **data bus** transfers instructions coming from or going to the processor. It is a bidirectional bus.

- The **control bus** (or *command bus*) transports orders and synchonisation signals coming from the control unit and travelling to all other hardware components. It is a bidirectional bus, as it also transmits response signals from the hardware.

The primary buses

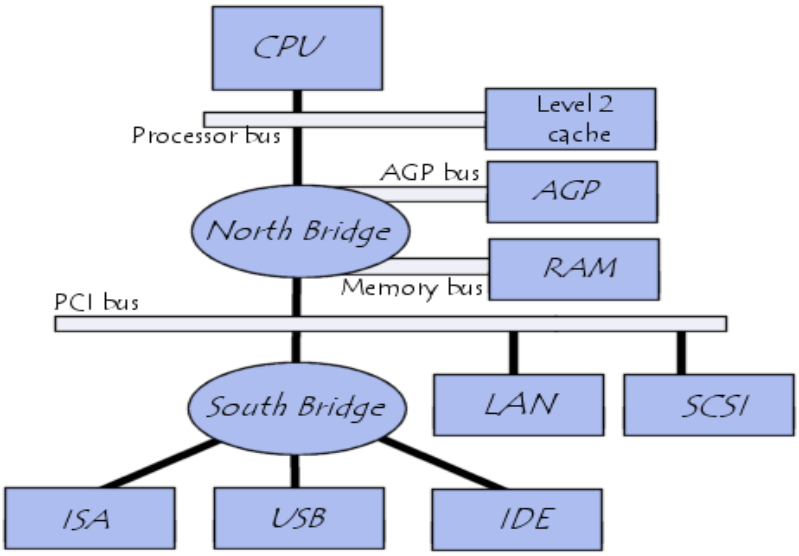
There are generally two buses within a computer:

- the **internal bus** (sometimes called the *front-side bus*, or *FSB* for short). The internal bus allows the processor to communicate with the system's central memory (the RAM).
- **the expansion bus** (sometimes called the *input/output bus*) allows various motherboardcomponents (USB, serial, and [contents/415-serial-port-and-parallel-port parallel ports], cards inserted in PCI connectors, hard drives, CD-ROM and CD-RW drives, etc.) to communicate with one another. However, it is mainly used to add new devices using what are called **expansion slots** connected to the input/outpur bus.

Chipset

A **chipset** is the component which routes data between the computer's buses, so that all the components which make up the computer can communicate with each other. The **chipset**originally was made up of a large number of electronic chips, hence the name. It generally has two components:

- The **NorthBridge** (also called the *memory controller*) is in charge of controlling transfers between the processor and the RAM, which is way it is located physically near the processor. It is sometimes called the **GMCH**, forr *Graphic and Memory Controller Hub*.
- The **SouthBridge** (also called the *input/output controller* or *expansion controller*) handles communications between peripheral devices. It is also called the **ICH** (*I/O Controller Hub*). The tem **bridge** is generally used to designate a component which connects two buses.



It is interesting to note that, in order to communicate, two buses must have the same width. The explains why RAM modules sometimes have to be installed in pairs (for example, early Pentium chips, whose processor buses were 64-bit, required two memory modules each 32 bits wide).

4.Main memory unit

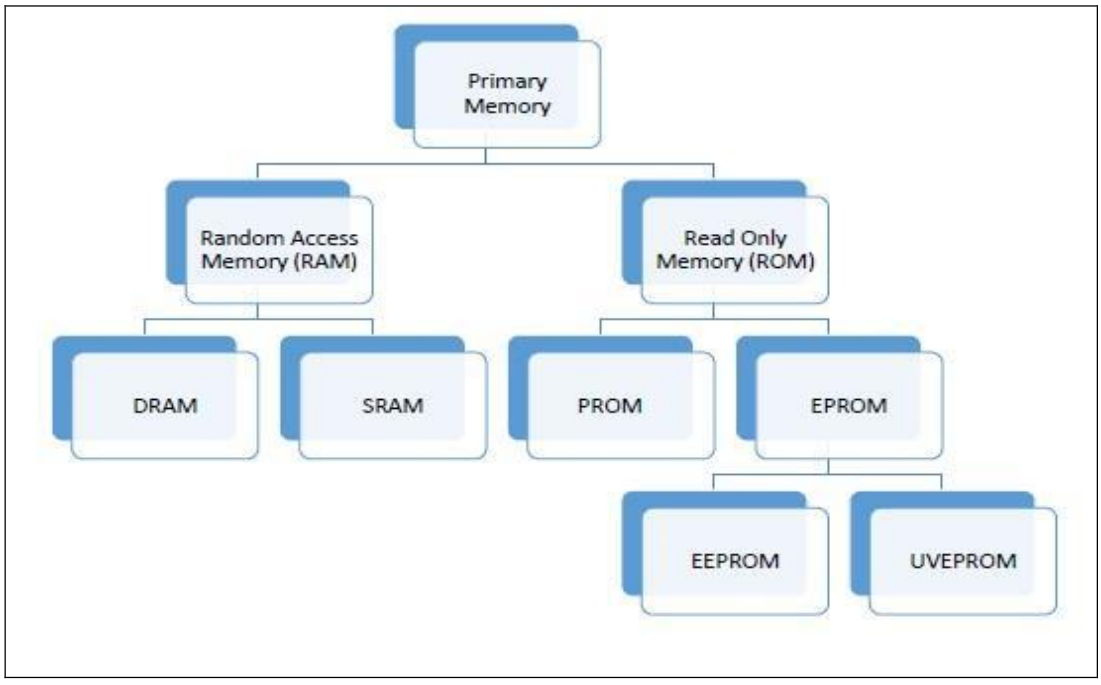
Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.

The main features of primary memory,

- It is accessed directly by the processor
- It is the fastest memory available
- Each word is stored as well as
- It is volatile, i.e. its contents are lost once power is switched off

Characteristics of Main Memory

- These are semiconductor memories.
- It is known as the main memory.
- Usually volatile memory.
- Data is lost in case power is switched off.
- It is the working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without the primary memory.



RAM

RAM stands for **Random Access Memory**. The processor accesses all memory addresses directly, irrespective of word length, making storage and retrieval fast. RAM is the fastest memory available and hence most expensive. These two factors imply that RAM is available in very small quantities of up to 1GB. RAM is volatile but my be of any of these two types

DRAM (Dynamic RAM)

Each memory cell in a DRAM is made of one transistor and one capacitor, which store one bit of data. However, this cell starts losing its charge and hence data stored in less than thousandth of a second. So it needs to be refreshed thousand times a second, which takes up processor time. However, due to small size of each cell, one DRAM can have large number of cells. Primary memory of most of the personal computers is made of DRAM.

SRAM (StaticRAM)

Each cell in SRAM is made of a flip flop that stores one bit. It retains its bit till the power supply is on and doesn't need to be refreshed like DRAM. It also has shorter read-write cycles as compared to DRAM. SRAM is used in specialized applications.

ROM

ROM stands for **Read Only Memory**. As the name suggests, ROM can only be read by the processor. New data cannot be written into ROM. Data to be stored into ROM is written during the manufacturing phase itself. They contain data that does not need to be altered, like booting sequence of a computer or algorithmic tables for mathematical applications. ROM is slower and hence cheaper than RAM. It retains its data even when power is switched off, i.e. it is non-volatile. ROM cannot be altered the way RAM can be but technologies are available to program these types of ROMs −

PROM (Programmable ROM)

PROM can be programmed using a special hardware device called PROM programmer or PROM burner.

EPROM (Erasable Programmable ROM)

EPROM can be erased and then programmed using special electrical signals or UV rays. EPROMs that can be erased using UV rays are called UVEPROM and those that can be erased using electrical signals are called EEPROM. However, handling electric signals is easier and safer than UV rays.

EEPROM (electrically erasable programmable read-only memory)

EEPROM (electrically erasable programmable read-only memory) is user-modifiable read-only memory (ROM) that can be erased and reprogrammed (written to) repeatedly through the application of higher than normal electrical voltage. Unlike EPROM chips, EEPROMs do not need to be removed from the computer to be modified. However, an EEPROM chip has to be erased and reprogrammed in its entirety, not selectively. It also has a limited life - that is, the number of times it can be reprogrammed is limited to tens or hundreds of thousands of times.

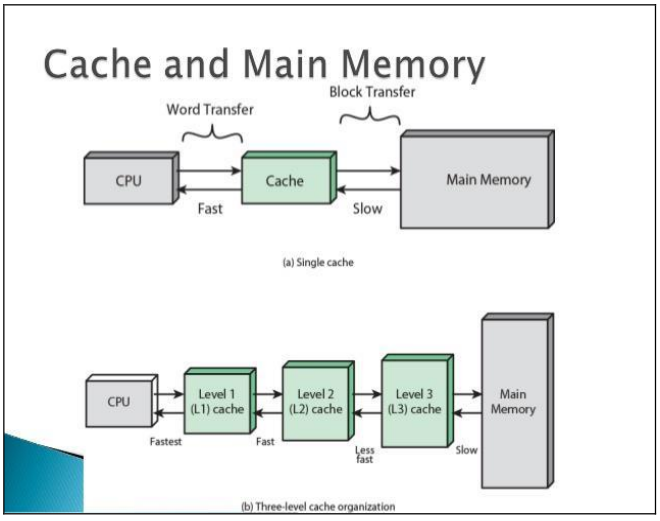
5.CACHE MEMORY

Cache memory, also called CPU memory, is random access memory (RAM) that a computer microprocessor can access more quickly than it can access regular RAM. This memory is typically integrated directly with the CPU chip or placed on a separate chip that has a separate bus interconnect with the CPU.

Cache memory is a small-sized type of volatile computer memory that provides high-speed data access to a processor and stores frequently used computer programs, applications and data. It stores and retains data only until a computer is powered up.

Cache memory provides faster data storage and access by storing an instance of programs and data routinely accessed by the processor. Thus, when a processor requests data that already has an instance in the cache memory, it does not need to go to the main memory or the hard disk to fetch the data.

Cache memory can be primary or secondary cache memory, where primary cache memory is directly integrated or closest to the processor. In addition to hardware-based cache, cache memory also can be a disk cache, where a reserved portion on a disk stores and provide access to frequently accessed data/applications from the disk.



The cache memory lies in the path between the processor and the memory. The cache memory therefore, has lesser access time than memory and is faster than the main memory. A cache memory have an access time of 100ns, while the main memory may have an access time of 700ns.

The cache memory is very expensive and hence is limited in capacity. Earlier cache memories were available separately but the microprocessors contain the cache memory on the chip itself.

The need for the cache memory is due to the mismatch between the speeds of the main memory and the CPU. The CPU clock as discussed earlier is very fast, whereas the main memory access time is comparatively slower. Hence, no matter how fast the processor is, the processing speed depends more on the speed of the main memory (the strength of a chain is the strength of its weakest link). It is because of this reason that a cache memory having access time closer to the processor speed is introduced.

The cache memory stores the program (or its part) currently being executed or which may be executed within a short period of time. The cache memory also stores temporary data that the CPU may frequently require for manipulation.

The cache memory works according to various algorithms, which decide what information it has to store. These algorithms work out the probability to decide which data would be most frequently needed. This probability is worked out on the basis of past observations.

It acts as a high speed buffer between CPU and main memory and is used to temporary store very active data and action during processing since the cache memory is faster then main memory, the processing speed is increased by making the data and instructions needed in current processing available in cache. The cache memory is very expensive and hence is limited in capacity.

6. INSIDE A COMPUTER

Motherboard

The **motherboard** is the computer's **main circuit board**. It's a thin plate that holds the CPU, memory, connectors for the hard drive and optical drives, expansion cards to control the video and audio, and connections to your computer's ports (such as USB ports). The motherboard connects directly or indirectly to every part of the computer.

CPU/processor

The central processing unit (CPU), also called a **processor**, is located inside the **computer case** on the motherboard. It is sometimes called the brain of the computer, and its job is to carry out commands. Whenever you press a key, click the mouse, or start an application, you're sending instructions to the CPU.

The CPU is usually a **two-inch ceramic square** with a **silicon chip** located inside. The chip is usually about the size of a thumbnail. The CPU fits into the motherboard's **CPU socket**, which is covered by the **heat sink**, an object that absorbs heat from the CPU.

A processor's **speed** is measured in **megahertz (MHz)**, or millions of instructions per second; and **gigahertz (GHz)**, or billions of instructions per second. A faster processor can execute instructions more quickly. However, the actual speed of the computer depends on the speed of many different components—not just the processor.

RAM (random access memory)

RAM is your system's **short-term memory**. Whenever your computer performs calculations, it temporarily stores the data in the RAM until it is needed.

This **short-term memory disappears** when the computer is turned off. If you're working on a document, spreadsheet, or other type of file, you'll need to **save** it to avoid losing it. When you save a file, the data is written to the **hard drive**, which acts as **long-term storage**.

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RAM is measured in **megabytes (MB) or gigabytes (GB)**. The **more RAM** you have, the more things your computer can do at the same time. If you don't have enough RAM, you may notice that your computer is sluggish when you have several programs open. Because of this, many people add **extra RAM** to their computers to improve performance.

Hard drive

The **hard drive** is where your software, documents, and other files are stored. The hard drive is **long-term storage**, which means the data is still saved even if you turn the computer off or unplug it.

When you run a program or open a file, the computer copies some of the data from the **hard drive** onto the **RAM**. When you **save** a file, the data is copied back to the **hard drive**. The faster the hard drive, the faster your computer can **start up** and **load programs**.

Power supply unit

The power supply unit in a computer **converts the power** from the wall outlet to the type of power needed by the computer. It sends power through cables to the motherboard and other components.

If you decide to open the computer case and take a look, make sure to **unplug** the computer first. Before touching the inside of the computer, you should touch a grounded metal object—or a metal part of the computer casing—to discharge any static buildup. Static electricity can be transmitted through the computer circuits, which can seriously damage your machine.

Expansion cards

Most computers have **expansion slots** on the motherboard that allow you to add various types of **expansion cards**. These are sometimes called **PCI (peripheral component interconnect) cards**. You may never need to add any PCI cards because most motherboards have built-in video, sound, network, and other capabilities.

However, if you want to boost the performance of your computer or update the capabilities of an older computer, you can always add one or more cards. Below are some of the most common types of expansion cards.

Video card

The **video card** is responsible for **what you see** on the monitor. Most computers have a **GPU (graphics processing unit)** built into the motherboard instead of having a separate video card. If you like playing graphics-intensive games, you can add a faster video card to one of the **expansion slots** to get better performance.

Sound card

The **sound card**—also called an audio card—is responsible for **what you hear** in the speakers or headphones. Most motherboards have integrated sound, but you can upgrade to a dedicated sound card for higher-quality sound.

Network card

The **network card** allows your computer to communicate over a network and access the Internet. It can either connect with an **Ethernet** cable or through a **wireless**connection (often called **Wi-Fi**). Many motherboards have built-in network connections, and a network card can also be added to an expansion slot.

Bluetooth card (or adapter)

Bluetooth is a technology for wireless communication over short distances. It's often used in computers to communicate with wireless **keyboards**, **mice**, and **printers**. It's commonly built into the motherboard or included in a **wireless network card**. For computers that don't have Bluetooth, you can purchase a USB adapter, often called a **dongle**.

8.Motherboard

A motherboard is the main printed circuit board (PCB) in a computer. The motherboard is a computer's central communications backbone connectivity point, through which all components and external peripherals connect.

The large PCB of a motherboard may include 6-14 layers of fiberglass, copper connecting traces and copper planes for power and signal isolation. Additional components can be added to a motherboard through its expansion slots. These may include processor sockets, DIMM, HTX, PCI, PCIe and M.2 slots as well as power supply connections. Typically motherboards offer additional connectivity through a Southbridge chip such as PCI, SATA, Thunderbolt, USB and more. CPU to RAM and PCIe are generally connected through point-to-point interconnects such as hypertransport (HT), quick path interconnect (QPI) or Ultrapath interconnect (UPI). Often, choosing a motherboard determines many of the features a desktop will have.

The most common motherboard design in desktop computers today is ATX, an Intel improvement on the AT design by IBM. Other form factors include extended ATX mini-ATX, microATX, BTX, microBTX mini ITX, micro ITX and nano ITX.

Data exchange in the motherboard

The motherboard is a large printed circuit board, which has lots of chips, connectors and other electronics mounted on it. Computer nerds simply call it a *board*.

Inside the PC, data is constantly being exchanged between or via the various *devices* Most of the data exchange takes place on the motherboard itself, where all the components are connected to each other:

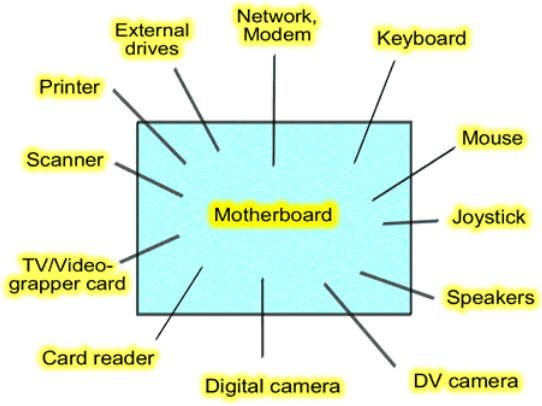


Fig. 23. Data exchange on the motherboard.

In relation to the PC's *external* devices, the motherboard functions like a central railway station.

Fig. 24. The motherboard is the hub of all data exchange.

All traffic originates from or ends up in the motherboard; which is appropriately called the most important component of the PC. I will show you pictures of the individual components of the motherboard later, but this is what it looks like as a total unit:

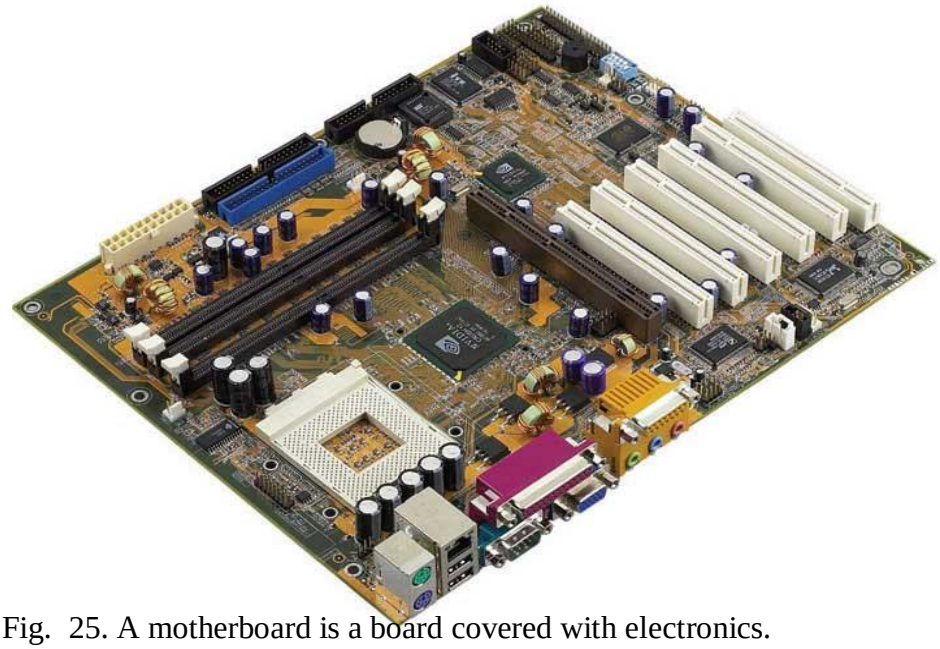


Fig. 25. A motherboard is a board covered with electronics.

Find your motherboard

If you are in position to look at a motherboard, I would recommend you do so. It is a very good exercise to try to identify the various components on a motherboard.

The motherboard is really just a big plastic sheet which is full of electrical conductors. The conductors (also called tracks) run across and down, and in several layers, in order to connect all the individual components, and transfer data between them.

The motherboard is mounted in the PC box using small plastic brackets and screws. The cabinet and the motherboard are made to suit each other, so there are holes in the metal for the connectors mounted on the board. Finally, the motherboard has to be connected to the PC's power supply installed in the cabinet. This is done using a standard connector:

The power supply is connected to the motherboard via a multi coloured cable and a large white plastic connector.

Chips

The active devices on the motherboard are gathered together in *chips*. These are tiny electronic circuits which are crammed with transistors. The chips have various functions. For example, there are:

- ROM chips, which store the BIOS and other *programs*.
- CMOS storage, which contains user-defined data used by the setup program.
- The chipset, which normally consists of two, so-called *controllers*, which incorporate a number of very essential functions.

Sockets

You will also find *sockets* on the motherboard. These are holders, which have been soldered to the motherboard. The sockets are built to exactly match a card or a chip.

This is how a number of components are directly connected to the motherboard. For example, there are sockets (*slots*) to mount:

- The CPU and working storage (the RAM modules).
- Expansion cards, also called adapters (PCI, AGP and AMR slots, etc.).

The idea of a socket is, that you can install a component directly on the motherboard without needing special tools. The component has to be pushed carefully and firmly into the socket, and will then hopefully stay there.

Plugs, connectors and ports…

The motherboard also contains a number of inputs and outputs, to which various equipment can be connected. Most ports (also called I/O ports) can be seen where they end in a connector at the back of the PC. These are:

- Ports for the keyboard and mouse.
- Serial ports, the parallel port, and USB ports.
- Sockets for speakers/microphone etc.

Often, the various connectors are soldered onto the motherboard, so that the external components, like the keyboard, mouse, printer, speakers, etc., can be connected directly to the motherboard.

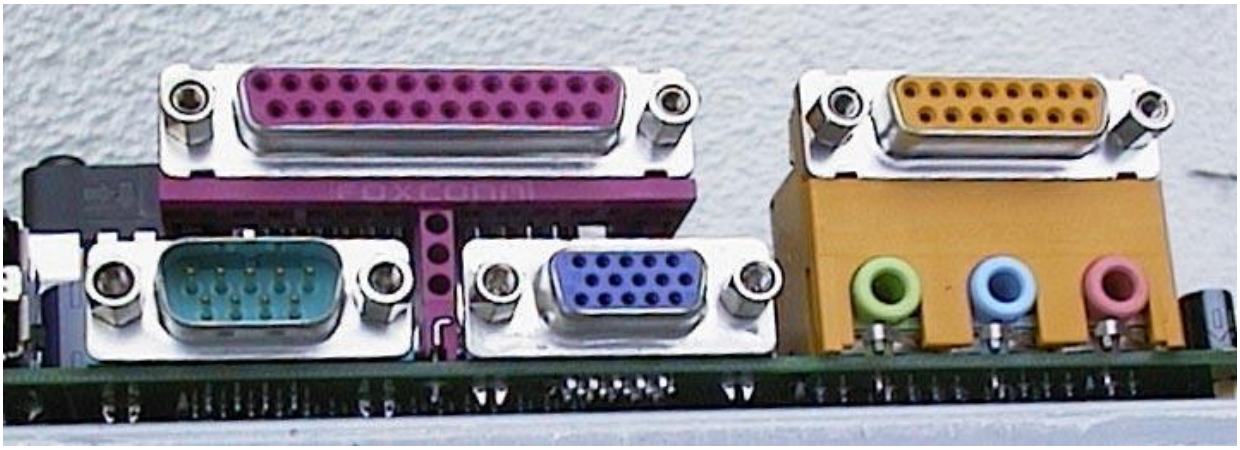


Fig. 28. Connectors mounted directly on a motherboard.

In addition to these sockets, connectors and ports, the motherboard contains a number of other contacts. These include:

- The big *connector* which supplies the motherboard with power from the power supply
- Other connectors for the diskette drive, hard disk, CD-ROM drive, etc.
- So-called *jumpers*, which are used on some motherboards to configure voltage and various operating speeds, etc.
- A number of pins used to connect the reset button, LED for hard disk activity, built-in speaker, etc.

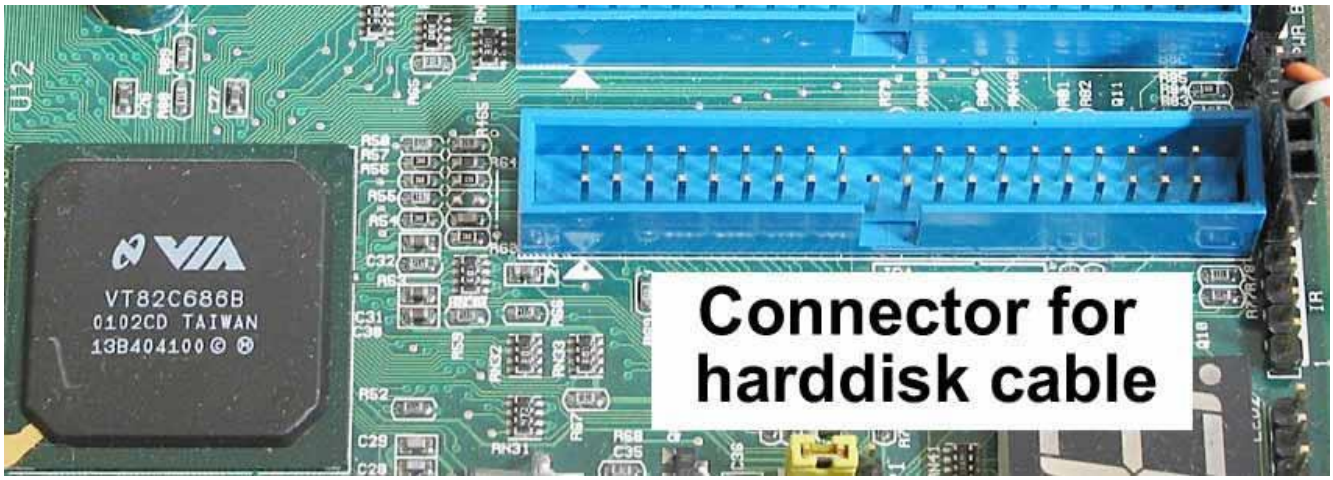


Fig. 29. A connector can be an array of pins like this, which suits a special cable.

Take a look at Fig. 30 and Fig. 31, which show connectors and jumpers from two different motherboards.

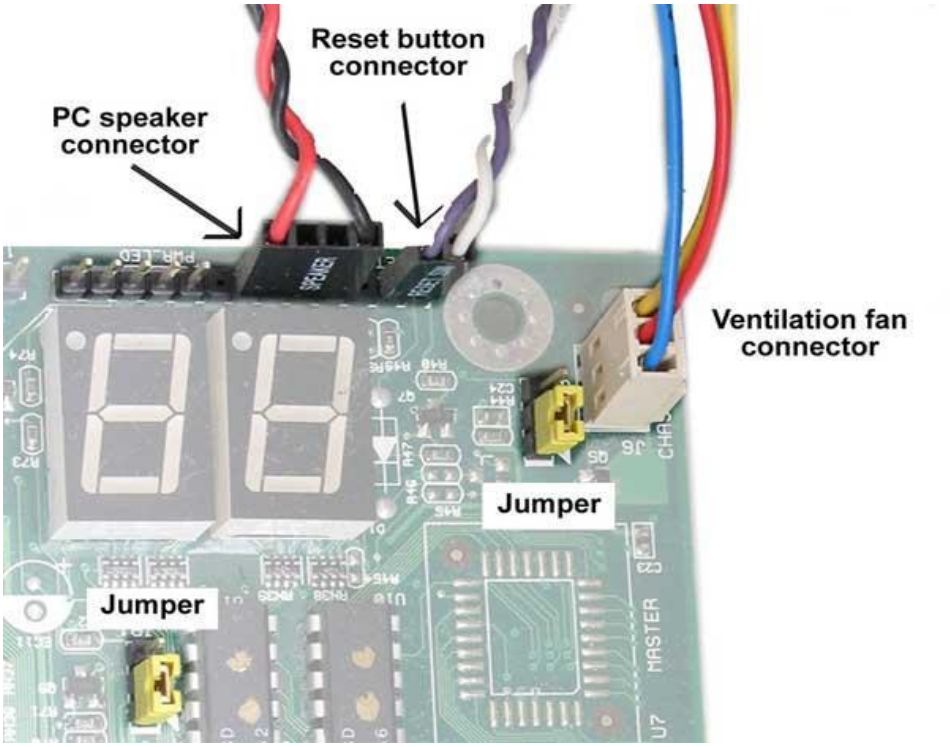


Fig. 30. The tiny connectors and jumpers that are hidden on any motherboard.

The ROM BIOS chip (Award brand), inFig. 31, contains a small collection of programs (software) which are permanently stored on the motherboard, and which are used, for example, when the PC starts up:

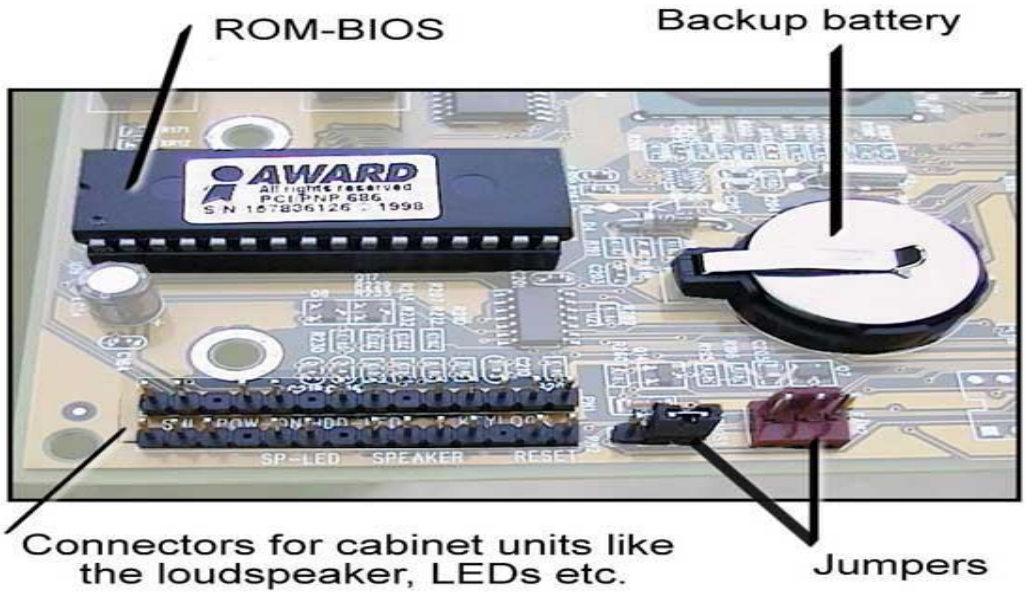


Fig. 31. At the bottom left, you can see the two rows of pins which connect, for example, to the little speaker inside the cabinet. On the bottom right you can see two "jumpers".

The round thing in Fig. 31 is the motherboard battery, which maintains the clock function and any settings saved in the CMOS storage.

9. Ports and interfaces

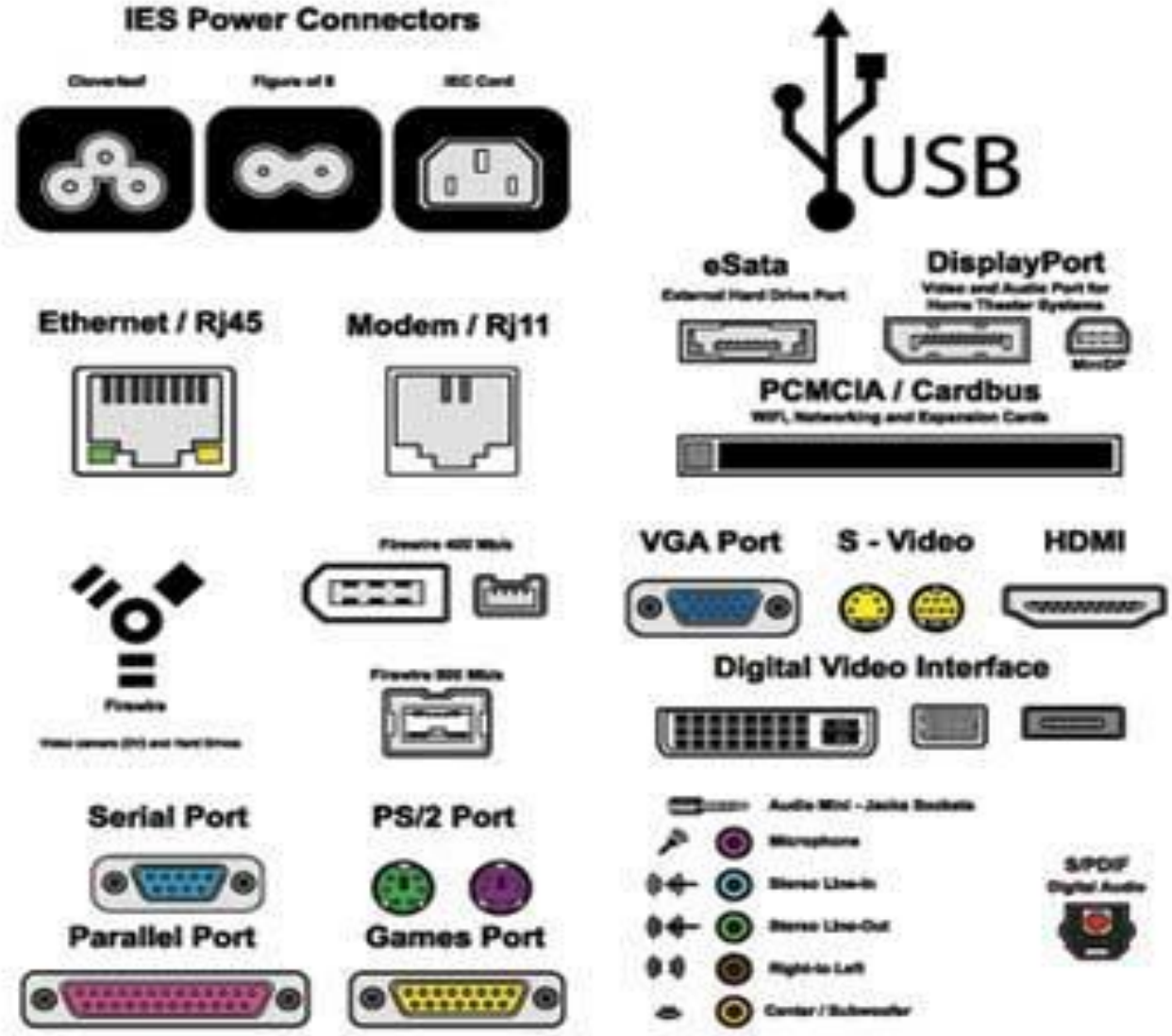
Ports

A port is a physical docking point using which an external device can be connected to the computer. It can also be programmatic docking point through which information flows from a program to the computer or over the Internet.

Characteristics of Ports

A port has the following characteristics −

- External devices are connected to a computer using cables and ports.
- Ports are slots on the motherboard into which a cable of external device is plugged in.
- Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speakers, etc.



Let us now discuss a few important types of ports −

Serial Port

- Used for external modems and older computer mouse
- Two versions: 9 pin, 25 pin model
- Data travels at 115 kilobits per second

Parallel Port

- Used for scanners and printers
- Also called printer port
- 25 pin model
- IEEE 1284-compliant Centronics port

PS/2 Port

- Used for old computer keyboard and mouse
- Also called mouse port
- Most of the old computers provide two PS/2 port, each for the mouse and keyboard
- IEEE 1284-compliant Centronics port

Universal Serial Bus (or USB) Port

- It can connect all kinds of external USB devices such as external hard disk, printer, scanner, mouse, keyboard, etc.
- It was introduced in 1997.
- Most of the computers provide two USB ports as minimum.
- Data travels at 12 megabits per seconds.
- USB compliant devices can get power from a USB port.

VGA Port

- Connects monitor to a computer's video card.
- It has 15 holes.
- Similar to the serial port connector. However, serial port connector has pins, VGA port has holes.

Power Connector

- Three-pronged plug.
- Connects to the computer's power cable that plugs into a power bar or wall socket.

Firewire Port

- Transfers large amount of data at very fast speed.
- Connects camcorders and video equipment to the computer.
- Data travels at 400 to 800 megabits per seconds.
- Invented by Apple.
- It has three variants: 4-Pin FireWire 400 connector, 6-Pin FireWire 400 connector, and 9-Pin FireWire 800 connector.

Modem Port

- Connects a PC's modem to the telephone network.

Ethernet Port

- Connects to a network and high speed Internet.
- Connects the network cable to a computer.
- This port resides on an Ethernet Card.
- Data travels at 10 megabits to 1000 megabits per seconds depending upon the network bandwidth.

Game Port

- Connect a joystick to a PC
- Now replaced by USB

Digital Video Interface, DVI port

- Connects Flat panel LCD monitor to the computer's high-end video graphic cards.
- Very popular among video card manufacturers.

Sockets

- Sockets connect the microphone and speakers to the sound card of the computer.

INTERFACES

The history of the PC has seen many different types of expansion slots. Some, like the MCA (*Micro-Channel Architecture*) interface, and the Video Electronics Standards Association's *VESA* interface, never really caught on and have quietly faded into history. A few newer interfaces, such as the ACR and the PCI-Express interfaces, are just now beginning to achieve acceptance.

The three most common expansion interfaces in current use are:

- PCI *(Peripheral Component Interconnect)*. The PCI interface is used for all kinds of expansion cards and is the most common expansion interface. All sorts of PCI expansion cards are available, including modems, add-on hard drive and I/O controllers, network cards, sound cards, some older video cards, and all manner of specialized controllers for industrial machinery.
- AGP *(Accelerated Graphic Port)*. The AGP interface is used only for video cards. It represents a significant improvement over older PCI video cards. But even within AGP, the standard has been improved and data transfer rates have increased. When selecting an AGP video card, one factor to consider is whether your motherboard is able to support it properly. For example, you shouldn't purchase a 4X AGP video card for a motherboard that only supports 2X AGP, nor vice-versa.
- PCI Express. The PCI-E interface theoretically can be used for almost any kind of I/O device, but is most popular as an interface for high-end video cards because of its massive data transfer capabilities (more than 250 Mb/sec, as of this writing).

10. Expansion cards

In computing, an expansion card is defined as a specific type of circuit board that is inserted into a computer to provide extra features, facilities or memory. Expansion cards are inserted into an expansion slot on the computer's motherboard and create an electronic link between the two with edge connectors so

data can be communicated across. They became popular soon after they were first introduced and remain popular to this day due to the opportunities they offer users to fully customise their computing experience.

Sound card

Also known as an audio card, this type of expansion card deals with everything to do with sounds and audio signals within the computer that are under the control of programs on the computer. This can include allowing applications on the computer to play music, programs which edit videos or audio, presentation software, games equipment and any other type of program which plays audio.

Sound Card - Certiology.com

The ability to play sound is often integrated into the motherboard of the computer, however this is not necessarily the best way to achieve high-quality sound. Sound expansion cards convert digital sound data into analog format, which is then relayed to an external device capable of playing sound such as headphones or a speaker. Sound cards also need to be capable of processing multiple sounds at the same time, splitting them up into audio channels. This allows different sound configurations to be produced, such as surround sound and stereo sound. Modern sound cards providing advanced sound mixing such as this are sometimes referred to as Hardware Audio Accelerators and can provide features such as positional audio and 3D sound.

Video card

A video card is more often called a graphics card or display card, and is responsible for generating images to a visual display such as a computer monitor or laptop screen. Although all motherboards have some degree of integrated graphics, a dedicated video card allows for higher quality graphics and better speeds. Video cards can offer such functions as the rendering of high-quality 3D and 2D graphics, the ability to connect to a TV and the ability to display graphics across multiple display screens.

A dedicated video card comes with its own RAM and cooling system, decreasing the reliance on the motherboard and allowing more processing power to be sectioned off solely for the display and processing of graphics. This can also help the computer as a whole to run faster and more efficiently as less system RAM power is being taken up by high demand graphics programs.

Network card

Often called a Network Interface Card or LAN Adapter, a network card is an expansion card which allows a computer to connect to a computer network such as a Local Area Network or Wide Area Network. This type of expansion card was most popular in early models of computers, in more modern machines almost all computers have a network interface built directly into the motherboard.

This is because it is cheaper and more convenient to use the Ethernet standard connection, which is easy to install as a chip straight from the motherboard and does not necessarily require a separate expansion card any more. For this reason, separate network cards are all but obsolete in newer computers other than in exceptional circumstances where a different type of network connection is required.

Serial and Parallel cards

Serial and Parallel expansion cards are used to provide additional connection ports to a computer, specifically to provide either parallel or serial port connections. A parallel port is only able to transmit data one way to a secondary device, commonly a printer or similar, using a dual data transmission system.

This type of one-way transmission was also used for older external storage devices. Serial ports are able to process data in a two-way direction, and are often slightly slower than parallel ports due to the more accurate transmission of data they send. Both serial ports and parallel ports have been mostly superseded by the faster and more efficient USB port in modern computers.

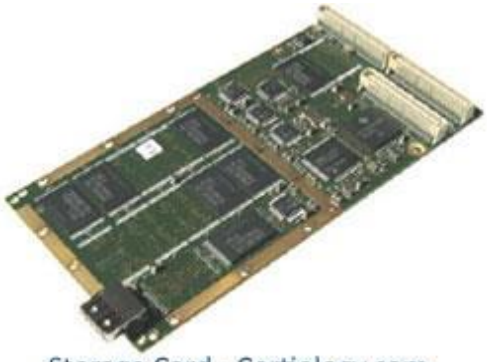
USB card

A USB expansion card is used to provide additional connection ports to a computer by connecting the card to the motherboard. USB is short for Universal Serial Bus, and is the most common type of port found in modern computers. Peripherals such as printers, keyboards, printers, removable flash drives and mice can be attached to the computer.

USB cards are necessary if a computer does not already have this capability, or to add additional ports for more use of external devices at once. USB connections are faster at transmitting data and quickly became a general industry standard for cross-platform communication.

Storage card

A storage card, often also called a flash memory card or simply a memory card that is connected to a computer in order to provide users with extra space to store their data on. This can include data such as music, pictures, text or video and is transferable to other devices such as digital cameras and mobile phones. These cards vary in both physical size and data capacity, and are constantly being developed and upgraded. Some of the most common on the market today include the Secure Digital (SD) Card, the Mini/Micro SD Card, and the MultiMediaCard (MMC).


Storage Card - Certiology.com

Data secured on storage cards is very stable and not in much danger of being lost or damaged outside of any actual physical damage to the card itself. Cards are much smaller physically than they were even as recently as 10 years ago, and some such as the Compact Flash card have been made almost obsolete by the introduction of more stable non-volatile memory devices. Storage cards also have an advantage over hard disk drives as they are very portable, allow immediate access when booted up and do not require cooling.

Modem card

A modem card allows a computer to send an analog carrier signal carrying digital information, and decodes the reverse of this signal in return to reproduce the original digital data. The most common way of doing this in the past was by using electrical signals transmitted over telephone lines, although more modern systems such as satellite, WiFi, mobile phones and mobile broadband modems also use this type of communication. Wireless modems can be embedded inside of a device or be external to it, and can be locked to only receive certain types of frequency signals, for example only those from one particular network provider.

Modern broadband modems are not limited to using telephone line, with newer types using satellite, television cables and power lines to transmit data signals. These are much more advanced than the older 'dial-up' style of modem, with much faster transmission of data and a hugely expanded range of channels available for use simultaneously. Modems are usually classified by how much data they are able to transfer in a set amount of time, generally bits per second (bps) or bytes per second (B/s), and this data can be used to compare modems when buying or choosing between them.

TV tuner card

A Television Tuner card is a card which is inserted into a computer to allow a device to receive television signals that would not otherwise be suited to picking them up. Cards are usually either PCI, mini PCI or PCIe, or sometimes as an external USB device. Most cards have an inbuilt processor to free up space from the system's CPU and ease the pressure on the computer. Cards can be either analog or digital depending on which type of television the user wishes to view, and many hybrid tuners exist which are able to switch between the two types. High-end tuner cards often include a special chip to encode and decode the data being transmitted, however smaller and cheaper cards are less likely to have this capability due to the high power it takes to run them.

Many TV tuner cards also include a form of flash memory which allows them to store several different types of decoding software, meaning the tuner card can be used in many different countries and with different video formats without reformatting the system to recognize the new data.

11. Ribbon cables

A **ribbon cable** (also known as multi-wire planar cable) is a cable with many conducting wires running parallel to each other on the same flat plane. As a result the cable is wide and flat. Its name comes from its resemblance to a piece of ribbon.Ribbon cables are usually seen for internal peripherals in computers, such as hard drives, CD drives and floppy drives. On some older computer systems (such as the BBC Micro and Apple II series) they were used for external connections as well. The ribbon-like shape interferes with computer cooling by disrupting airflow within the case and also makes the cables awkward to handle, especially when there are a lot of them; as a result, round cables have almost entirely replaced ribbon cables for external connections and are increasingly being used internally as well.

Color-coding

To reduce the risk of reversed connections one edge of the cable is usually marked with a red stripe. By convention the edge with the stripe is connected to pin 1 on the connector. This method of identification is fine for cables that just consist of two or more IDC connectors with every connector connecting to every wire, but is somewhat less helpful when individual wires or small groups of wires must be terminated separately.

To make it easier to identify individual conductors in a cable; ribbon-cable manufacturers introduced rainbow ribbon cable, which uses a repeating pattern of colors borrowed from the standard resistor color code (Brown is pin 1 or pin 11 or pin 21, etc. Red is pin 2 or pin 12 or pin 22, etc.). It is sometimes known affectionately to its users as "hippie cable" due to its distinct appearance.

Sizes

Ribbon cables are usually specified by two numbers: the spacing or *pitch* of the conductors, and the number of conductors or *ways*. A spacing of 0.05 inch (1.27 mm) is the most usual, allowing for a two-row connector with a pin spacing of 0.1 inch (2.54 mm). These types are used for many types of equipment, in particular for interconnections within an enclosure. For personal computers, this size is used today in floppy-disk-drive cables and older or custom Parallel ATA cables.

Based on availability of standard connectors, the number of conductors is usually restricted to a few values, These include 4, 6, 8, 9, 10, 14, 15, 16, 18, 20, 24, 25, 26, 34, 37, 40, 50, 60, 64 and 80. The wire is usually stranded copper wire, usually either 0.32, 0.20, or 0.13 mm^2 (22, 24, or 26 AWG).

Finer and coarser pitch cables are also available. For instance, the high-speed ATA interface cable used for computer hard disk interfaces ULTRA-ATA has 0.025-inch (0.64-mm) pitch. Finer pitches, as small as 0.3 mm, are found in portable electronic equipment, such as laptops; however, portable electronic equipment usually uses flexible flat cables (FFC).

Connectors

The main point of ribbon cables is to allow mass termination to specially designed IDC connectors in which the ribbon cable is forced onto a row of sharp forked contacts. (The phrase "IDC connector" is widely used, even though it is redundant—an example of RAS syndrome.) Most commonly termination is done at both ends of the cable, although sometimes (for example, when making a lead that needs to change wiring between the two connectors) only one end will be IDC terminated, with the other end being terminated in a regular crimp or solder-bucket connection. Although it is sometimes possible to dismantle and re-use IDC connectors, they are not designed to allow this to be done easily.

Popular types of connectors available with IDC termination suitable for ribbon cable include

- BT224 connector – also defined by BS9525-F0023, DIN41651, MIL-C-83503 standards; these are the type used on ATA cables and are often simply called "IDC connectors". They mate with either a purpose-made plug or a two-row grid of header pins with 0.1 inch (2.54 mm) spacing.
- D-subminiature connector – used for serial ports and printer ports (however IDC D connectors are far less common than crimp and solder bucket types).
- Micro ribbon connector - used for 36-pin printer ports (IEEE 1284 - "Centronics") and 50-pin SCSI ports.
- DIN 41612 connector – used for Eurocard buses.

- PCB transition headers – has two rows of pins with the same spacings as BT244 connectors. Intended to be soldered directly into a PCB.
- DIL headers – Has pins with the same spacings as standard DIL ICs. Generally used where for some reason it is desired to replace an IC with a connection to an external device (*e.g.*, in-circuit emulators). Can also be used like a PCB transition header, especially on stripboard. (Fitting a standard-spacing header to stripboard is tricky, because you have to cut the tracks between two holes rather than on a hole.)

When electronics hobbyists are working on their computers or digital musical keyboards to "mod" (modify) or "hack" them, they sometimes have to solder ribbon cables. Soldering ribbon cables can present a challenge to a hobbyist who has not been trained as an electronics technician. In some cases, hobbyists strip off the wire with a fine razor, and then separate the wires before soldering them. Some hobbyists use fine sandpaper to wear away the plastic insulation from the wires. The sanding also primes the copper tracks. Then when the "tinned" soldering iron is touched onto the bare wire, the solder is guided into the track.

12. Memory chips

A memory chip is a small computer device used to store information, data or a program that is run on a computer or other electronic device that runs like a computer, such as a camera or video game console. There are several different types of memory chips, although some are more commonly used than others.

DRAM

Dynamic random access memory chips or DRAM chips is a memory cell requiring refreshing because it transits only single lines of memory. A DRAM chip has numerous small capacitors that contain each memory bit. DRAM chips do not hold change and need to be refreshed in order to keep the contents on the chips from being lost. DRAM chips are commonly referred to as volatile memory chips because they lose their memory when power is lost. DRAM chips are used in some computers that are constantly hooked to power supplies.

SRAM

SRAM chips are static random access memory chips. SRAM chips are non-volatile memory chips and do not require refreshing or power to keep memory intact. SRAM chips are most common in portable battery powered devices like laptops, cameras, cell phones and video game consoles.

FIFO

FIFO memory chips or First-In First-Out memory chips are used in applications that are used between different devices. The devices work at different speeds, so the FIFO memory chips are necessary

to buffer the memory between the two devices. Flash or jump drives that are used to transport memory between different computers and types of computers use FIFO memory chips.

EPROM

EPROM chips are erasable programmable read-only memory. These types of memory chips can be erased when they are exposed to ultraviolet light. When erased, the ERPOM chips can then be reprogrammed to contain a new set of data or reused to house a different program. A variation of this type of memory chip is the EEPROM chip that can be erased electronically rather than with UV light.

PROM

PROM chips are programmable read-only memory chips that differ from other programmable read-only memory chips because they can only be written to once. PROM chips cannot be erased with UV light or electronically.

13.Processors

A processor, or "microprocessor," is a small chip that resides in computers and other electronic devices. Its basic job is to receive input and provide the appropriate output. While this may seem like a simple task, modern processors can handle trillions of calculations per second.

The central processor of a computer is also known as the CPU, or "central processing unit." This processor handles all the basic system instructions, such as processing mouse and keyboard input and running applications. Most desktop computers contain a CPU developed by either Intel or AMD, both of which use the x86 processor architecture. Mobile devices, such as laptops and tablets may use Intel and AMD CPUs, but can also use specific mobile processors developed by companies like ARM or Apple.

Modern CPUs often include multiple processing cores, which work together to process instructions. While these "cores" are contained in one physical unit, they are actually individual processors. In fact, if you view your computer's performance with a system monitoring utility like Windows Task Manager (Windows) or Activity Monitor (Mac OS X), you will see separate graphs for each processor. Processors that include two cores are called dual-core processors, while those with four cores are called quad-coreprocessors. Some high-end workstations contain multiple CPUs with multiple cores, allowing a single machine to have eight, twelve, or even more processing cores

.

Besides the central processing unit, most desktop and laptop computers also include a GPU. This processor is specifically designed for rendering graphics that are output on a monitor. Desktop computers often have a video card that contains the GPU, while mobile devices usually contain a graphics chip that is integrated into the motherboard. By using separate processors for system and graphics processing, computers are able to handle graphic-intensive applications more efficiently.

Types

Modern processors are designed by two distinct companies: Intel and Advanced Micro Devices (AMD). Intel processors are most commonly used in prefabricated computer systems, such as those from Dell and HP. The company focuses on two different lines of processors: the Pentium and the Celeron. Pentium processors are the larger microchip style that works on most desktop and some laptops. They can handle high-demand processing, such as that found in 3D gaming, video editing and other multimedia-intense applications. Celeron processors are more compact models with the ability to run a basic computer efficiently and cost-effectively.

AMD's line of computer processors can be found in prefabricated models, however, are most commonplace with home-built systems or specially designed machines. AMD was the first to build a 64-bit processor, capable of high-end applications use with graphic intensive operations. The previous industry standard had been 32-bit processing. Some AMD processors offer built-in virus protection.

7. SMPS

Switched Mode Power Supply (SMPS)

The disadvantages of LPS such as lower efficiency, the need for large value of capacitors to reduce ripples and heavy and costly transformers etc. are overcome by the implementation of **Switched Mode Power Supplies**.

The working of SMPS is simply understood by knowing that the transistor used in LPS is used to control the voltage drop while the transistor in SMPS is used as a **controlled switch**.

Input Stage

The AC input supply signal 50 Hz is given directly to the rectifier and filter circuit combination without using any transformer. This output will have many variations and the capacitance value of the capacitor should be higher to handle the input fluctuations. This unregulated dc is given to the central switching section of SMPS.

Switching Section

A fast switching device such as a Power transistor or a MOSFET is employed in this section, which switches ON and OFF according to the variations and this output is given to the primary of the transformer present in this section. The transformer used here are much smaller and lighter ones unlike the ones used for 60 Hz supply. These are much efficient and hence the power conversion ratio is higher.

Output Stage

The output signal from the switching section is again rectified and filtered, to get the required DC voltage. This is a regulated output voltage which is then given to the control circuit, which is a feedback circuit. The final output is obtained after considering the feedback signal.

Control Unit

The output sensor senses the signal and joins it to the control unit. The signal is isolated from the other section so that any sudden spikes should not affect the circuitry. A reference voltage is given as one input along with the signal to the error amplifier which is a comparator that compares the signal with the required signal level.

By controlling the chopping frequency the final voltage level is maintained. This is controlled by comparing the inputs given to the error amplifier, whose output helps to decide whether to increase or decrease the chopping frequency. The PWM oscillator produces a standard PWM wave fixed frequency.

The SMPS is mostly used where switching of voltages is not at all a problem and where efficiency of the system really matters. There are few points which are to be noted regarding SMPS. They are

- SMPS circuit is operated by switching and hence the voltages vary continuously.
- The switching device is operated in saturation or cut off mode.
- The output voltage is controlled by the switching time of the feedback circuitry.
- Switching time is adjusted by adjusting the duty cycle.
- The efficiency of SMPS is high because, instead of dissipating excess power as heat, it continuously switches its input to control the output.

Disadvantages

There are few disadvantages in SMPS, such as

- The noise is present due to high frequency switching.
- The circuit is complex.

- It produces electromagnetic interference.

Advantages

The advantages of SMPS include,

- The efficiency is as high as 80 to 90%
- Less heat generation; less power wastage.
- Reduced harmonic feedback into the supply mains.
- The device is compact and small in size.
- The manufacturing cost is reduced.
- Provision for providing the required number of voltages.

Applications

There are many applications of SMPS. They are used in the motherboard of computers, mobile phone chargers, HVDC measurements, battery chargers, central power distribution, motor vehicles, consumer electronics, laptops, security systems, space stations, etc.

Types of SMPS

SMPS is the Switched Mode Power Supply circuit which is designed for obtaining the regulated DC output voltage from an unregulated DC or AC voltage. There are four main types of SMPS such as

- DC to DC Converter
- AC to DC Converter
- Fly back Converter
- Forward Converter

The AC to DC conversion part in the input section makes the difference between AC to DC converter and DC to DC converter. The Fly back converter is used for Low power applications. Also there are Buck Converter and Boost converter in the SMPS types which decrease or increase the output voltage depending upon the requirements. The other type of SMPS include Self-oscillating fly-back converter, Buck-boost converter, Cuk, Sepic, etc.

POSSIBLE QUESTIONS

Section B

(5X2=10 Marks)

1. Define CPU.
2. Describe registers
3. What is ALU?
4. Define Capacitors.
5. What is Control Unit?

Section C

(5X6=30 Marks)

6. Elaborate the architecture of CPU with a neat diagram.
7. Elucidate in detail about Registers.
8. Discuss about Inside a Computer with examples.
9. Elaborate about the Types of Processor.
10. Elucidate the Ribbon cable.
11. What are System Bus inside a Computer?
12. Discuss on Types of Main Memory.
13. Discuss in detail about Processors.
14. Elucidate the Ports and Interfaces in a Computer.
15. Discuss in detail about the Memory chips.

KARPAGAM ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF COMPUTER SCIENCE

I B.Sc IT (Batch 2018-2021)

COMPUTER FUNDAMENTALS

PART - A OBJECTIVE TYPE/MULTIPLE CHOICE QUESTIONS

ONLINE EXAMINATIONS ONE MARKS QUESTIONS

UNIT IV

S.No	Questions	Option1	Option2	Option3	Option4	Answer
1	_____ is the brain of a Computer	memory	CPU	Processor	Peripherals	**CPU**
2	All the major _____ performed by a computer are carried outside its CPU	memory	Processor	calculations	Peripherals	**calculations**
3	_____ is also responsible for activating and controlling the operations of other units of a computer system.	CPU	memory	Processor	calculations	CPU
4	Two basic components of a CPU are	Control Unit	ALU	both a and b	None	**both a and b**
5	_____ of the CPU selects and interprets program instructions and then coordinates their execution.	Control Unit	ALU	both a and b	None	**Control Unit**
6	The special purpose registers named _____ register hold the current instruction	instruction	program control	decoder	CPU	**instruction**
7	The special purpose registers named _____ register hold the next instruction	instruction	program control	decoder	CPU	**program control**
8	_____ has necessary circuitry to decode and interpret the meaning of every instruction supported by the CPU	.	program control	decoder	CPU	**decoder**

9	Each instruction is accompanied by _____ how to execute the instruction	micro code	program control	decoder	CPU	**micro code**
10	_____ act as a nervous system for all other components of computer	Control Unit	ALU	both a and b	None	**Control Unit**
11	_____ manages and coordinates the entire computer system including input and output unit.	Control Unit	ALU	both a and b	None	**Control Unit**
12	_____isigna_ obtain instructions from a program stored in main memory, interprets the instructions and issues signals to other units	Control Unit	ALU	both a and b	None	**Control Unit**
13	_____ is the place where actual executions takes place during data processing operations	Control Unit	ALU	both a and b	None	**ALU**
14	When arithmetic operation or logic operations it passes control to	Control Unit	ALU	both a and b	None	**ALU**
15	_____ has register and circuitry to carry out all arithmetic and logic operations.	Control Unit	ALU	both a and b	None	**ALU**
16	CU and ALU is contained on a single chip it is	microprocessor	Control Unit	ALU	None	**microprocessor**
17	Every CPU ha built-in ability to execute a set of machine instructions called	microprocessor	Control Unit	instruction set	None	**instruction set**
18	The machine language designed for a processor is based on the list of instrctions supported by the CPU in its	microprocessor	Control Unit	instruction set	None	**instruction set**
19	Most CPU have200 or _____ instructions in their instruction set	more	less	few	none	**more**
20	Machine language programs written for one computer will generally not run on another computer with a different CPU.	TRUE	FALSE	few	none	**TRUE**
21	_____ is said to be backward compatible with its predecessor.	micro code	program control	decoder	CPU	**CPU**

22	In order to speed up the rate of information transfer, a number of special memory unit called _____are used.	registers	microprocessor	Control Unit	instruction set	**registers**
23	These _____ are used to hold information on a temporary basis and are part of the CPU.	registers	microprocessor	Control Unit	instruction set	**registers**
24	_____ hold the address of the active memory location.	MAR	MBR	PC	A	**MAR**
25	_____ hold the contents of the accessed memory word.	MAR	MBR	PC	A	**MBR**
26	_____ hold the address of the next instruction to be executed	MAR	MBR	PC	A	**PC**
27	_____ holds the data to be operated upon and the result of processing.	MAR	MBR	PC	A	**A**
28	_____ hold the current instruction bieng executed.	MAR	MBR	PC	I	**I**
29	Input/Output Register is to communicate with ____ devices.	I/O devices	Control Unit	ALU	Memory	I/O devices
30	MAR means	Memory Address	Memory Buffer	Address	Memory	**Memory Address**
31	MBR means	Memory Buffer	Memory Address	Address	Memory	**Memory Buffer**
32	PC means in Memory	Memory Buffer	Memory Address	Program counter	Personal Computer	**Program counter**
33	A means in Memory	Memory Buffer	Memory Address	Program counter	Accumulator	**Accumulator**
34	I Register in Memory	Instruction Register	Memory Address	Program counter	Accumulator	**Instruction Register**

35	Types of Processor	CISC	RISC	EPIC	all the above	**all the above**
36	CISC means	Complex Instruction Set Computer	Complete Instruction Set Computer	Common Instruction Set Computer	Complex Information Set Computer	**Complex Instruction Set Computer**
37	RISC means	Recycle Instruction Set Computer	Recalculate Instruction Set Computer	Reduced Instruction Set Computer	Recalculate Information Set Computer	**Reduced Instruction Set Computer**
38	EPIC means	Explicitly Parallel Instruction Computing	Expert Parallel Instruction Computing	Expand Parallel Instruction Computing	Elaborate Parallel Instruction Computing	**Explicitly Parallel Instruction Computing**
39	_____ processor can handle more work in parallel.	Processor	Multicore Processor	Multi Processor	Multiple Processor	**Multicore Processor**
40	Multicore Processor is also reffered as _____.	Energy Efficient	power aware	both a and b	none	**both a and b**
41	Multicore Processor Architecture _____.	share memory	memory Management	both a and b	none	**both a and b**
42	Limitation of Multicore	Application redesigned	Chellenging to create software	different views	all the above	**all the above**
43	Storage unit of a computer system is characterized	storage capacity	Access time	volatile	all the above	**all the above**
44	RAM means	Random Access Memory	Read Only Memory	main memory	Secondary memory	**Random Access Memory**
45	Memory locations can store a fixed number of bits called _____.	Word Length	address	instruction set	word	**Word Length**
46	The act of entering data into a storage location	read operation	write operation	store	retrieve	**write operation**

47	The act of retrieving data from a storage location is called _____.	read operation	write operation	store	retrieve	**read operation**
48	Memory capacity of a computer system	KB	MB	GB	all the above	**all the above**
49	Memory consists of IC chips are	RAM	ROM	PROM	None	**RAM**
50	ROM means	Random Access Memory	Read Only Memory	Memory	None	**Read Only Memory**
51	Micro programs deal with low level machine functions.	TRUE	FALSE	few	none	**TRUE**
52	customize micro programs is stored in	RAM	ROM	PROM	None	**PROM**
53	Micro programs can be stored many times	RAM	ROM	EPROM	None	**EPROM**
54	EPROM Means	Random Access Memory	Erasable Read Only Memory	main memory	Secondary memory	**Erasable Read Only Memory**
55	Cache memory match the speed of	memory Devices	Main memory	CPU	none	**CPU**
56	ROM means	Random Access Memory	Read Only Memory	main memory	Secondary memory	**Read Only Memory**
57	PROM Means	Read Only Memory	Random Access Memory	Programmable ROM	main memory	**Programmable ROM**
58	_____ chip be programmed to store new information	EPROM	ROM	RAM	None	**EPROM**
59	ROM can be	Manufacture Programmed	User Programmes	both a and b	None	**both a and b**

60	_____ Chip lated on the circuit board of each printer.	ROM	RAM	both a and b	None	**ROM**

KARPAGAM ACADEMY OF HIGHER EDUCATION

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(For the candidates admitted from 2018 onwards)

DEPARTMENT OF CS, CA & IT

SUBJECT : COMPUTER FUNDAMENTALS SEMESTER: I L T P C
SUBJECT CODE: 18ITU103 CLASS : I B. Sc. IT 4 0 0 4

UNIT-V

Overview of Emerging Technologies: Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

Suggested Readings:

1. Goel A. (2010). Computer Fundamentals. New Delhi: Pearson Education.

2. Aksoy P & DeNardis, L. (2006).Introduction to Information Technology. New Delhi: Cengage Learning

3. Sinha P. K.& Sinha, P. (2007). Fundamentals of Computers. New Delhi: BPB Publishers.

Websites

1. **www.en-wikipedia-org**
2. **www.in.pcmag.com/networking-communications-software**
3. **www.slideshare.net/**
4. **www.tutorialspoint.com/data_mining/**
5. **www.electronicsforu.com/**

OVERVIEW OF EMERGING TECHNOLOGIES

1. **BLUETOOTH**
2. **CLOUD COMPUTING**
3. **BIG DATA**
4. **DATA MINING**
5. **MOBILE COMPUTING**
6. **EMBEDDED SYSTEMS.**

1.BLUETOOTH

Bluetooth, the curiously named communication standard has taken the world by storm. Now a given feature on everything from smart phones to in-vehicle entertainment systems, Bluetooth has an interesting history and working, proving how versatile this communication standard is. It is managed by the Bluetooth Special Interest Group (SIG), a non-profit, non stock company which mainly deals with setting standards, licensing and advancing Bluetooth capabilities.

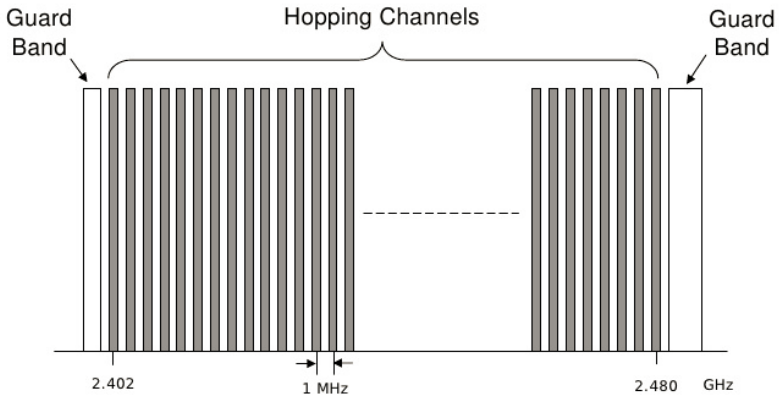
How Did Bluetooth Start and Why Is It Named So?

Members from this group have a say in the direction the company is going, and have generally had a hand in the development of the standard as a whole. The Promoter members are:

- Ericsson
- Intel
- Microsoft
- Nokia
- Lenovo
- Toshiba
- Motorola

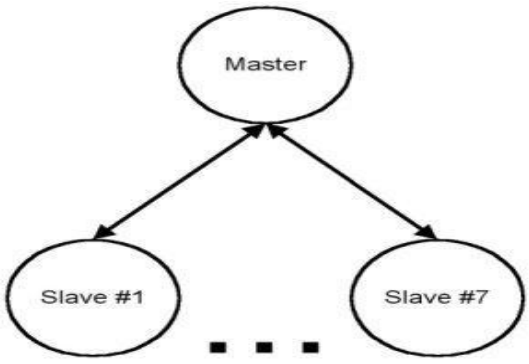
The Bluetooth Special Interest Group has a set of terms and conditions that must be followed by all members, and also has a set of compliance guidelines for all devices.

Now, to the very interesting name. Ericsson, the company that started Bluetooth is from Sweden, which is part of the Scandinavian region, a historical and cultural-linguistic part of Europe. The name comes from an epithet of a tenth-century King of Denmark and Norway named Harald "Bluetooth" Gormsson. In the local language, he was called *Blåtand* or *Blåtann,* which translated in English became 'Bluetooth'. He was known for uniting the Vikings in ages past, from which the idea of the communication standard came, something that was a single unifying standard for mobile technologies. The logo, in fact, is a combination of two Nordic runes called 'Hagall' and 'Bjarkan', which were the initials of King Harald "Bluetooth" Gormsson.



How Does Bluetooth Work?

For the tech savvy, Bluetooth operates in the standard Industrial, Scientific and Medical (ISM) short range frequency band of 2.4 GHz. Specifically, it operated in the 2400–2483.5 MHz frequency band, which includes guard bands as well. It uses something called Frequency Hopping Spread Spectrum (FHSS), which is basically a multiple access method in which data packets are divided based on frequency over 79 designated Bluetooth channels. Each channel has a bandwidth of 1 MHz. The newer Bluetooth 4.0 standard, however, uses 2 MHz steps and thus has 40 designated channels. It uses a variation of FHSS called Adaptive Frequency-hopping spread spectrum (AFH), which theoretically skips channels with interference and results in better communication.



Bluetooth is essentially a protocol with a master-slave architecture, which means that one master device can communicate with up to 7 devices. This was and is a huge advantage to earlier wired communication protocols which could work only with a 1 to 1 configuration. Essentially creating a new standard called Personal Area Networks (PANs), Bluetooth brought about far more effective ad-hoc networks and allows communication without traditional host based networking. This network of Bluetooth devices is called a 'piconet'. There's also work going on to create something called a 'scatternet', which is a combination of two or more piconets, where a device that acts as a master in one piconet can be a slave in another.

Bluetooth Classes – Power Consumption and Range

Most Bluetooth devices have a range of around 10 meters or so, because they're battery operated and are of the Class 2 type. Depending on power consumption and range, there are basically 3 types of Bluetooth devices. They are:

- Class 1: Max. Permitted Power – 100 mW, Range: Around 100 m
- Class 2: Max. Permitted Power – 2.5 mW, Range: Around 10 m
- Class 3: Max. Permitted Power – 1 mW, Range: Around 1 m

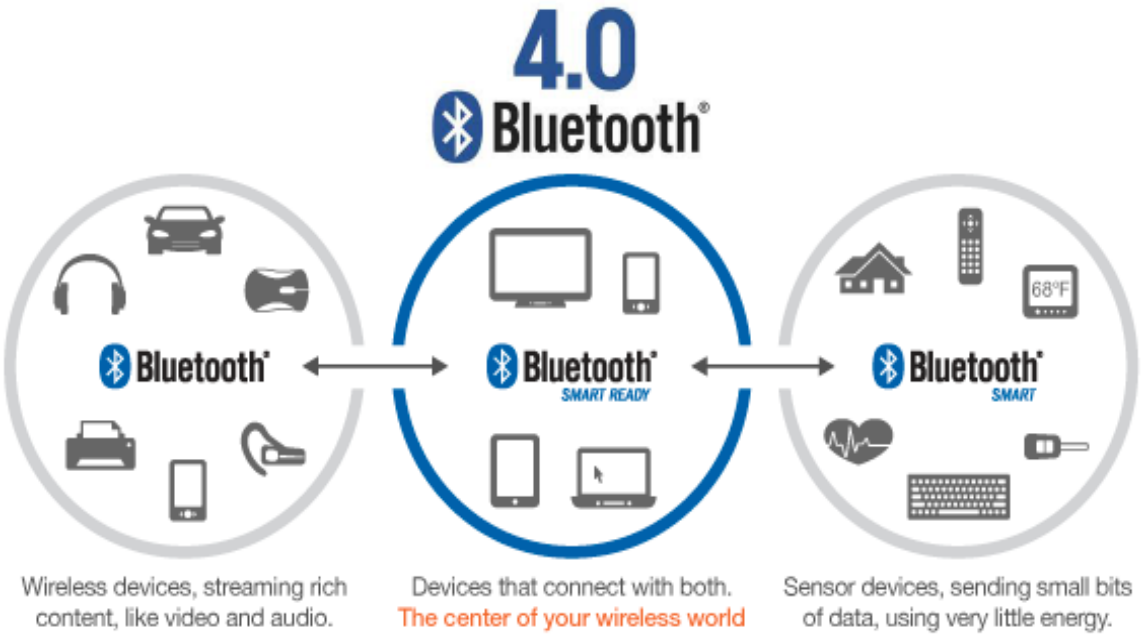
The huge drop in power from Class 2 to Class 1 is why the range is so short, but for daily use, 10 meters is more than enough. Larger applications and more powerful transceivers are where you can expect to see 100 meters range, and they are usually replacements for WiFi in certain situations where WLANs (Wireless Local Area Networks) are required. Although a line of sight is not always required for operation, a clear path is more or less recommended for optimum functioning. Like WiFi, walls and similar obstacles will decrease efficiency, more so since most devices aren't meant for high range usage.

Bluetooth Versions Throughout the Years

Over the years, Bluetooth went from unknown network protocol to one of the most well known and commonly used standards in the world. Currently in v4.1, here's how it has grown from strength to strength:

- **Bluetooth v1.0:** The first standard introduced, it wasn't actually used commercially because it had difficulties with interoperability, which was supposed to be the main draw of a universal communication standard.
- **Bluetooth v1.1:** Dubbed IEEE 802.15.1-2002 since the SIG didn't exist, it fixed a lot of the problems from the previous versions and added non-encrypted channels and signal strength indicators.

- **Bluetooth v1.2:** Brought about much faster transfer speeds, introduced AFH and better transmission conventions such as retransmission of corrupted data packets.
- **Bluetooth v2.0+EDR:** Again brought about faster transfer speeds, upto 3 Mbits/s theoretically. EDR stood for 'Enhanced Data Rate', to signify this.
- **Bluetooth v2.1+EDR:** A major revision that let device pairing happen much faster and more easily, as we know today.
- **Bluetooth v3.0+HS:** Another major revision that allowed data transfer of upto 24 Mbits/s, but not on the actual Bluetooth channel. The Bluetooth channel was used to pair devices, then the actual transfer was done over a channelized WiFi link.
- **Bluetooth v4.0 LE:** Called Bluetooth Low Energy, this drastically lowered power required while keeping data rates up, which opened up a whole new world of constantly connected devices such as fitness bands, smart watches and the like. It wasn't possible earlier to keep the link on for too long because of battery and heat issues, so Bluetooth v4.0 LE was something of a milestone.



- **Bluetooth v4.1:** An evolution of v4.0, this version will support LTE transfers, higher exchange rates, better security protocols, efficient pairing and reduced network cycles.

Advantages and Disadvantages

As mentioned earlier, Bluetooth was something of a revolution, creating Personal Area Networks for easy sharing. Here's some pros of Bluetooth technology:

- Easy to use
- Widespread and works across a range of devices
- Free ad-hoc networking
- Data transmission control
- Backwards compatible to a certain extent
- Does not require specific line of sight

Then, there are the cons:

- somewhat vulnerable to hacking
- Loses connection after a certain short range
- Throughput can be affected in certain conditions
- Prone to wireless interference since it shares a common channel
- Slow transfer rates for heavy data usage
- Eats up battery power prior to the implementation of Bluetooth LE

Applications of Bluetooth

One thing's for sure, however. Despite all the disadvantages or cons, Bluetooth is one of the most widely used network protocols in the world. While we are used to Bluetooth headsets, there's way more to it than just that. Some of the applications include:

- Wireless headsets
- Interface between devices and in-vehicle entertainment systems
- Replacement for some WiFi networks
- Wireless bridging in corporate or industrial networks
- Wireless connection for peripherals like keyboards and mice
- Wireless audio transmission
- Videogame console controllers

Embedded System

As its name suggests, Embedded means something that is attached to another thing. An embedded system can be thought of as a computer hardware system having software embedded in it. An embedded system can be an independent system or it can be a part of a large system. An embedded system is a microcontroller or microprocessor based system which is designed to perform a specific task. For example, a fire alarm is an embedded system; it will sense only smoke.

An embedded system has three components –

- It has hardware.
- It has application software.
- It has Real Time Operating system (RTOS) that supervises the application software and provide mechanism to let the processor run a process as per scheduling by following a plan to control the latencies. RTOS defines the way the system works. It sets the rules during the execution of application program. A small scale embedded system may not have RTOS.

So we can define an embedded system as a Microcontroller based, software driven, and reliable, real-time control system.

Characteristics of an Embedded System

- **Single-functioned** – An embedded system usually performs a specialized operation and does the same repeatedly. For example: A pager always functions as a pager.
- **Tightly constrained** – All computing systems have constraints on design metrics, but those on an embedded system can be especially tight. Design metrics is a measure of an implementation's features such as its cost, size, power, and performance. It must be of a size to fit on a single chip, must perform fast enough to process data in real time and consume minimum power to extend battery life.
- **Reactive and Real time** – Many embedded systems must continually react to changes in the system's environment and must compute certain results in real time

without any delay. Consider an example of a car cruise controller; it continually monitors and reacts to speed and brake sensors. It must compute acceleration or de-accelerations repeatedly within a limited time; a delayed computation can result in failure to control of the car.

- **Microprocessors based** – It must be microprocessor or microcontroller based.
- **Memory** – It must have a memory, as its software usually embeds in ROM. It does not need any secondary memories in the computer.
- **Connected** – It must have connected peripherals to connect input and output devices.
- **HW-SW systems** – Software is used for more features and flexibility. Hardware is used for performance and security.

Advantages

- Easily Customizable
- Low power consumption
- Low cost
- Enhanced performance

Disadvantages

- High development effort
- Larger time to market

Basic Structure of an Embedded System

The following illustration shows the basic structure of an embedded system –

- **Sensor** – It measures the physical quantity and converts it to an electrical signal which can be read by an observer or by any electronic instrument like an A2D converter. A sensor stores the measured quantity to the memory.
- **A-D Converter** – An analog-to-digital converter converts the analog signal sent by the sensor into a digital signal.

- **Processor & ASICs** – Processors process the data to measure the output and store it to the memory.
- **D-A Converter** – A digital-to-analog converter converts the digital data fed by the processor to analog data
- **Actuator** – An actuator compares the output given by the D-A Converter to the actual (expected) output stored in it and stores the approved output.

MOBILE COMPUTING

Mobile Computing is a technology that allows transmission of data, voice and video via a computer or any other wireless enabled device without having to be connected to a fixed physical link. The main concept involves –

- Mobile communication
- Mobile hardware
- Mobile software

Mobile communication

The mobile communication in this case, refers to the infrastructure put in place to ensure that seamless and reliable communication goes on. These would include devices such as protocols, services, bandwidth, and portals necessary to facilitate and support the stated services. The data format is also defined at this stage. This ensures that there is no collision with other existing systems which offer the same service.

Mobile Hardware

Mobile hardware includes mobile devices or device components that receive or access the service of mobility. They would range from portable laptops, smart phones; tablet Pc's, Personal Digital Assistants.

These devices will have a receptor medium that is capable of sending and receiving signals. These devices are configured to operate in full- duplex, whereby they are capable of sending and receiving signals at the same time. They don't have to wait until one device has finished communicating for the other device to initiate communications.

Above mentioned devices use an existing and established network to operate on. In most cases, it would be a wireless network.

Mobile software

Mobile software is the actual program that runs on the mobile hardware. It deals with the characteristics and requirements of mobile applications. This is the engine of the mobile device. In other terms, it is the operating system of the appliance. It's the essential component that operates the mobile device.

Since portability is the main factor, this type of computing ensures that users are not tied or pinned to a single physical location, but are able to operate from anywhere. It incorporates all aspects of wireless communications.

Mobile Computing Classification

- **Personal digital assistant (pda)**
- **Smart phones**
- **Tablet pc and I pads**

Personal Digital Assistant (PDA)

The main purpose of this device is to act as an electronic organizer or day planner that is portable, easy to use and capable of sharing information with your computer systems.

PDA is an extension of the PC, not a replacement. These systems are capable of sharing information with a computer system through a process or service known as synchronization. Both devices will access each other to check for changes or updates in the individual devices. The use of infrared and Bluetooth connections enables these devices to always be synchronized.

With PDA devices, a user can browse the internet, listen to audio clips, watch video clips, edit and modify office documents, and many more services. The device has a stylus and a touch sensitive screen for input and output purposes.

Smart phones

This kind of phone combines the features of a PDA with that of a mobile phone or camera phone. It has a superior edge over other kinds of mobile phones.

Smart phones have the capability to run multiple programs concurrently. These phones include high-resolution touch screens, web browsers that can access and properly

display standard web pages rather than just mobile-optimized sites, and high-speed data access via Wi-Fi and high speed cellular broadband.

The most common mobile Operating Systems (OS) used by modern smartphones include Google's Android, Apple's iOS, Nokia's Symbian, RIM's BlackBerry OS, Samsung's Bada, Microsoft's Windows Phone, and embedded Linux distributions such as Maemo and MeeGo. Such operating systems can be installed on different phone models, and typically each device can receive multiple OS software updates over its lifetime.

Tablet PC and iPads

This mobile device is larger than a mobile phone or a PDA and integrates into a touch screen and is operated using touch sensitive motions on the screen. They are often controlled by a pen or by the touch of a finger. They are usually in slate form and are light in weight. Examples would include ipads, Galaxy Tabs, Blackberry Playbooks etc.

They offer the same functionality as portable computers. They support mobile computing in a far superior way and have enormous processing horsepower. Users can edit and modify document files, access high speed internet, stream video and audio data, receive and send e-mails, attend/give lectures and presentations among its very many other functions. They have excellent screen resolution and clarity.

Advantages

- Location flexibility
- Saves time
- Enhanced productivity
- Ease of research
- Entertainment
- Streamlining of business processes

Security Issues

It's also important to take the necessary precautions to minimize these threats from taking place. Some of those measures include –

- Hiring qualified personnel.

- Installing security hardware and software
- Educating the users on proper mobile computing ethics
- Auditing and developing sound, effective policies to govern mobile computing
- Enforcing proper access rights and permissions.

Current Trends

3G/4G

3G/4G or third/Fourth generation mobile telecommunications is a generation of standards for mobile phones and mobile telecommunication services fulfilling the International Mobile Telecommunications-2000 (IMT-2000) specifications by the International Telecommunication Union.

Global Positioning System (GPS)

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. The GPS program provides critical capabilities to military, civil and commercial users around the world.

Long Term Evolution (LTE)

LTE is a standard for wireless communication of high-speed data for mobile phones and data terminals. It is based on the GSM/EDGE and UMTS/HSPA network technologies, increasing the capacity and speed using new modulation techniques.

WiMAX

WiMAX (Worldwide Interoperability for Microwave Access) is a wireless communications standard designed to provide 30 to 40 megabit-per-second data rates, with the latest update providing up to 1 Gbit/s for fixed stations. It is a part of a fourth generation or 4G wireless-communication technology. WiMAX far surpasses the 30-metre wireless range of a conventional Wi-Fi Local Area Network (LAN), offering a metropolitan area network with a signal radius of about 50 km.

Near Field Communication

Near Field Communication (NFC) is a set of standards for smart phones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few centimeters. Present and anticipated applications include contact less transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi.

CLOUD COMPUTING

INTRODUCTION TO CLOUD COMPUTING:

- Cloud computing refers to applications and services that run on a distributed network using virtualized resources and accessed by common Internet protocols and networking standards.
- Cloud computing represents a real paradigm shift in the way in which systems are deployed. The massive scale of cloud computing systems was enabled by the popularization of the Internet and the growth of some large service companies. Cloud computing makes the long-held dream of utility computing possible with a pay-as-you-go, infinitely scalable, universally available system.
- Cloud computing takes the technology, services, and applications that are similar to those on the Internet and turns them into a self-service utility. The use of the word "cloud" makes reference to the two essential concepts:
  - ✓ **Abstraction:** Cloud computing abstracts the details of system implementation from users and developers. Applications run on physical systems that aren't specified, data is stored in locations that are unknown, administration of systems is outsourced to others, and access by users is ubiquitous.
  - ✓ **Virtualization:** Cloud computing virtualizes systems by pooling and sharing resources. Systems and storage can be provisioned as needed from a centralized infrastructure, costs are assessed on a metered basis, multi-tenancy is enabled, and resources are scalable with agility.
- Cloud computing is an abstraction based on the notion of pooling physical resources and presenting them as a virtual resource. It is a new model for provisioning resources, for staging applications, and for platform-independent user access to services. Clouds can come in many

different types, and the services and applications that run on clouds may or may not be delivered by a cloud service provider.

- (E.G):- Google, Microsoft Azure and Amazon Web services.

TYPES OF CLOUD:

Cloud computing is of distinct sets of models:

- ✓ **Deployment models:** This refers to the location and management of the cloud's infrastructure.
- ✓ **Service models:** This consists of the particular types of services that you can access on a cloud computing platform.

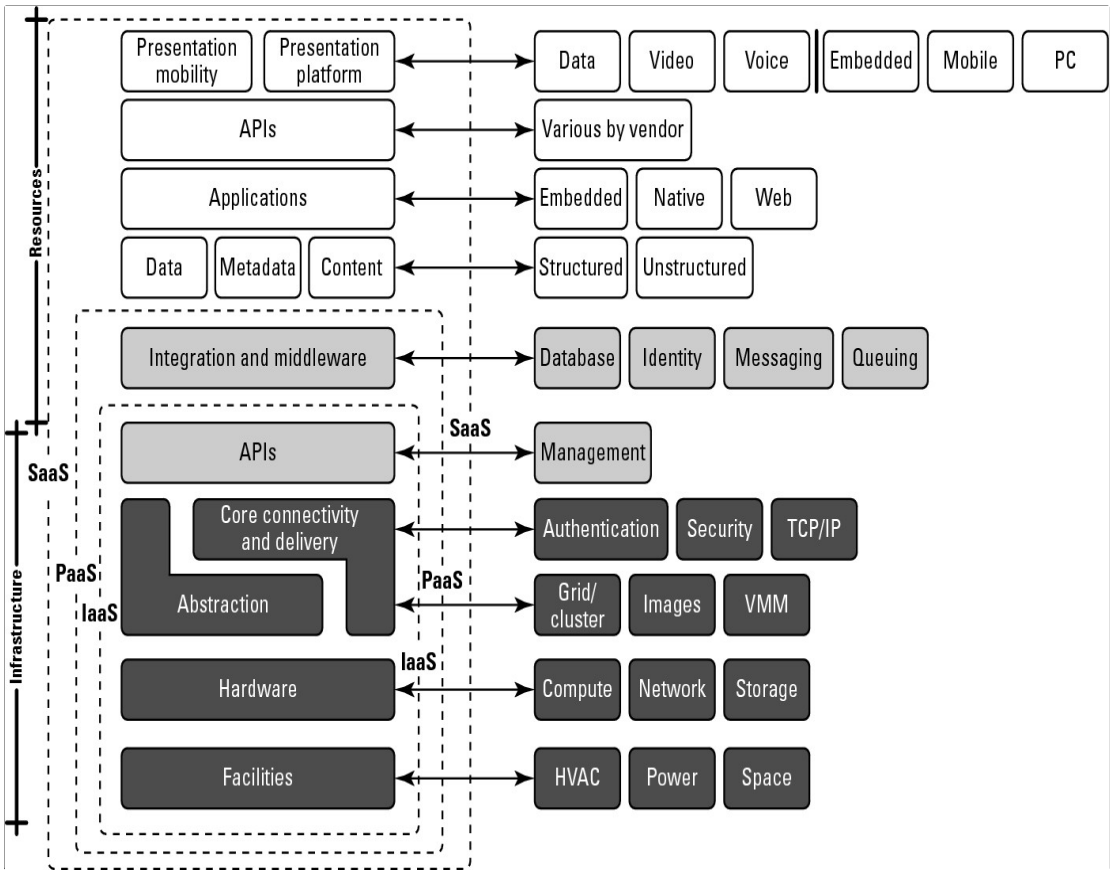
- **Deployment models**

A deployment model defines the purpose of the cloud and the nature of how the cloud is located.

The NIST definition for the four deployment models is as follows:

- ✓ **Public cloud:** The public cloud infrastructure is available for public use alternatively for a large industry group and is owned by an organization selling cloud services.
- ✓ **Private cloud:** The private cloud infrastructure is operated for the exclusive use of an organization. The cloud may be managed by that organization or a third party. Private clouds may be either on- or off-premises.
- ✓ **Hybrid cloud:** A hybrid cloud combines multiple clouds (private, community of public) where those clouds retain their unique identities, but are bound together as a unit. A hybrid cloud may offer standardized or proprietary access to data and applications, as well as application portability.
- ✓ **Community cloud:** A community cloud is one where the cloud has been organized to serve a common function or purpose. It may be for one organization or for several organizations, but they share common concerns such as their mission, policies, security, regulatory compliance needs, and so on. A community cloud may be managed by the constituent organization or by a third party

The following diagram shows the different locations that clouds can come in.



- **Service models**

In the deployment model, different cloud types are an expression of the manner in which infrastructure is deployed. You can think of the cloud as the boundary between where a client's network, management, and responsibilities ends and the cloud service provider's begins. As cloud computing has developed, different vendors offer clouds that have different services associated with them.

The portfolio of services offered adds another set of definitions called the service model.

There are many different service models described in the literature, all of which take the following form: XaaS, or "<*Something*> as a Service"

Three service types have been universally accepted:

- **Infrastructure as a Service:** IaaS provides virtual machines, virtual storage, virtual

infrastructure, and other hardware assets as resources that clients can provision. The IaaS service provider manages the entire infrastructure, while the client is responsible for all other aspects of the deployment. This can include the operating system, applications, and user interactions with the system.

• **Platform as a Service:** PaaS provides virtual machines, operating systems, applications, services, development frameworks, transactions, and control structures. The client can deploy its applications on the cloud infrastructure or use applications that were programmed using languages and tools that are supported by the PaaS service provider. The service provider manages the cloud infrastructure, the operating systems, and the enabling software. The client is responsible for installing and managing the application that it is deploying.

• **Software as a Service:** SaaS is a complete operating environment with applications, management, and the user interface. In the SaaS model, the application is provided to the client through a thin client interface (a browser, usually), and the customer's responsibility begins and ends with entering and managing its data and user interaction. Everything from the application down to the infrastructure is the vendor's responsibility.

The three different service models taken together have come to be known as the SPI model of cloud computing. Many other service models have been mentioned: StaaS, Storage as a Service; IdaaS, Identity as a Service; CmaaS, Compliance as a Service; and so forth.

A PaaS service adds integration features, middleware, and other orchestration and choreography services to the IaaS model.

Examples of PaaS services are:

• Force.com, GoGrid CloudCenter, Google AppEngine and Windows Azure Platform.

When a cloud computing vendor offers software running in the cloud with use of the application on a pay-as-you-go model, it is referred to as SaaS. With SaaS, the customer uses the application as needed and is not responsible for the installation of the application, its maintenance, or its upkeep.

Good examples of SaaS cloud service providers are:

• GoogleApps, Oracle on Demand, SalesForce.com and SQL Azure.

Windows Azure Platform allows .NET developers to stage their applications on top of Microsoft's infrastructure so that any application built with the .NET Framework can live locally, in Microsoft's cloud network, or some combination thereof. As Microsoft adds enterprise applications to its cloud service portfolio, as it has in the case of SQL Azure (and many other enterprise applications to come), these offerings fall under the rubric of being an SaaS service model.

Characteristics of Cloud Computing:

Cloud computing builds on so many older concepts in computer technology that it can be hard for people newly introduced to the concept to grasp that it represents a paradigm shift in computing. It's an evolutionary change that enables a revolutionary new approach to how computing services are produced and consumed.

Paradigm Shift:

When you choose a cloud service provider, you are renting or leasing part of an enormous infrastructure of datacenters, computers, storage, and networking capacity. Many of these datacenters are multi-million-dollar investments by the companies that run them. To give you some sense of scale, it has been estimated that a state-of-the-art microchip fabrication facility can cost anywhere from $2 to $5 billion. By comparison, a state of the art cloud computing datacenter can run in the range of $100 million.

Most of the large cloud computing service providers have multiple datacenters located all over the world.

Amazon.com's infrastructure was built to support elastic demand so the system could accommodate peak traffic on a busy shopping day such as “Black Monday.” Because much of the capacity was idle, Amazon.com first opened its network to partners and then as Amazon Web Services to customers.

Benefits of Cloud Computing:

The NIST Definition of Cloud Computing by Peter Mell and Tim Grance (version 14, 10/7/2009) classified cloud computing into the three SPI service models (SaaS, IaaS, and PaaS) and four cloud types (public, private, community, and hybrid), also assigns five essential characteristics that cloud computing systems must offer:

• **On-demand self-service:** A client can provision computer resources without the need for interaction with cloud service provider personnel.

• **Broad network access:** Access to resources in the cloud is available over the network using standard methods in a manner that provides platform-independent access to clients of all types. This includes a mixture of heterogeneous operating systems, and thick and thin platforms such as

Laptops, mobile phones, and PDA.

• **Resource pooling:** A cloud service provider creates resources that are pooled together in a system that supports multi-tenant usage. Physical and virtual systems are dynamically allocated or reallocated as needed. Intrinsic in this concept of pooling is the idea of abstraction that hides the location of resources such as virtual machines, processing, memory, storage, and network bandwidth and connectivity.

• **Rapid elasticity:** Resources can be rapidly and elastically provisioned. The system can add resources by either scaling up systems (more powerful computers) or scaling out systems (more computers of the same kind), and scaling may be automatic or manual. From the standpoint of the client, cloud computing resources should look limitless and can be purchased at any time and in any quantity.

• **Measured service:** The use of cloud system resources is measured, audited, and reported to the customer based on a metered system. A client can be charged based on a known metric such as amount of storage used, number of transactions, network I/O (Input/Output) or bandwidth, amount of processing power used, and so forth.

• **Lower costs:** Because cloud networks operate at higher efficiencies and with greater utilization, significant cost reductions are often encountered.

• **Ease of utilization:** Depending upon the type of service being offered, you may find that you do not require hardware or software licenses to implement your service.

• **Quality of Service:** The Quality of Service (QoS) is something that you can obtain under contract from your vendor.

• **Reliability:** The scale of cloud computing networks and their ability to provide load balancing and failover makes them highly reliable, often much more reliable than what you can achieve in a single organization.

• **Outsourced IT management:** A cloud computing deployment lets someone else manage your computing infrastructure while you manage your business. In most instances, you achieve considerable reductions in IT staffing costs.

• **Simplified maintenance and upgrade:** Because the system is centralized, you can easily apply patches and upgrades. This means your users always have access to the latest software versions.

• **Low Barrier to Entry:** In particular, upfront capital expenditures are dramatically reduced. In cloud computing, anyone can be a giant at any time. This very long list of benefits should make it obvious why so many people are excited about the idea of cloud computing.

Datamining

What is Data mining?

Data Mining is defined as the procedure of extracting information from huge sets of data. data mining is mining knowledge from data.

Datamining is often defined as finding hidden information in a database. Alternatively. it has been called exploratory data analysis, data driven discovery, and deductive learning.

Extraction of information is not the only process we need to perform; data mining also involves other processes such as Data Cleaning, Data Integration, Data Transformation, Data Mining, Pattern Evaluation and Data Presentation.

Database Processing vs. Data Mining Processing

- SQL -No precise query language

Data

- Operational Data - Not operational data

Output

- Precise - Fuzzy
- Subset of database - Not a subset of database

Examples

Data base:

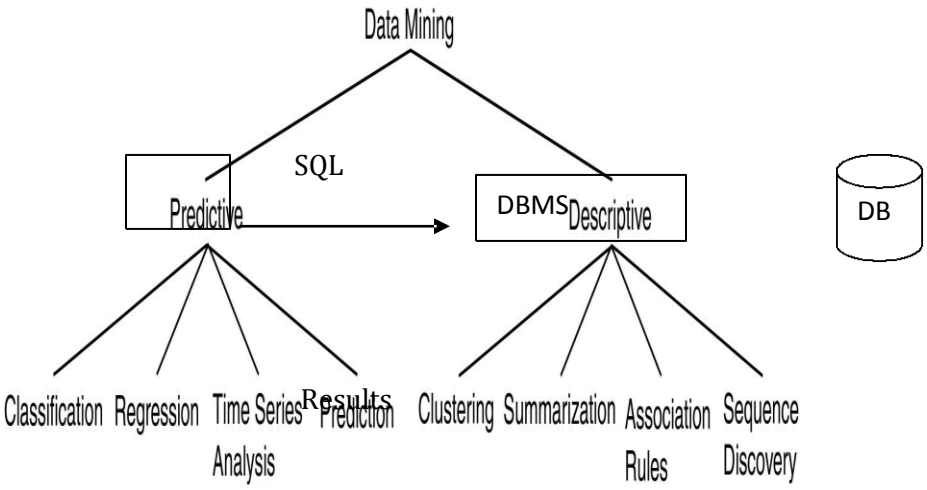
Find all credit applicants with last name of Smith. Identify customers who have purchased more than $10,000 in the last month. Find all customers who have purchased milk.

Datamining:

Find all credit applicants who are poor credit risks. (Classification)

Identify customers with similar buying habits.(Clustering)

Find all items which are frequently purchased with milk. (association rules)



Datamining algorithms can be characterized as consisting of three parts:

- **Model:** the purpose of the algorithm is to fit a model to the data.
- **Preference**: Some criteria must be used to fit one model over another.
- **Search:** All algorithms require some technique to search the data.

Predictive Model:

It makes a prediction about values of data using known results found from different data. Predictive model may be made based on the use of other historical data.

Descriptive Model:

It identifies patterns or relationship in data. Unlike predictive model, a descriptive model serves as a way to explore the properties of the data examined not to predict new properties.

Basic Datamining tasks:

Classification:

- Classification maps data into predefined groups or classes.
- It is often referred to as supervised learning because the classes are determined before examining the data.
- Pattern recognition is a type of classification where an input pattern is classified into one several classes based on its similarity to these predefined classes.

Regression:

- Regression is used to map a data item to a real valued prediction variable.
- Regression assumes that the target data fit into some known type of function and then determines the best function of this type that models in the given data.

Time series analysis:

- With time series analysis the value of an attribute is examines as it varies over time. The values are obtained as evenly space time points.
- There are three basic functions performed in time series analysis. In one case, distance measures are used to determine the similarity between different time series.
- In second case, the structure of the line is examined to determine its behavior.

- In third application would be to use the historial time series plot to predict future values.
- Example: Stock Market

Prediction

It is used to predict missing or unavailable numerical data values rather than class labels. Regression Analysis is generally used for prediction. Prediction can also be used for identification of distribution trends based on available data.

Clustering:

- Clustering is similar to classification except that the groups are not rather defined by the data alone.
- Clustering is alternatively referred to as unsupervised learning or segmentation.
- Clustering groups similar data together into clusters.
- A special type of clustering is called segmentation. With segmentation a database is partitioned into disjointed groupings of similar tuples called segments.

Summarization

It maps data into subsets with associated simple descriptions. It extracts or derives representative information about the database. It is also called as Characterization,Generalization

Association rules:

Link Analysis uncovers relationships among data. It is also referred to as Affinity Analysis or Association Rules, refers to the datamining task of uncovering relationship among data. An association rule is a model that identifies specific types of data associations.

Datamining Vs Knowledge Discovery in Databases:

The terms Knowledge discovery in databases and datamining are often used interchangeably. Many other names given to this process of discovering useful hidden patterns in data:

- knowledge extraction,
- Information discovery,
- Exploratory data analysis,
- Information harvesting and
- Unsupervised pattern recognition.

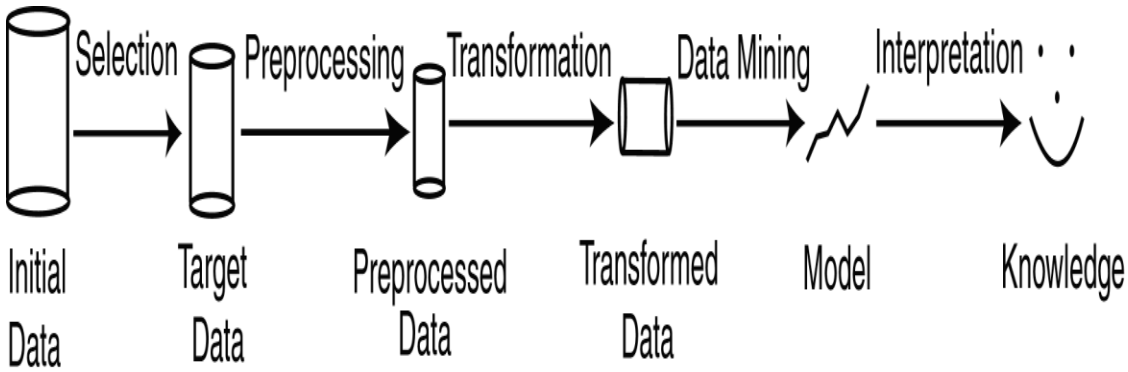
Knowledge Discovery in Databases (KDD): process of finding useful information and patterns in data.

Data Mining: Use of algorithms to extract the information and patterns derived by the KDD process

Selection: The data needed for the datamining process may be Obtain data from various data sources.

Preprocessing: The data to be used by the process may have incorrect or missing data.Erroneous data may be corrected or removed, whereas missing data must be supplied or predicted.

The KDD process consists of the following five steps:



Transformation: Data from different sources must be converted into a common format for processing.

Data Mining: This step applied algorithms to the transformed data to generate the desired results.

Interpretation/Evaluation: Present results to user in meaningful manner.

Visualization refers to the visual presentation of data. The use of visualization techniques allows use to summarize , extract and grasp more complex results than more mathematical or text type descriptions of the results.

Visualization techniques include:

Graphical: Barcharts, pie charts, histograms, and line graphs.

Geometric: Box Plot, Scatter diagram

Icon based: Figures, colors, or other icons

Pixel based: uniquely colored pixel

Hierarchical: Divide display area into regions

Hybrid: Preceding approaches can be combined into one display.

BigData

Introduction

Big data is a blanket term for the non-traditional strategies and technologies needed to gather, organize, process, and gather insights from large datasets. While the problem of working with data that exceeds the computing power or storage of a single computer.

What Is Big Data?

An exact definition of "big data" is difficult to nail down because projects, vendors, practitioners, and business professionals use it quite differently. With that in mind, generally speaking, **big data** is:

- large datasets
- the category of computing strategies and technologies that are used to handle large datasets

In this context, "large dataset" means a dataset too large to reasonably process or store with traditional tooling or on a single computer. This means that the common scale of big datasets is constantly shifting and may vary significantly from organization to organization.

Big Data Systems

The basic requirements for working with big data are the same as the requirements for working with datasets of any size. However, the massive scale, the speed of ingesting and processing, and the characteristics of the data that must be dealt with at each stage of the process present significant new challenges when designing solutions.

Characteristics that make big data different from other data processing:

Volume

The sheer scale of the information processed helps define big data systems. These datasets can be orders of magnitude larger than traditional datasets, which demands more thought at each stage of the processing and storage life cycle.

Often, because the work requirements exceed the capabilities of a single computer, this becomes a challenge of pooling, allocating, and coordinating resources from groups of computers. Cluster management and algorithms capable of breaking tasks into smaller pieces become increasingly important.

Velocity

Another way in which big data differs significantly from other data systems is the speed that information moves through the system. Data is frequently flowing into the system from multiple sources and is often expected to be processed in real time to gain insights and update the current understanding of the system.

This focus on near instant feedback has driven many big data practitioners away from a batch-oriented approach and closer to a real-time streaming system. Data is constantly being added, massaged, processed, and analyzed in order to keep up with the influx of new information and to surface valuable information early when it is most relevant.

Variety

Big data problems are often unique because of the wide range of both the sources being processed and their relative quality.Data can be ingested from internal systems like application and server logs, from social media feeds and other external APIs, from physical device sensors, and from other providers. Big data seeks to handle potentially useful data regardless of where it's coming from by consolidating all information into a single system.

Other Characteristics

Various individuals and organizations have suggested expanding the original three Vs, though these proposals have tended to describe challenges rather than qualities of big data. Some common additions are:

- **Veracity**: The variety of sources and the complexity of the processing can lead to challenges in evaluating the quality of the data (and consequently, the quality of the resulting analysis)
- **Variability**: Variation in the data leads to wide variation in quality. Additional resources may be needed to identify, process, or filter low quality data to make it more useful.
- **Value**: The ultimate challenge of big data is delivering value. Sometimes, the systems and processes in place are complex enough that using the data and extracting actual value can become difficult.

So how is data actually processed when dealing with a big data system? While approaches to implementation differ, there are some commonalities in the strategies and software that we can talk about generally. While the steps presented below might not be true in all cases, they are widely used.The general categories of activities involved with big data processing are:

- Ingesting data into the system
- Persisting the data in storage
- Computing and Analyzing data
- Visualizing the results

Clustered Computing

Because of the qualities of big data, individual computers are often inadequate for handling the data at most stages. To better address the high storage and computational needs of big data, computer clusters are a better fit. Big data clustering software combines the resources of many smaller machines, seeking to provide a number of benefits:

- **Resource Pooling**: Combining the available storage space to hold data is a clear benefit, but CPU and memory pooling is also extremely important. Processing large datasets requires large amounts of all three of these resources.
- **High Availability**: Clusters can provide varying levels of fault tolerance and availability guarantees to prevent hardware or software failures from affecting access to data and processing. This becomes increasingly important as we continue to emphasize the importance of real-time analytics.
- **Easy Scalability**: Clusters make it easy to scale horizontally by adding additional machines to the group. This means the system can react to changes in resource requirements without expanding the physical resources on a machine.
- **Batch processing** is one method of computing over a large dataset. The process involves breaking work up into smaller pieces, scheduling each piece on an individual machine, reshuffling the data based on the intermediate results, and then calculating and assembling the final result.

Big Data Glossary

While we've attempted to define concepts as we've used them throughout the guide, sometimes it's helpful to have specialized terminology available in a single place:

- **Big data**: Big data is an umbrella term for datasets that cannot reasonably be handled by traditional computers or tools due to their volume, velocity, and variety. This term is also typically applied to technologies and strategies to work with this type of data.
- **Batch processing**: Batch processing is a computing strategy that involves processing data in large sets. This is typically ideal for non-time sensitive work that operates on very large sets of data.
- **Cluster computing**: Clustered computing is the practice of pooling the resources of multiple machines and managing their collective capabilities to complete tasks.
- **Data lake**: Data lake is a term for a large repository of collected data in a relatively raw state. This is frequently used to refer to the data collected in a big data system which might be unstructured and frequently changing.
- **Data mining**: Data mining is a broad term for the practice of trying to find patterns in large sets of data.
- **Data warehouse**: Data warehouses are large, ordered repositories of data that can be used for analysis and reporting. In contrast to a *data lake*, a data warehouse is composed of data that has been cleaned, integrated with other sources, and is generally well-ordered.
- **ETL**: ETL stands for extract, transform, and load. It refers to the process of taking raw data and preparing it for the system's use.
- **In-memory computing**: In-memory computing is a strategy that involves moving the working datasets entirely within a cluster's collective memory.
- **Machine learning**: Machine learning is the study and practice of designing systems that can learn, adjust, and improve based on the data fed to them.
- **Map reduce (big data algorithm)**: Map reduce (the big data algorithm, not Hadoop's MapReduce computation engine) is an algorithm for scheduling work on a computing cluster.

POSSIBLE QUESTIONS

Section B
(5X2=10 Marks)

1. What is Cloud Computing?

2. Define big data.

3. Define Bluetooth.

4. Define cloud computing.

5. Define Embedded Systems.

Section C
(5X6=30 Marks)

6. Explain in detail Architecture of Bluetooth.

7. Write in detail about Mobile Computing.

8. Discuss in detail about Cloud Computing.

9. Explain in detail about Data Mining Techniques.

10. Discuss in detail about Embedded Systems with a Diagram.

11. Elaborate about Mobile Computing Applications.

12. What is Classification in Data Mining? Explain.

13. Explain Software as a Service in cloud Computing with example.

14. List out the Advantages and Disadvantages of Mobile Computing.

15. List out the Characteristics of an Embedded System.

KARPAGAM ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF COMPUTER SCIENCE

I B.Sc IT (Batch 2018-2021)

COMPUTER FUNDAMENTALS

PART - A OBJECTIVE TYPE/MULTIPLE CHOICE QUESTIONS

ONLINE EXAMINATIONS ONE MARKS QUESTIONS

UNIT V

S.No	Questions	Option1	Option2	Option3	Option4	Answer
1	Bluetooth is the wireless technology for	Local area network	personal area network	both a and b	none	**personal area network**
2	Bluetooth uses	frequency hoping spread spectrum	orthogonal frequency division multiplexing	time division multiplexing	none	**frequency hoping spread spectrum**
3	Unauthorised access of information from a wireless device through a bluetooth connection is called	bluemaking	bluesharfing	bluestring	none	**bluesharfing**
4	What is A2DP (advanced audio distribution profile)?	a Bluetooth for streaming audio	a Bluetooth for streaming vedio	a Bluetooth profile for security	none	**a Bluetooth for streaming audio**
5	In the piconet of the bluetooth are master device.	can not be slave	can be slave in another piconet	can be slave in the same piconet	none	**can be slave in another piconet**
6	Bluetooth tranceiver devices operate in _____ band	2.4 GHS ISM	2.5 GHS ISM	2.6 GHS ISM	2.7 GHS ISM	**2.4 GHS ISM**
7	Bluetooth supports	point to point connections	point to multipoint connections	both a and b	none	**both a and b**
8	a Scatternet can have maximum	10 piconets	20 piconets	30 piconets	none	**10 piconets**

9	Bluetooth is a wireless	WAN technology	MAN technology	LAN technology	none	**LAN technology**
10	An interconnected collection of piconet is called	scatternet	micronet	mininet	none	**scatternet**
11	A cloud is Datacenter hardware and software	Resources	services	both a and b	none	**both a and b**
12	Who a Cloud providers	IBM	amazon	micosoft	all the above	**all the above**
13	Cloud users and Service Providers	IBM	amazon	Animoto	all the above	**all the above**
14	Cloud computing Services_____	Software as a Service (SAAS)	System	Network	RF	Software as a Service (SAAS)
15	SAAS means	Software as a Service	Services as a Software	Software as a software	Services as a Service	**Software as a Service**
16	PAAS means	Platform as a Service	Program as a Service	Person as a Service	people as a Service	**Platform as a Service**
17	IAAS means	Information as a Service	Internet as a Service	Infrastructure as a Service	Input as a Service	**Infrastructure as a Service**
18	SAAS architecture Maturity levels	own instance	configurable	multi-tenant	all the above	**all the above**
19	Delivery of an integrated computing platform(PAAS)	build	test	deploy custom apps	all the above	**all the above**
20	Infrastructure as a service	Server	Software	Data centre space	all the above	**all the above**
21	Characterization of Big Data	volume	velocity	variety	all the above	**all the above**

22	Big Data in Gartner Hype- cycle 2011	Internet TV	cloud computing	streams	all the above	**all the above**
23	Why Big- Data?	storage capacities	Faster	Secure	Easy Access	storage capacities
24	Enabler: Data availability	terabytes	petabyte	both a and b	none	**both a and b**
25	In Big Data - Data Availabe in	Video	Image	Audio	all the above	**all the above**
26	Huge Data available from	Social networks	Mobile devices	both a and b	none	**both a and b**
27	Tools typically used in Big Data Scenarios are	NoSQL	MapReduce	storage	all the above	**all the above**
28	When Big Data is really a hard problem?	modeling	reasoning	both a and b	none	**both a and b**
29	Each click on the web site is enriched and Indexed	Domain	Word	Page	Loader	Domain
30	Application: online Advertising	microtrends	Macrotrends	Minitrends	None	**microtrends**
31	Why Mine Data?	web data	ecommerce	bank	all the above	**all the above**
32	Scientific viewpoint of Data Mining.	sensors data	telescopes scanning	microarray	all the above	**all the above**
33	Motivation of mining large Data Sets	hidden information	raw data	BigData	none	**hidden information**
34	Origins of Data Mining	Enormaity of data	High dimensionality of data	Heterogeneous nature of data	all the above	**all the above**

35	Data Mining Tasks are	Prediction Methods	Description Methods	both a and b	none	**both a and b**
36	Data Mining Tasks are _____	SQL	clustering	Storage	reading	clustering
37	Each record contain set of attributes one of the attributes is the class.	Classification	clustering	Regression	all the above	**Classification**
38	Data points in one cluster are more similar to one another	Classification	clustering	Regression	all the above	**clustering**
39	Predict a value of a given continuous valued variable based on the values of other variables.	Classification	clustering	Regression	all the above	**clustering**
40	Challenges of Data Mining_____	Faster	Secure	Heterogeneous nature of data	Compactable	Heterogeneous nature of data
41	Wi-Fi Means	Wireless Fidelity	Wired Fidelity	Wireless Fidelities	Wireless Free	**Wireless Fidelity**
42	SMS means	Small Message Service	Short Method Service	Short Message Security	Short Message Service	**Short Message Service**
43	MMS means	Message Service	Method Service	Message Security	None of these	**Message Service**
44	V-Commerce means	Voice Control	Voice Commerce	Value Commerce	None of these	**Voice Commerce**
45	VOIP means	Value Over IP	Voice Over IR	Voice Over IP	None of these	**Voice Over IP**
46	VML means	Value Markup Languages	Voice Mark Languages	Voice Markup Level	Voice Markup Languages	**Voice Markup Languages**
47	WAP means	Application Protocol	Wired Application Protocol	Application Provider	None of these	**Application Protocol**

48	P-Commerce means	Positional Control	Positional Commerce	Post Commerce	None of these	**Positional Commerce**
49	Agent is a	Hardware Entity	Firmware Entity	Software Entity	None of these	**Software Entity**
50	DNS means	Done Name Services	Domain Name Systems	Domain Nature Services	Domain Name Services	**Domain Name Services**
51	WAE means	Application Environment	Application Entity	Application Environment	None of these	**Application Environment**
52	Embedded system has_____	Hardware	Graphics	Sound	Processor	Hardware
53	Characteristics of an Embedded System	Single functioned	Tightly constrained	Reactive and Real time	all the above	**all the above**
54	Embedded system has	ROM	Microprocessor	HW- SW	all the above	**all the above**
55	Advantages of Embedded System	Easy to carry	low power consumption	Portable	Faster	low power consumption
56	Disadvantages of Embedded System	High development effort	Larger time to market	both a and b	none	**both a and b**
57	Basic structure of an Embedded System has	sensor	Processor	converter	all the above	**all the above**
58	Basic structure of an Embedded System has	sensor	DA Converter	both a and b	none	**both a and b**
59	Types of Processors & General purpose Processor_____	Memory	Microcontroller	ROM	Reader	Microcontroller
60	A microcontroller is a single chip VLSI	mouse	scanner	RAM & ROM	printer	RAM & ROM

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act 1956)

COIMBATORE – 641 021

COMPUTER TECHNOLOGY

FIRST -INTERNAL EXAMINATION - JULY 2018

First Semester

COMPUTER FUNDAMENTALS

CLASS : I BSc (CT/IT) Maxmarks: 50

Sub Code:18CTU103/18ITU103 Duration : 2 Hours

PART-A (20x1=20Marks)
Answer All the Questions

1) Processing data using a Computer is called _____.
   a) Computing b) **data processing** c) Information d) Output
2) The Electronic Numerical Integrator and Calculator was the first _____.
   a) Calculator b) Digital computer c) **Electronic computer** d) Mechanical
3) The _____ is used in First Generation Computers.
   a) IC chips b) Transistor c) **Vacuum Tubes** d) None
4) Second Generation Computers used _____.
   a) **Transistor** b) Vacuum Tubes c) IC chip d) Filament
5) Random Access Memory is in _____ generation.
   a) First b) Second c) **Third** d) Fourth
6) The _____ is father of modern digital computers.
   a) Blaise Pascal b) Baron Gottfried c) **Charles Babbage** d) John Von Neumann
7) The _____ also known as Automatic Sequenced Controlled calculator.
   a) **Mark I** b) IBM c) ENIAC d) UNIVAC
8) Computer has _____.
   a) Intelligence b) **not intelligence** c) Decision d) None
9) Characteristics of computer _____.
   a) **Speed** b) Memory c) Disk d) Cables
10) A Computer is free from tiredness and _____.
   a) **Diligence** b) speed c) Accurate d) Auto
11) SCI means _____.
   a) **Small scale Integration** b) Smart scale Integration c) Small scale Integration d) None
12) Hexa Decimal Number consists of _____.
   a) 0,1 b) 0-7 c**) 0-9,A-F** d) 0-9
13) Application Software is a set of one or more programs _____.
   a) **Specific problem** b) General problems c) Operating system d) Translator
14) Example of System Software is _____.
   a) **Operating system** b) Java c) C++ d) Backup
15) Operating System support for _____.
   a) User Interface b) Manage Resources c) Process Management d) **All the above**

16) Input data from External world is _____.
a) **Input device** b) Memory c) Output device d) CPU
17) Data Enty is done through _____.
a) **Keyboard** b) Scanner c) Digitizer d) All the above
18) The _____ is most popular point and draw device.
a) **Mouse** b) Keyboard c) Trackball d) Joystick
19) Joystick used in _____.
a) **Video games** b) printer c) Scanner d) Network
20) The _____also called desktop scanners.
a) Drum scanners b) **Flat-bed scanners** c) Film scanners d) Hand scanners

Part-B (3x2=6 Marks)
Answer All the Questions

21) What are the categories of computers?

1. Supercomputer – The fastest, largest, most powerful and most expensive computer.

2. Mainframe Computer – This is a little smaller and less powerful than the supercomputer, but, like the supercomputer it is also expensive.

3. Personal Computer (PC) - This is the computer that most people use in their daily lives. This computer is much smaller, less powerful and less expensive than the supercomputer and the mainframe computer. There are two main types of personal computers. Macintosh (Macs) and the PC compatibles (PC). The main differences between the two are the operating systems and the processor they use. This category of computer has two additional types of computers. These are mobile computer and handheld computer. The most popular type of mobile computer is the notebook or laptop computer, and the handheld computer is a very small PC that you can hold in your hand.

22) Write a short note on microcomputers.

Microcomputers are small, low-cost and single-user digital computer. They consist of CPU, input unit, output unit, storage unit and the software. Although microcomputers are stand-alone machines, they can be connected together to create a network of computers that can serve more than one user. IBM PC based on Pentium microprocessor and Apple Macintosh is some examples of microcomputers. Microcomputers include desktop computers, notebook computers or laptop, tablet computer, handheld computer, smart phones and netbook, etc.,

- ***Desktop Computer or Personal Computer (PC)*** is the most common type of microcomputer. It is a stand-alone machine that can be placed on the desk. It is not very expensive and is suited to the needs of a single user at home, small business units, and organizations. Apple, Microsoft, HP, Dell and Lenovo are some of the PC manufacturers.

- ***Notebook Computers or Laptop*** resembles a notebook. They are portable and have all the features of a desktop computer. The advantage of the laptop is that it is small in size, can be carried anywhere, has a battery backup and has all the functionality of the desktop.

- ***Netbook*** These are smaller notebooks optimized for low weight and low cost, and are designed for accessing web-based applications. Netbooks deliver the performance needed to enjoy popular activities like streaming videos or music, emailing, Web surfing or instant messaging. The word *netbook* was created as a blend of Inter*net* and note*book*.

- ***Tablet Computer*** has features of the notebook computer but it can accept input from a stylus or a pen instead of the keyboard or mouse. It is a portable computer. Tablet computer are the new kind of PCs.

23) List the input devices and output devices.

Some of the important input devices which are used in a computer −

- Keyboard
- Mouse
- Joy Stick
- Light pen
- Track Ball
- Scanner
- Graphic Tablet
- Microphone
- Magnetic Ink Card Reader(MICR)
- Optical Character Reader(OCR)
- Bar Code Reader
- Optical Mark Reader(OMR)

Part-C (3x8=24 Marks)

Answer All the Questions

24) a) Write briefly about the history of computer.

History of Computers:

The development of the first generation computers based on vacuum tubes, there had been several developments in the computing technology related to the mechanical computing devices. The key developments that took place till the first computer was developed are as follows—

- ***Calculating Machines*** ABACUS was the first mechanical calculating device for counting of large numbers. The word ABACUS means calculating board. It consists of bars in horizontal positions on which sets of beads are inserted. The horizontal bars have 10 beads each, representing units, tens, hundreds, etc.

- ***Napier's Bones*** was a mechanical device built for the purpose of multiplication in 1617 **AD**. by an English mathematician John Napier.

- ***Slide Rule*** was developed by an English mathematician Edmund Gunter in the 16th century. Using the slide rule, one could perform operations like addition, subtraction, multiplication and division. It was used extensively till late 1970s.

- ***Pascal's Adding and Subtraction Machine*** was developed by Blaise Pascal. It could add and subtract. The machine consisted of wheels, gears and cylinders.

- ***Leibniz's Multiplication and Dividing Machine*** was a mechanical device that could both multiply and divide. The German philosopher and mathematician Gottfried Leibniz built it around 1673.

- ***Punch Card System*** was developed by Jacquard to control the power loom in 1801. He invented the punched card reader that could recognize the presence of hole in the punched card as binary one and the absence of the hole as binary zero. The 0s and 1s are the basis of the modern digital computer.

- ***Babbage's Analytical Engine*** An English man Charles Babbage built a mechanical machine to do complex mathematical calculations, in the year 1823. The machine was called as difference engine. Later, Charles Babbage and Lady Ada Lovelace developed a general-purpose calculating machine, the analytical engine. Charles Babbage is also called the father of computer.

- ***Hollerith's Punched Card Tabulating Machine*** was invented by Herman Hollerith. The machine could read the information from a punched card and process it electronically.

b) Explain about the generations of computers.

Generations of Computer:

The computer has evolved from a large-sized simple calculating machine to a smaller but much more powerful machine. The evolution of computer to the current state is defined in terms of the generations of computer. Each generation of computer is designed based on a new technological development, resulting in better, cheaper and smaller computers that are more powerful, faster and efficient than their predecessors. Currently, there are five generations of computer. In the following subsections, we will discuss the generations of computer in terms of—

i. the technology used by them (hardware and software),

ii. computing characteristics (speed, i.e., number of instructions executed per second),

iii. physical appearance, and

iv. their applications.

First Generation (1940 to 1956): Using Vacuum Tubes

- ***Hardware Technology*** The first generation of computers used vacuum tubes for circuitry and magnetic drums for memory. The input to the computer was through punched cards and paper tapes. The output was displayed as printouts.

- ***Software Technology*** The instructions were written in machine language. Machine language uses 0s and 1s for coding of the instructions. The first generation computers could solve one problem at a time.

- ***Computing Characteristics*** The computation time was in milliseconds.

- ***Physical Appearance*** These computers were enormous in size and required a large room for installation.

- ***Application*** They were used for scientific applications as they were the fastest computing device of their time.

- ***Examples*** UNIVersal Automatic Computer (UNIVAC), Electronic Numerical Integrator And Calculator (ENIAC), and Electronic Discrete Variable Automatic Computer (EDVAC).

The first generation computers used a large number of vacuum tubes and thus generated a lot of heat. They consumed a great deal of electricity and were expensive to operate. The machines were prone to frequent malfunctioning and required constant maintenance. Since first generation computers used machine language, they were difficult to program.

Second Generation (1956 to 1963): Using Transistors

- ***Hardware Technology*** Transistors (**Figure**) replaced the vacuum tubes of the first generation of computers. Transistors allowed computers to become smaller, faster, cheaper, energy efficient and reliable. The second generation computers used *magnetic core technology* for primary memory. They used magnetic tapes and magnetic disks for secondary storage. The input was still through punched cards and the output using printouts. They used the concept of a stored program, where instructions were stored in the memory of computer.

- ***Software Technology*** The instructions were written using the *assembly language*. Assembly language uses mnemonics like ADD for addition and SUB for subtraction for coding of the instructions. It is easier to write instructions in assembly language, as compared to writing instructions in machine language. High-level programming languages, such as early versions of COBOL and FORTRAN were also developed during this period.

- ***Computing Characteristics*** The computation time was in microseconds.

- ***Physical Appearance*** Transistors are smaller in size compared to vacuum tubes, thus, the size of the computer was also reduced.

- ***Application*** The cost of commercial production of these computers was very high, though less than the first generation computers. The transistors had to be assembled manually in second generation computers.

- ***Examples*** PDP-8, IBM 1401 and CDC 1604.

Second generation computers generated a lot of heat but much less than the first generation computers. They required less maintenance than the first generation computers.

Third Generation (1964 to 1971): Using Integrated Circuits

- ***Hardware Technology*** The third generation computers used the *Integrated Circuit (IC)* chips. In an IC chip, multiple transistors are placed on a silicon chip.

Silicon is a type of semiconductor. The use of IC chip increased the speed and the efficiency of computer, manifold. The keyboard and monitor were used to interact with the third generation computer, instead of the punched card and printouts.

- ***Software Technology*** The keyboard and the monitor were interfaced through the*operating system*. Operating system allowed different applications to run at the same time. *High-level languages* were used extensively for programming, instead of machine language and assembly language.

- ***Computing Characteristics*** The computation time was in nanoseconds.

- ***Physical Appearance*** The size of these computers was quite small compared to the second generation computers.

- ***Application*** Computers became accessible to mass audience. Computers were produced commercially, and were smaller and cheaper than their predecessors.

- ***Examples*** IBM 370, PDP 11.

The third generation computers used less power and generated less heat than the second generation computers. The cost of the computer reduced significantly, as individual components of the computer were not required to be assembled manually. The maintenance cost of the computers was also less compared to their predecessors.

Fourth Generation (1971 to present): Using Microprocessors

- ***Hardware Technology*** They use the *Large Scale Integration (LSI)* and the *Very Large Scale Integration (VLSI)* technology. Thousands of transistors are integrated on a small silicon chip using LSI technology. VLSI allows hundreds of thousands of components to be integrated in a small chip. This era is marked by the development of microprocessor. *Microprocessor* is a chip containing millions of transistors and components, and, designed using LSI and VLSI technology. A microprocessor chip is shown in **Figure**. This generation of computers gave rise to Personal Computer (PC). Semiconductor memory replaced the earlier magnetic core memory, resulting in fast random access to memory. Secondary storage device like magnetic disks became smaller in physical size and larger in capacity. The *linking of computers* is another key development of this era. The computers were linked to form networks that led to the emergence of the Internet. This generation also saw the development of pointing devices like mouse, and handheld devices.

- ***Software Technology*** Several new operating systems like the MS-DOS and MS-Windows developed during this time. This generation of computers supported *Graphical User Interface* (*GUI*). GUI is a user-friendly interface that allows user to interact with the computer via menus and icons. High-level programming languages are used for the writing of programs.

- ***Computing Characteristics*** The computation time is in picoseconds.

- ***Physical Appearance*** They are smaller than the computers of the previous generation. Some can even fit into the palm of the hand.

- ***Application*** They became widely available for commercial purposes. Personal computers became available to the home user.

- ***Examples*** The Intel 4004 chip was the first microprocessor. The components of the computer like Central Processing Unit (CPU) and memory were located on a single chip. In 1981, IBM introduced the first computer for home use. In 1984, Apple introduced the Macintosh.

The microprocessor has resulted in the fourth generation computers being smaller and cheaper than their predecessors. The fourth generation computers are also portable and more reliable. They generate much lesser heat and require less maintenance compared to their predecessors. GUI and pointing devices facilitate easy use and learning on the computer. Networking has resulted in resource sharing and communication among different computers.

Fifth Generation (Present and Next): Using Artificial Intelligence

The goal of fifth generation computing is to develop computers that are capable of learning and self-organization. The fifth generation computers use *Super Large Scale Integrated (SLSI)* chips that are able to store millions of components on a single chip. These computers have large memory requirements.

This generation of computers uses *parallel processing* that allows several instructions to be executed in parallel, instead of serial execution. Parallel processing results in faster processing speed. The Intel dual-core microprocessor uses parallel processing.

The fifth generation computers are based on *Artificial Intelligence (AI)*. They try to simulate the human way of thinking and reasoning. Artificial Intelligence includes areas like Expert System (ES), Natural Language Processing (NLP), speech recognition, voice recognition, robotics, etc.

25) a) Discuss about organization of computer system.

ORGANIZATION OF COMPUTER SYSTEM COMPONENTS:

A computer is a fast and accurate symbol manipulating system that is organized to accept, store, and process data and produce output results under the direction of a stored program of instructions.

INPUT DEVICES Computer systems use many devices for input purpose.

CENTRAL PROCESSING UNIT The heart of any computer system is the central processing unit (CPU). The primary storage section, the arithmetic logic section, and the control section. But these three sections aren't unique to personal computer: They are found in CPUs of all sizes.

OUTPUT DEVICES Like input units, output devices are instruments of interpretation and communication between humans and computer systems of all sizes. These devices take output results from the CPU in machine coded form and convert them into a form

The different types of computer languages can be broadly classified into two types; assembly level language and high level language.

An **assembly language** is a low-level programming language for a computer, or other programmable device, in which there is a very strong (generally one-to-one) correspondence between the language and the architecture's machine code instructions. Each assembly language is specific to particular computer architecture, in contrast to most high-level programming languages, which are generally portable across multiple architectures, but require interpreting or compiling.

Assembly language is converted into executable machine code by a program referred to as an *assembler*; the conversion process is referred to as *assembly*, or *assembling* the code.

A **High level language** enables a programmer to write programs that are more or less independent of a particular type of computer. Such languages are considered high-level because they are closer to human languages and further from machine languages. In contrast, languages are considered low-level because they are very close to machine languages.

The main advantage of high-level languages over low-level languages is that they are easier to read, write, and maintain. Ultimately, programs written in a high-level language must be translated into machine language by a compiler or interpreter.

The first high-level programming languages were designed in the 1950s. Now there are dozens of different languages, including Ada, Algol, BASIC, COBOL, C, C++, FORTRAN, LISP, Pascal, and Prolog.

b) i) Convert decimal to binary **a) 78_{10}** **b) 112_{10}**

a) 78_{10} = [1001110_2]

b) 112_{10} = [1110000_2]

ii) Convert binary to octal **a) 10110110_2** **b) 110011011_2**

a) 10110110_2 = [266_8]

b) 110011011_2 = [633_8]

26) a) Write about different types of scanner.

A scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display. Scanners come in hand-held, feed-in, and flatbed types and for scanning black-and-white only, or color. Very high resolution scanners are used for scanning for high-resolution printing, but lower resolution scanners are adequate for capturing images for computer display. Scanners usually come with software, such as Adobe's Photoshop product, that lets you resize and otherwise modify a captured images.

Scanners usually attach to your personal computer with a Small Computer System Interface (SCSI). An application such as PhotoShop uses the TWAINprogram to read in the image.

Flatbed Scanners

The type of image scanning device you'll see most often around the office is a flatbed scanner. This looks just like the work surface of a photocopier, where you put the page to be copied, and that's pretty much what a flatbed scanner is. You can also use them to scan thick original items, like books or magazines, as well as single pages.

Most printer manufacturers offer multifunction laser or inkjet printers with scanning ability built in, so you don't need to make space for a separate scanner that might not see a lot of use. Multifunction printers give you the additional perk of acting as a copier or sometimes a fax machine, as well as printing and scanning. That makes them a good option in a small office, where a "jack of all trades" device is often more practical than buying several separate machines.

Sheet-Fed Scanners

Flatbed scanners are simple and easy to use, but they're really only meant for scanning one page at a time. If you're scanning a longer document, doing one page at a time gets old in a hurry. Even worse, you're paying someone's wages while they scan all of those single pages. If multipage documents are a frequent part of doing business, you might be better off with a sheet-fed scanner. This type has an input tray holding anywhere from a handful of pages to dozens, and feeds them through in much the same way paper feeds through a printer. Some models even offer duplex printing, meaning they'll scan both sides of a double-sided document at the same time. That can be a serious time-saver.

Large-Format Scanners

Flatbed scanners and sheet-fed scanners are both versatile business machines, but they're usually pretty limited in the sizes they can scan. Usually, if you routinely need to scan anything larger than a legal sized document, you're out of luck. If you work with larger pages in your business – such as blueprints, architectural drawings or posters – you'll need to get a large-format scanner. These rather resemble a musician's electronic piano, with a flat scanning mechanism mounted atop a stand that brings it up to desk height. To use it, you slide your oversized original into the scanner until the rollers grip it and position it for scanning. From there, it works much like a jumbo sheet-fed scanner, with the document sliding through the scanning mechanism and coming out the other side.

Special-Purpose Scanners

Depending on your business, you may find that one or another special-purpose image scanning device makes your life simpler. If you're in sales, for example, investing in a business card scanner can speed and simplify the task of turning dozens – or hundreds – of newly acquired business cards into JPGs on your computer.

If images are more your thing, there are custom scanners for photos, as well. Most scanners handle photos reasonably well, but specialized photo scanners are likelier to do it without distorting the image unduly. Better models give you the option of scanning from a slide or even directly from film negatives, which is great for archiving old photos for storage purposes or doing new prints to replace old and faded images.

If you're on the road a lot, or have limited space, one final type of scanner is worth knowing about. Handheld scanners work the same way as other scanners, except that you slide the lightweight, portable unit across the page you want to scan. Some models include a dock that lets them work as a sheet-fed scanner, as well.

b) Explain about OCR and OMR.

OMR

Optical Mark Recognition (**OMR**) is the technology of electronically extracting intended data from marked fields, such as checkboxes and fill-in fields, on printed forms. It is generally distinguished from OCR by the fact that a recognition engine is not required. This requires the image to have high contrast and an easily-recognizable or irrelevant shape.

OMR technology scans a printed form and reads predefined positions and records where marks are made on the form. This technology is useful for applications in which large numbers of hand-filled forms need to be processed quickly and with great accuracy, such as surveys, reply cards, questionnaires,academic testing and ballots.A common OMR application is the use of "bubble sheets" for multiple-choice tests used by schools.

The student indicates the answer on the test by filling in the corresponding bubble, and the form is fed through an optical mark reader (also abbreviated as OMR, a device that scans the document and reads the data from the marked fields. The error rate for OMR technology is less than 1%.

OCR

OCR (optical character recognition) is the recognition of printed or written text characters by a computer. This involves photoscanning of the text character-by-character, analysis of the scanned-in image, and then translation of the character image into character codes, such as ASCII, commonly used in data processing.

In OCR processing, the scanned-in image or bitmapis analyzed for light and dark areas in order to identify each alphabetic letter or numeric digit. When a character is recognized, it is converted into an ASCII code. Special circuit boards and computer chips designed expressly for OCR are used to speed up the recognition process.

OCR is being used by libraries to digitize and preserve their holdings. OCR is also used to process checks and credit card slips and sort the mail. Billions of magazines and letters are sorted every day by OCR machines, considerably speeding up mail delivery.

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COIMBATORE – 641 021

COMPUTER TECHNOLOGY

FIRST -INTERNAL EXAMINATION - JULY 2018

First Semester

COMPUTER FUNDAMENTALS

CLASS : I BSc (CT/IT) Maxmarks: 50

Sub Code: 18CTU103/18ITU103 Duration : 2 Hours

PART-A (20x1=20Marks)
Answer All the Questions

1) Data Enty is done through _____.
   a) Keyboard b) Scanner c) Digitizer d) All the Above
2) GUI means
   a) Graphical User Interface b) Screen
   c) Graphical user Implementation d) Graphics Card
3) _____ is most popular point and draw device.
   a) Keyboard **b) Mouse** c) Trackball d) Joystick
4) _____ is displayed as a variety of symbols such as arrow.
   a) cursor b) Mouse c) Trackball d) Joystick
5) Magnetic tape consist of _____
   a) supply reel b) Plates c) Circle d) Boxes
6) Magnetic tape is sealed inside the
   a) reel **b) cartridge** c) vacuum d) cover
7) Magnetic tape is to serve as back up storage medium
   a) Disk b) tape c) drives d) none
8) _____ are so called they read/write data serially as streams of bits.
   a) QIC standard b)computer **c) streamer** d) exchange
9) _____ is the most simple and easiest to use of all input devices.
   a) Touch screen b) mouse c) Trackball d) Joystick
10) _____ are often used in information kiosks
   a) Touch screen b) mouse c) Trackball d) Joystick
11) kiosks are located in _____ to provide information
   a) airport b) System c) Network d) Earth
12) _____Devices are used for direct data entry into computer
   a) Joystick **b) Flatbed Scanner** c) mouse d) OCR
13) Optical Disks like_____
   a) Hard disk **b) DVD** c) pendrive d) Tape
14) Memory Storage Devices are _____
   a) Processor **b) Memory card** c) Joystick d) Chip

15) Hard Disks like_____
a) Zip Disk b) Disk Pack d) Winchester Disk **d) all the above**

16) Secondary storage which has sequential Access is
a) Magnetic Tape b) Magnetic Disks c) Floppy d) Hard disks

17) Direct Access Device_____ Magnetic Disks
a) optical disk b) Memory storage c) Devices **d) all the above**

18) Magnetic Tape medium is a
a) plastic ribbon b) iron oxide **c) both a and b** d) Rubber

19) A tape divided into vertical columns
a) frames b) channels c) tracks d) divide

20) A tape divided into horizontal rows
a) frames **b) channels** c) tracks d) divide

Part-B (3x2=6 Marks)

Answer All the Questions

21) List the output Devices.

(i) Monitor
(ii) Printer
(iii) Plotter
(iv) Speaker

22) Define Cache memory.

Small piece of high speed volatile memory available to the processor for fast processing is called **cache memory**. Cache may be a reserved portion of main memory, another chip on CPU or an independent high speed storage device. Cache memory is made of fast speed SRAMs. The process of keeping some data and instructions in cache memory for faster access is called**caching**. Caching is done when a set of data or instructions is accesses again and again.

23) Brief system bus.

The system bus is a pathway composed of cables and connectors used to carry data between a computer microprocessor and the main memory. The bus provides a communication path for the data and control signals moving between the major components of the computer system. The system bus works by combining the functions of the three main buses: namely, the data, address and control buses. Each of the three buses has its separate characteristics and responsibilities.

Part-C (3x8=24 Marks)
Answer All the Questions

24) a) Discuss about the Output Devices with a neat diagram.

Monitors, commonly called as **Visual Display Unit** (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Flat-Panel Display

Cathode-Ray Tube (CRT) Monitor

The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity or resolution. It takes more than one illuminated pixel to form a whole character, such as the letter 'e' in the word help.A finite number of characters can be displayed on a screen at once. The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed. Most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically.

There are some disadvantages of CRT −

- Large in Size
- High power consumption

Flat-Panel Display Monitor

The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the CRT. You can hang them on walls or wear them on your wrists. Current uses of flat-panel displays include calculators, video games, monitors, laptop computer, and graphics display.

The flat-panel display is divided into two categories −

- **Emissive Displays** − Emissive displays are devices that convert electrical energy into light. For example, plasma panel and LED (Light-Emitting Diodes).
- **Non-Emissive Displays** − Non-emissive displays use optical effects to convert sunlight or light from some other source into graphics patterns. For example, LCD (Liquid-Crystal Device).

Printers

Printer is an output device, which is used to print information on paper.

There are two types of printers −

- Impact Printers
- on-Impact Printers

Impact Printers

Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper.Characteristics of Impact Printers are the following −

- Very low consumable costs
- Very noisy
- Useful for bulk printing due to low cost
- There is physical contact with the paper to produce an image

These printers are of two types −

- Character printers
- Line printers

Character Printers

Character printers are the printers which print one character at a time.

These are further divided into two types:

- Dot Matrix Printer(DMP)
- Daisy Wheel

Dot Matrix Printer

In the market, one of the most popular printers is Dot Matrix Printer. These printers are popular because of their ease of printing and economical price. Each character printed is in the form of pattern of dots and head consists of a Matrix of Pins of size (5*7, 7*9, 9*7 or 9*9) which come out to form a character which is why it is called Dot Matrix Printer.

Daisy Wheel

Head is lying on a wheel and pins corresponding to characters are like petals of Daisy (flower) which is why it is called Daisy Wheel Printer. These printers are generally used for word-processing in offices that require a few letters to be sent here and there with very nice quality.

Non-impact Printers

Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page Printers.

These printers are of two types −

- Laser Printers
- Inkjet Printers

Characteristics of Non-impact Printers

- Faster than impact printers
- They are not noisy
- High quality
- Supports many fonts and different character size

Laser Printers

These are non-impact page printers. They use laser lights to produce the dots needed to form the characters to be printed on a page.

Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features. They make less noise because no hammering is done and

these have many styles of printing modes available. Color printing is also possible. Some models of Inkjet printers can produce multiple copies of printing also.

(or)

b) Enlighten the types of Plotters.

The **plotter** is a computer printer for printing vector graphics. In the past, plotters were used in applications such as computer-aided design, though they have generally been replaced with wide-format conventional printers. A plotter gives a hard copy of the output. It draws pictures on a paper using a pen. Plotters are used to print designs of ships and machines, Digitally controlled plotters evolved from earlier fully analog **XY-writers** used as output devices for measurement instruments and analog computers. Pen plotters print by moving a pen or other instrument across the surface of a piece of paper. This means that plotters are vector graphics devices, rather than raster graphics as with other printers. Pen plotters can draw complex line art, including text, but do so slowly because of the mechanical movement of the pens. They are often incapable of efficiently creating a solid region of color, but can hatch an area by drawing a number of close, regular lines. Plotters offered the fastest way to efficiently produce very large drawings or color high-resolution vector-based artwork when computer memory was very expensive and processor power was very limited, and other types of printers had limited graphic output capabilities. Pen plotters have essentially become obsolete, and have been replaced by large-format inkjet printers and LED toner based printers. Such devices may still understand vector languages originally designed for plotter use, because in many uses, they offer a more efficient alternative to raster data.

Electrostatic plotters

Electrostatic plotters used a dry toner transfer process similar to that in many photocopiers. They were faster than pen plotters and were available in large formats, suitable for reproducing engineering drawings. The quality of image was often not as good as contemporary pen plotters. Electrostatic plotters were made in both flat-bed and drum types.

Cutting plotters

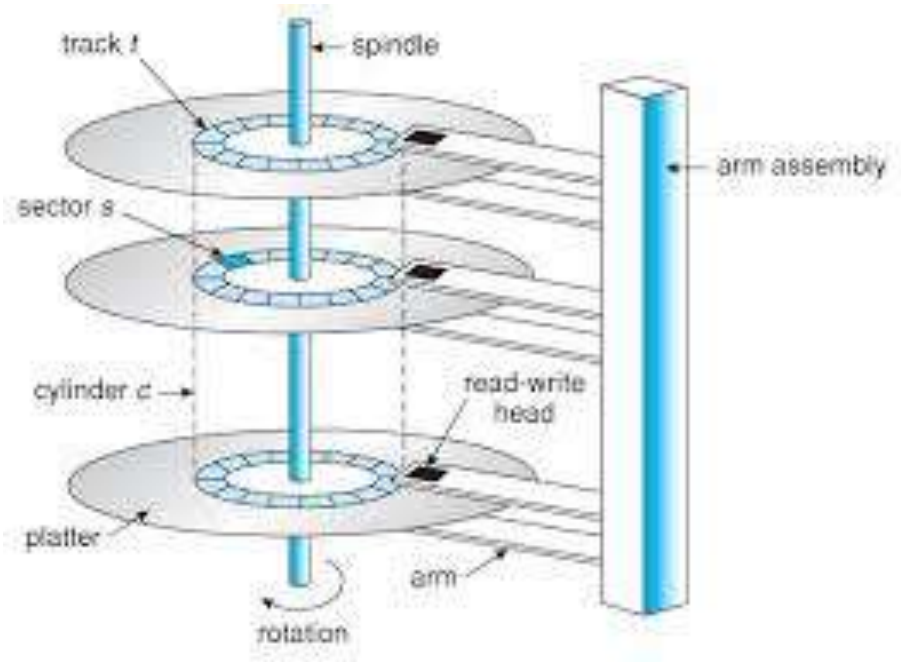
Cutting plotters use knives to cut into a piece of material that is lying on the flat surface area of the plotter. It is achieved because the cutting plotter is connected to a computer, which is equipped with specialized cutting design or drawing computer software programs. Those

computer software programs are responsible for sending the necessary cutting dimensions or designs in order to command the cutting knife to produce the correct project cutting needs.[1]

In recent years the use of cutting plotters (generally called die-cut machines) has become popular with home enthusiasts of paper crafts such as card making and scrap booking. Such tools allow desired card shapes to be cut out very precisely, and repeated perfectly identically.

25) a) Explain Magnetic Tape.

Magnetic tapes: A magnetic tape transport consists of electric, mechanical and electronic components to provide the parts and control mechanism for a magnetic tape unit. The tape itself is a strip of plastic coated with a magnetic recording medium. Bits are recorded as magnetic spots on tape along several tracks. Seven or nine bits are recorded to form a character together with a parity bit. R/W heads are mounted in each track so that data can be recorded and read as a sequence of characters.



(or)

b) Elaborate Magnetic Disk with a neat Diagram.

Magnetic Disk*:* A magnetic disk is a circular plate constructed of metal or plastic coated with magnetized material. Both sides of the disk are used and several disks may be stacked on one spindle with read/write heads available on each surface. Bits are stored on

the magnetized surface in spots along concentric circles called tracks. Tracks are commonly divided into sections called sectors. Disk that are permanently attached and cannot be removed by the occasional user are called hard disks. A disk drive with removable disks is called a floppy disk drive.

26) a. Why do we need memory units in computer? Explain.

- It is used to store data and instructions.
- Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored.
- The memory is divided into large number of small parts called cells.
- Each location or cell has a unique address, which varies from zero to memory size minus one.

Memory is required in computers to store data and instructions. Memory is physically organized as a large number of cells that are capable of storing one bit each. Logically they are organized as groups of bits called **words** that are assigned an address. Data and instructions are accessed through this memory address. The speed with which these memory addresses can be accessed determines the cost of the memory. Faster the memory speeds, higher the price. Based on this criteria memory is of two types – **primary** and **secondary**. Here we will look at primary memory in detail.

Primary Memory (Main Memory)

Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.

The main features of primary memory,

- It is accessed directly by the processor
- It is the fastest memory available
- Each word is stored as well as
- It is volatile, i.e. its contents are lost once power is switched off

Characteristics of Main Memory

- These are semiconductor memories.
- It is known as the main memory.
- Usually volatile memory.
- Data is lost in case power is switched off.
- It is the working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without the primary memory.

(or)

b. Explicate the random access memory with neat diagram

RAM stands for **Random Access Memory**. The processor accesses all memory addresses directly, irrespective of word length, making storage and retrieval fast. RAM is the fastest memory available and hence most expensive. These two factors imply that RAM is available in very small quantities of up to 1GB. RAM is volatile but my be of any of these two types

DRAM (Dynamic RAM)

Each memory cell in a DRAM is made of one transistor and one capacitor, which store one bit of data. However, this cell starts losing its charge and hence data stored in less than thousandth of a second. So it needs to be refreshed thousand times a second, which takes up processor time. However, due to small size of each cell, one DRAM can have large number of cells. Primary memory of most of the personal computers is made of DRAM.

SRAM (StaticRAM)

Each cell in SRAM is made of a flip flop that stores one bit. It retains its bit till the power supply is on and doesn't need to be refreshed like DRAM. It also has shorter read-write cycles as compared to DRAM. SRAM is used in specialized applications.

ROM

ROM stands for **Read Only Memory**. As the name suggests, ROM can only be read by the processor. New data cannot be written into ROM. Data to be stored into ROM is written during the manufacturing phase itself. They contain data that does not need to be altered, like booting sequence of a computer or algorithmic tables for mathematical applications. ROM is slower and hence cheaper than RAM. It retains its data even when power is switched off, i.e. it is non-volatile. ROM cannot be altered the way RAM can be but technologies are available to program these types of ROMs −

PROM (Programmable ROM)

PROM can be programmed using a special hardware device called PROM programmer or PROM burner.

EPROM (Erasable Programmable ROM)

EPROM can be erased and then programmed using special electrical signals or UV rays. EPROMs that can be erased using UV rays are called UVEPROM and those that can be erased using electrical signals are called EEPROM. However, handling electric signals is easier and safer than UV rays.

Cache Memory

Small piece of high speed volatile memory available to the processor for fast processing is called **cache memory**. Cache may be a reserved portion of main memory, another chip on CPU or an independent high speed storage device. Cache memory is made of fast speed SRAMs. The process of keeping some data and instructions in cache memory for faster access is called**caching**. Caching is done when a set of data or instructions is accesses again and again.

Secondary Memory

Alternatively referred to as external memory, secondary memory, a secondary storage device is a non-volatile device that holds data until it is deleted or overwritten. Secondary storage is about two orders of magnitude cheaper than primary storage. The faster primary memory is also volatile. If we need to store large amount of data or programs permanently, we need a cheaper and permanent memory. Such memory is called secondary memory. Here we will discuss secondary memory devices that can be used to store large amount of data, audio, video and multimedia files.

Characteristics of Secondary Memory

These are some characteristics of secondary memory, which distinguish it from primary memory

- It is non-volatile, i.e. it retains data when power is switched off
- It is large capacities to the tune of terabytes
- It is cheaper as compared to primary memory

Depending on whether secondary memory device is part of CPU or not, there are two types of secondary memory – fixed and removable.

Hard Disk Drive

Hard disk drive is made up of a series of circular disks called **platters** arranged one over the other almost ½ inches apart around a **spindle**. Disks are made of non-magnetic material like aluminum alloy and coated with 10-20 nm of magnetic material.

Standard diameter of these disks is 14 inches and they rotate with speeds varying from 4200 rpm (rotations per minute) for personal computers to 15000 rpm for servers. Data is stored by magnetizing or demagnetizing the magnetic coating. A magnetic reader arm is used to read data from and write data to the disks. A typical modern HDD has capacity in terabytes (TB).

CD Drive

CD stands for **Compact Disk**. CDs are circular disks that use optical rays, usually lasers, to read and write data. They are very cheap as you can get 700 MB of storage space for less than a dollar. CDs are

.