KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed University Established Under Section 3 of UGC Act 1956)
Coimbatore - 641021.
(For the candidates admitted from 2019 onwards)

DEPARTMENT OF COMPUTER SCIENCE,CA & IT

SUBJECT : COMPUTER FUNDAMENTALS	**SEMESTER**: I	**L T P C**
SUBJECT CODE: 19CSU103	**CLASS** : I B.Sc.CS -A	**4 0 0 4**

Course Objectives:

To help the students to know the basic concept of computers, understand the meaning and basic components of a computer system, and to define and distinguish the Hardware and Software components of computer system finally, the students should know to explain and identify different computing machines during the evolution of computer system.

Learning Outcomes

Competencies have been identified that are relevant to the level of instruction in the community college environment. These competencies reflect the knowledge and skills of the employees need to succeed in any occupation. This course will expose the student to the concepts and application of the following competencies:

- Understand the meaning and basic components of a computer system.
- Define and distinguish the 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 inputs and output units and explain their purposes.
- Understand the role of CPU and its components.
- Understand the concepts and need of primary and secondary memories.
- Discuss the advantages, limitations and applications of computers.
- Understand the classification of computers.

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, Pearson Education, New Delhi.

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

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

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/

STAFF **HOD**

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 COMPUTER SCIENCE,CA & IT

SUBJECT : COMPUTER FUNDAMENTALS	**SEMESTER**: I	**L T P C**
SUBJECT CODE: 19CSU103	**CLASS** : I B.Sc.CS -A	**4 0 0 4**

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, Pearson Education, New Delhi.
2. Aksoy, P., & DeNardis, L. (2006).Introduction to Information Technology, engage Learning, New Delhi
3. Sinha, P. K., & Sinha, P. (2007). Fundamentals of Computers, BPB Publishers, New Delhi.

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/

STAFF **HOD**

KARPAGAM ACADEMY OF HIGHER EDUCATION

Coimbatore - 641021.

(For the candidates admitted from 2019 onwards)

DEPARTMENT OF COMPUTER SCIENCE, CA & IT

LECTURE PLAN

SUBJECT NAME:COMPUTER FUNDAMENTALS

SUBJECT CODE:19CSU103 **SEMESTER: I**

LESSON PLAN -UNIT I			
S-NO	**Lecture Duration (Hour)**	**Topics To Be Covered**	**Support Materials/ Pg-No**
1	1	**Introduction to Computer System**	S1-Pg: 1-4
		Characteristics of Computer	S1-Pg: 1-4
2	1	History of Computer	S1-Pg: 1-5
3	1	Generation of Computer - First, Second	S1-Pg: 1-6
		Third, Fourth Genaration	S1-Pg: 1-8
4	1	Types of Computer	S1-Pg: 1-10
5	1	**Data Representation**	S1-Pg: 2-4
		Human Computer Interface: Types of Software	S2-Pg: 173
6	1	- System software	S2-Pg: 174
		- Application Software	S2-Pg: 175
7	1	Operating System as User Interface	S2-Pg: 251
8	1	Utility Programs	S3-Pg:167-171
9	1	-Backup and Recovery	S2-180
		- Compactability	S2-183
10	1	Recapitulation and Discussuin of Important Questions	
		Total No of Hours Planned for- Unit I	**10**
UNIT II			

S-NO	Lecture Duration (Hour)	Topics To Be Covered	Support Materials/ Pg-No
1	1	**Devices - Input and Output**	S2-Pg: 149
		-Keyboard	S2-Pg: 149
2	1	-Mouse	S2-Pg: 149
		-Joystick	S2-Pg: 150
3	1	-Scanner	S2-Pg: 153
4	1	OCR, OMR	S2-Pg: 154
		Bar code Reader	S2-Pg: 155
5	1	Web camera	S2-Pg: 159
6	1	Monitor	S2-Pg: 165
7	1	Printer	S2-Pg: 167
8	1	Plotter	S2-Pg: 169
9	1	Recapitulation and Discussuin of Important Questions	
		Total No of Hours Planned for Unit II	**9**

UNIT III			
S-NO	**Lecture Duration (Hour)**	**Topics To Be Covered**	**Support Materials/ Pg-No**
1	1	**Memory: Primary**	S2-Pg: 108
		Secondary	S2-Pg: 108
2	1	Auxiliary Memory	S2-Pg: 112
3	1	RAM	W3
		ROM	W3
4	1	- PROM	W3
5	1	- EPROM,EEPROM	W3
6	1	Cache Memory	S2-Pg: 113
7	1	Hard Disks	S2-Pg: 124
		Optical Disks	S2-Pg: 134

8	1	- CD, DVD, Players	S2-Pg: 135
9	1	Recapitulation and Discussuin of Important Questions	
		Total No of Hours Planned for Unit III	**9**

UNIT IV			
S-NO	**Lecture Duration (Hour)**	**Topics To Be Covered**	**Support Materials/ Pg-No**
1	1	**Computer Organisation and Architecture**	S2-Pg: 101
		CPU	S2-Pg: 101
2	1	Registers	S2-Pg: 103
		System Bus,	S2-Pg: 108
3	1	Main memory Unit	S2-Pg: 109
		Cache Memory	S2-Pg: 113
4	1	Inside a Computer, SMPS	S1-Pg: 1-28
5	1	Motherboard,	S1-Pg: 1-28
		Ports and Interfaces	S1-Pg: 1-30
6	1	Expansion Cards	S1-Pg: 1-34
7	1	Ribbon cables	S1-Pg: 1-38
8	1	Memory Chips,Processor	S1-Pg: 1-32
9	1	Recapitulation and Discussuin of Important Questions	
		Total No of Hours Planned for Unit IV	**9**

UNIT V			
S-NO	**Lecture Duration (Hour)**	**Topics To Be Covered**	**Support Materials/ Pg-No**
1	1	**Overview of Emerging Technologies**	
		Bluetooth	W1
2	1	Cloud Computing,	W2
3	1	Big Data	W2
4	1	Data Mining	W4

5	1	- KDD Process	W4
6	1	Mobile Computing,	W5
7	1	Embedded Systems	W5
8	1	Recapitulation and Discussuin of Important Questions	
9	1	Discussion of previous ESE question papers	
10	1	Discussion of previous ESE question papers	
11	1	Discussion of previous ESE question papers	
		Total No of Hours Planned for Unit V	**11**

Support Meterials :

Suggested Readings	**S1**	A-Goel, 2010,Computer Fundamentals, Pearson Education,New Delhi.
	S2	P-K-Sinha, P-Sinha,2007 ,Fundamentals of Computers, BPB Publishers, New delhi.
	S3	P-Aksoy, L-DeNardis,2006, Introduction to Information Technology, Cengage Learning, New delhi.
Websites	W1	www.en-wikipedia-org
	W2	www.in.pcmag.com/networking-communications-software
	W3	www.slideshare.net/
	W4	www.tutorialspoint.com/data_mining/
	W5	www.electronicsforu.com/

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed University Established Under Section 3 of UGC Act 1956)
Coimbatore - 641021.
(For the candidates admitted from 2019 onwards)

DEPARTMENT OF COMPUTER SCIENCE,CA & IT

SUBJECT : COMPUTER FUNDAMENTALS

L T P C

SEMESTER I **4 0 0 4**

SUBJECT CODE: 19CSU103 **CLASS** : I B.Sc.CS A

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.

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/

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

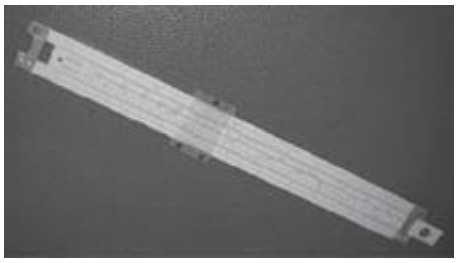
computing devices. The key developments that took place till the first computer was developed are as follows—

- ***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.

Figure: 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.

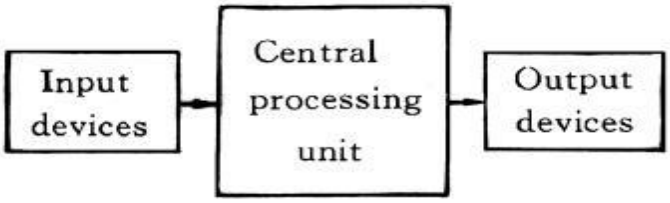


Fig.1–1 The basic organization of a computer system

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.

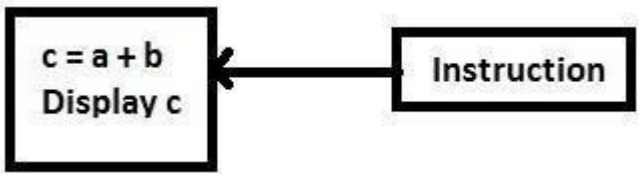
Types of Software:

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.

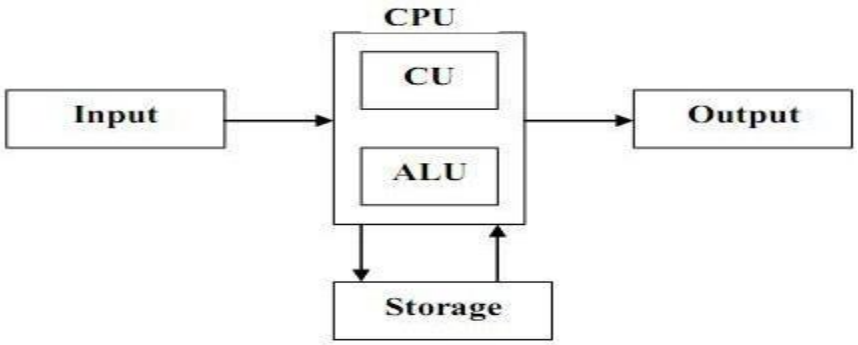
Processing of a computer program:

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.

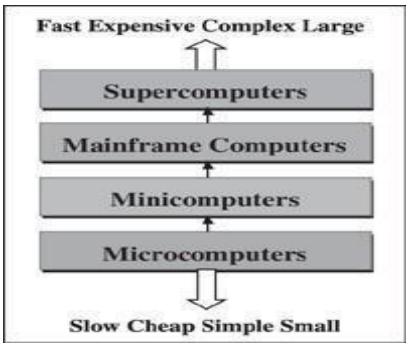
What is Operating System?

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.

KARPAGAM ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF COMPUTER SCIENCE ,CA & IT

COMPUTER FUNDAMENTALS -One Mark SUBJECT CODE :19CSU103

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 memory
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 software
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
(Deemed University Established Under Section 3 of UGC Act 1956)
Coimbatore - 641021.
(For the candidates admitted from 2019 onwards)

DEPARTMENT OF COMPUTER SCIENCE,CA & IT

SUBJECT : COMPUTER FUNDAMENTALS
SUBJECT CODE: 19CSU103

SEMESTER: I
CLASS : I B.Sc.CS

L T P C
4 0 0 4

UNIT-II

- Devices: Input and output devices
- keyboard,
- mouse,
- joystick,
- scanner,
- OCR,
- OMR,
- bar code reader,
- web camera,
- monitor,
- printer,
- plotter.

INPUT DEVICES

An *input device* can be defined as an electromechanical device that allows the user to feed information (data) into the computer for analysis, storage, and to give commands to the computer. Data and instructions are entered into the computer's main memory through an input device. Input device captures information and translates it into a form that can be processed and used by other parts of the computer.

6.1.1 Importance of Input Devices

Any hardware item that is attached to the main unit of a computer, the CPU, is referred to as a *peripheral device*. An input device is a peripheral device through which data is entered and transformed into the machine-readable form. This processing of the data by the computer system can be viewed as a three-phase process:

1. Data input via an input device
2. Processing of data
3. Data output via an output device

Input devices play a major role in the processing of any data via the computer system because the output of the computer is always based on the given input.

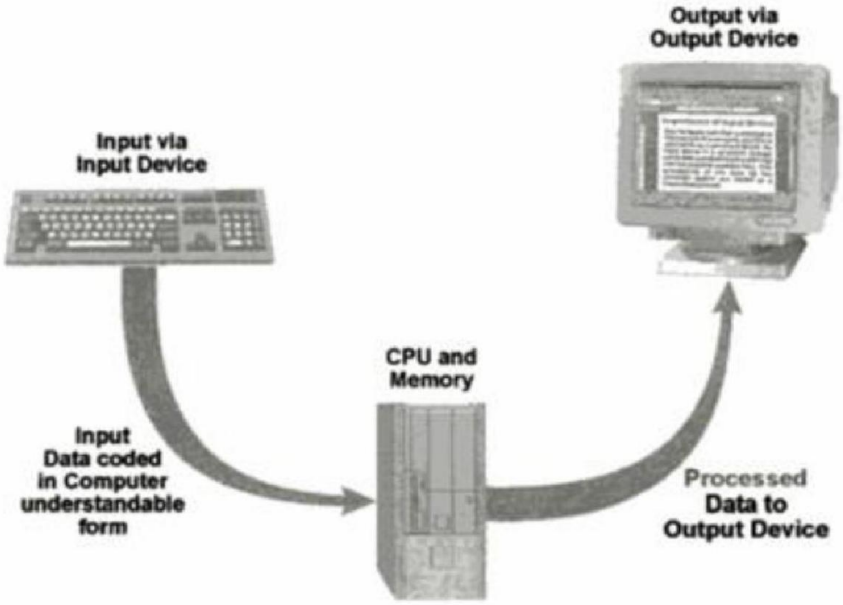


Figure 6.1 Data Processing

TYPES OF INPUT DEVICES

A computer can accept this input in two ways, either manually or directly. In case of manual data entry, the user enters the data into computer by hand such as by using keyboard and mouse.

1. Keyboard
2. Pointing Devices
3. Speech Recognition
4. Digital Camera
5. Scanners
6. Optical Scanners

6.2 KEYBOARD

A keyboard is the most common data entry device. Using a keyboard, the user can type text and execute commands. Keyboard is designed to resemble a regular typewriter with a few additional keys. Data is entered into computer by simply pressing various keys.

Keyboard is the easiest input device, as it does not require any special skill. Usually, it is supplied with a computer so no additional cost is incurred. The maintenance and operation cost of keyboard is also less. However, using a keyboard for data entry may be a slow process because the user has to type all the text manually.

6.2.1 Layout of the Keyboard

The layout of the keyboard can be divided into the following five sections:

- **Typing Keys:** These keys include the letter keys (1, 2, A, B, etc.), which are generally laid out in the same style that was common for typewriters.
- **Numeric Keypad:** Numeric keys are located on the right hand side of the keyboard. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machines and calculators.
- **Function Keys:** The functions keys (F1, F2, F3, etc.) are arranged in a row along the top of the keyboard and could be assigned specific commands by the current application or the operating system. For example, most of the Microsoft programs use F1 to display help.
- **Control Keys:** These keys provides cursor and screen control. It includes four directional arrow keys that are arranged in an inverted T formation between the typing keys and the numeric keypad. These keys allow the user to move the cursor on the display area one space at a time in either an up, down, left or right direction. Control keys also include *Home*, *End*, *Insert*, *Delete*, *Page Up*, *Page Down*, *Control (Ctrl)*, *Alternate (Alt)*, and *Escape (Esc)*. The Windows keyboard also consists of two *Windows* or *Start keys* (), and an *Application key* ().
- **Special Purpose Keys:** Apart from the above-mentioned keys, a keyboard contains some special purpose keys such as *Enter*, *Shift*, *Caps Lock*, *Num Lock*, *Spacebar*, *Tab*, and *Print Screen*.

Working of a Keyboard

user presses a key, it causes a change in the amount of current flowing through the circuit associated specifically with that key. The keyboard microprocessor detects this change in current flow. By doing this, the processor can tell when a key has been pressed and when it is being released. Depending upon which key's circuit carries a signal to the microprocessor, the processor generates the associative code, known as *scan code*, of the key and sends it to the operating system. A copy of this code is also stored in the keyboard's memory. When the operating system reads the scan code, it informs the same to the keyboard and the scan code stored in keyboard's memory is then erased.

6.3 POINTING DEVICES

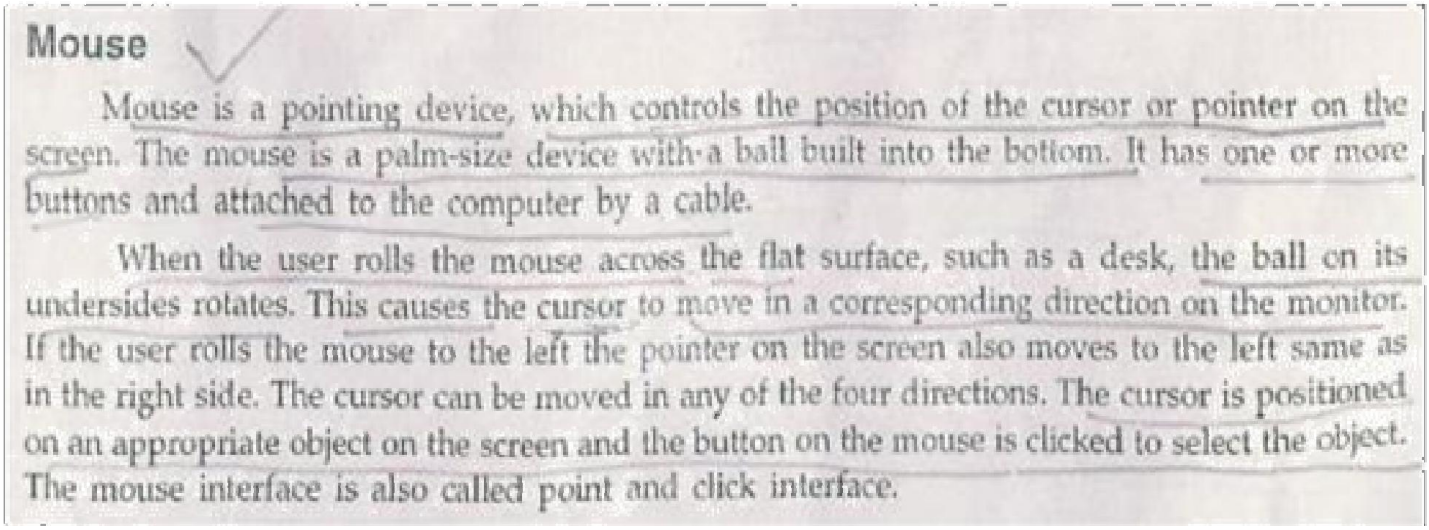
A *pointing device* is used to communicate with the computer by pointing to

locations on the monitor screen. Such devices do not require keying of characters, instead the user can move a cursor on the screen and perform move, click or drag operations. Some of the commonly used pointing devices are mouse, trackball, joystick, light pen, and touch screen.

Following are 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



Mouse

Mouse is a pointing device, which controls the position of the cursor or pointer on the screen. The mouse is a palm-size device with a ball built into the bottom. It has one or more buttons and attached to the computer by a cable.

When the user rolls the mouse across the flat surface, such as a desk, the ball on its undersides rotates. This causes the cursor to move in a corresponding direction on the monitor. If the user rolls the mouse to the left the pointer on the screen also moves to the left same as in the right side. The cursor can be moved in any of the four directions. The cursor is positioned on an appropriate object on the screen and the button on the mouse is clicked to select the object. The mouse interface is also called point and click interface.

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

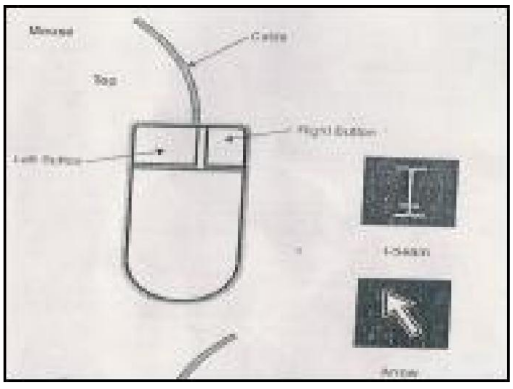
signal processing (DSP).This mouse doesn't have mouse ball and electromechanical transducer. Movement is detected by sensing changes in reflected light, instead of interpreting the motion of a rolling sphere. an optical mouse does not have moving parts thats why there is no need of cleaning .Also there 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.



Common mouse actions Some of the common mouse actions are listed below.

- **Pointing:** Point means position the mouse pointer over a particular word or object on the screen. Pointing is usually referred to the process of doing anything by using one of the mouse buttons.
- **Click:** The action of pressing down a mouse button (usually the left one) and releasing it is known as a click. The term comes from the fact that pressing and releasing most mouse buttons makes a clicking sound. Often clicking is initiated to do some action, such as to move the cursor in a word processor or to select links on the web pages.
- **Right-Click:** Clicking of the right mouse button is known as right-click. Right-click means a single click on the right mouse button. In Microsoft Windows, right-clicking often produces a 'pop-up' menu that, depending on the object selected, offers options that can lead the user to open a program, cut or copy, create a shortcut, or display the properties of the selected object.
- **Double-Click:** Double-click refers to the action of clicking the mouse button twice in rapid succession without moving the mouse between clicks. Double-clicking carries out an action, such as starting an application or to open a folder.
- **Drag and Drop:** It refers to the action of clicking and holding down the mouse button while moving the mouse (drag), and then releasing the mouse button (drop). This moves the object (for example, a file) or selected text to the new position. If the mouse has several buttons, use the leftmost button unless instructed otherwise.

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.

6.6 SCANNERS

A *scanner* scans an image and transforms the image to ASCII codes (the code used by a computer to represent the characters you find on your keyboard – letters of the alphabet, numbers, punctuation marks, etc.) and graphics. These can be edited, manipulated, combined, and then printed. Scanners use a light beam to scan the input data.

6.6.1 Hand-Held Scanner

A hand-held scanner consists of light emitting diodes, which are placed over the material to be scanned. This scanner performs the scanning of the document very slowly from the top to the bottom, with its light on. In this process, all the documents are converted and then stored as an image. While working, the scanner is dragged very steadily and carefully over the document and it should move at a constant speed without stopping, or jerking in order to obtain best results. Due to this reason, hand-held scanners are widely used where high accuracy is not of much importance. The

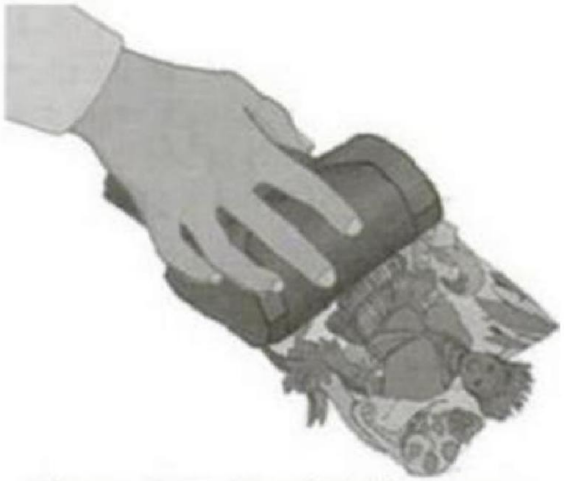


Figure 6.19 Hand-Held Scanner

Working of a hand-held scanner When the hand-held scanner's scan button is pressed, a light emitting diode illuminates the document underneath it. An inverted angled mirror directly over the scanner's window reflects the image onto the scanner's lens, which is located at the back of the scanner. The lens focuses a single line of the image onto a charged coupled device (CCD), which contains a row of light detectors. As the light shines through these detectors, each of them records the amount of light as a voltage that corresponds to white, black, grey or to a colour. These voltages are sent to a specialised analog chip, which corrects any colour detection error. After that, a single line image is passed to analog to digital converter (ADC), which converts the analog signals nto binary forms that can be sent to the computer. In this way, the converter clears itself of the data so that it can receive the next line of the image.

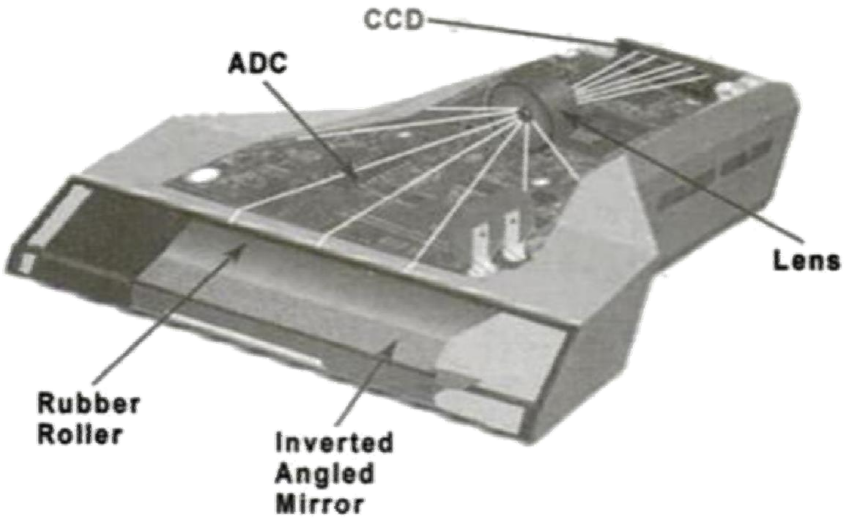
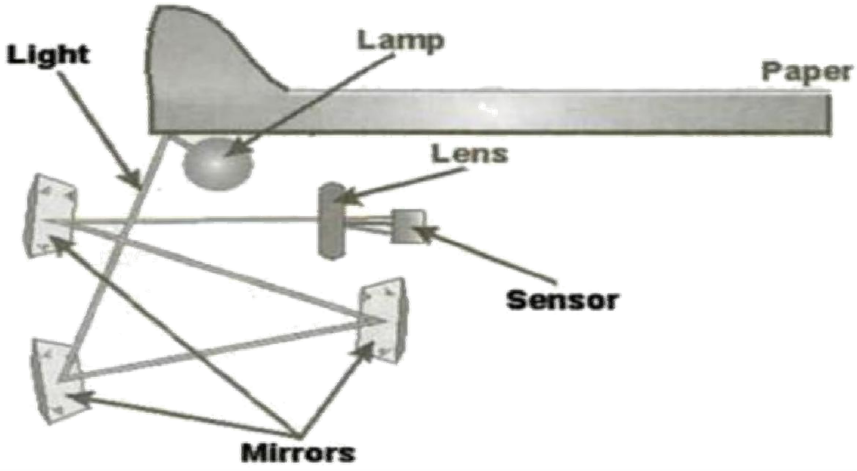


Figure 6.20 Inside Hand-Held Scanner

Working of a flat-bed scanner To scan a document, first it is placed on the glass plate and the cover is closed. A lamp is used to illuminate the document. The scan head (mirrors, lens, filter, and CCD array constitutes a scan head) is moved slowly across the document by a belt that is attached to a stepper motor. The head is attached to a stabiliser bar to ensure that there is no wobble or deviation in the pass. In scanning terms, a pass means that the scan head has completed a single complete scan of the document. The image of the document is reflected by an angled mirror to another mirror. Each mirror is slightly curved to focus the image it reflects onto a smaller surface. The last mirror reflects the image onto a lens. The lens focuses the image through a filter on the CCD array. It is a collection of tiny light-sensitive diodes (also called photosites), which convert light into electrical charge. The brighter the light that hits a single photosite, the greater the electrical charge that will accumulate at that site.



Some scanners use a three pass scanning method. Each pass uses a different colour filter (red, green or blue) between the lens and CCD array. After the three passes are completed, the scanner software assembles the three filtered images into a single full-colour image. Nowadays, most scanners use the single pass method. The lens splits the image into three smaller versions of the original image. Each smaller version passes through a colour filter (either red, green or blue) onto a discrete section of the CCD array. The scanner combines the data from the three parts of the CCD array into a single full-colour image, which is then sent to the computer.

.7 OPTICAL SCANNERS

Recent innovations have developed alternative methods to input data instead of entering data through keystrokes. Devices such as bar code reader can interpret machine printed marks or codes. Accordingly, there are four types of optical recognition: *optical character recognition* (OCR), *optical mark recognition* (OMR), *magnetic ink character recognition* (MICR), and *bar code reader*.

6.7.1 Optical Character Recognition (OCR)

Optical Character Recognition (OCR) is a process of scanning printed pages as images on a flatbed scanner and then using OCR software to recognise the letters as ASCII text. The OCR software has tools for both acquiring the image from a scanner and recognising the text. In the OCR system, a book or a magazine article is fed directly into an electronic computer file, and then this file is edited by using a word processor. Advanced OCR systems can read text in a large variety of fonts, but they still have difficulty with handwritten text.

OCR works best with originals or very clear copies and mono-spaced fonts like Courier. For a good OCR, one should use 12 point or greater font size. The text should be laid out in single column and it should be printed/written in black on a white background. OCR has been used to enter data automatically into a computer for dissemination and processing. The earliest of systems was dedicated to high volume variable data entry. The first major use of OCR was in processing petroleum credit card sales drafts. Over time, other applications evolved including cash register tape readers, page scanners, etc. Any standard form or document with repetitive variable data would be a candidate application for OCR. Using an OCR system, one can consolidate data entry and reduce data entry errors. The result of OCR is very human readable and can be used with many printing techniques. However, it is a very expensive input device and if the document is not typed properly, it will become difficult for the OCR to recognise the characters. Furthermore, except for tab stops and paragraph marks, most document formatting is lost during text scanning. The output from a finished text scan will be a single column editable text file. This text file will always require spell checking and proof reading as well as re-formatting to desired final layout.

Working of an OCR All the OCR systems include an optical scanner for reading text and sophisticated software for converting the text into machine-readable form. During the OCR processing, the text is analyzed for light and dark areas in order to identify each alphabetic letter or numeric digit. When a character is recognised, it is converted into an ASCII code. There are two basic methods used for OCR: *matrix matching* and *feature extraction*. The matrix matching technique compares what the OCR scanner sees as a character with a library of character matrices or templates. When an image matches one of these prescribed matrices of dots within a given level of similarity, the computer labels that image as the corresponding ASCII character. Feature extraction OCR does not require strict matching to prescribed templates. This method varies depending on how much 'computer intelligence' is applied by the manufacturer. The computer looks for general features such as open areas, closed shapes, diagonal lines, line intersections, etc. This method is much more versatile than matrix matching. Matrix matching works best when the OCR encounters a limited repertoire of type styles; with little or no variation within each style where the characters are less predictable, feature extraction is superior.

At the end of the OCR processing, the final information can be saved in a number of different formats, text or Rich Text Format (RTF). OCR software, which supports RTF, can also recognize bold, italics, retain tabs, and white space, as well as recognize a limited number of different fonts. However, using OCR, the computer cannot interpret the special characters and images. In addition, the storage capacity required for storing the document as an image is much more than required for storing the document as a text.

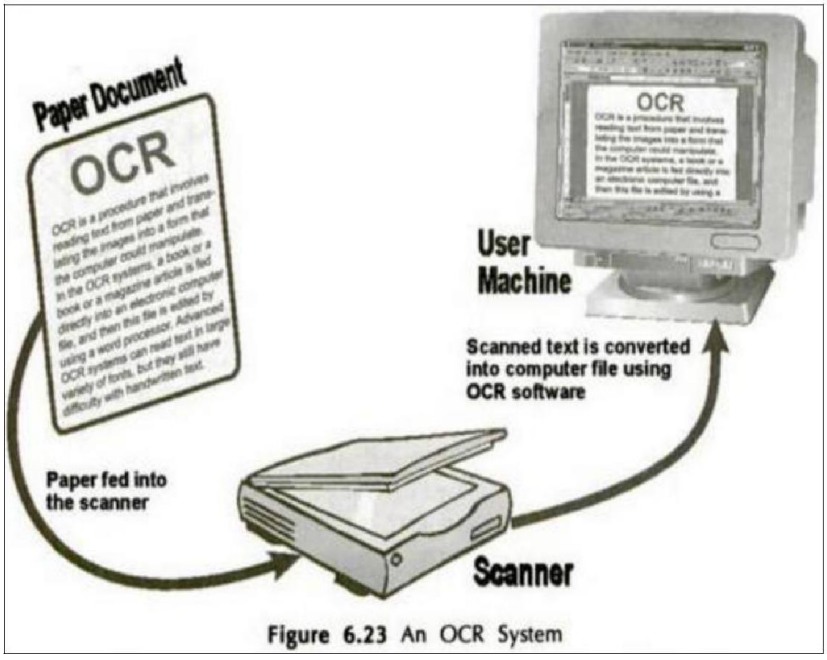


Figure 6.23 An OCR System

6.7.2 Optical Mark Recognition (OMR)

Optical Mark Recognition (OMR) is the process of detecting the presence of intended marked responses. A mark registers significantly less light than the surrounding paper. Optical mark reading is done by a special device known as *optical mark reader*. In order to be detected by the OMR reader, a mark has to be positioned correctly on the paper and should be significantly darker than the surrounding paper. The OMR technology enables a high speed reading of large quantities of data and transferring this data to computer without using a keyboard. The OMR reader scans the form, detects the presence of marks, and passes this information to the computer for processing by application software. Generally, this technology is used to read answer sheets (objective type tests). In this method, special printed forms/documents are printed with boxes, which can be marked with dark pencil or ink. These forms are then passed under a light source and the presence of dark ink is transformed into electric pulses, which are transmitted to the computer.

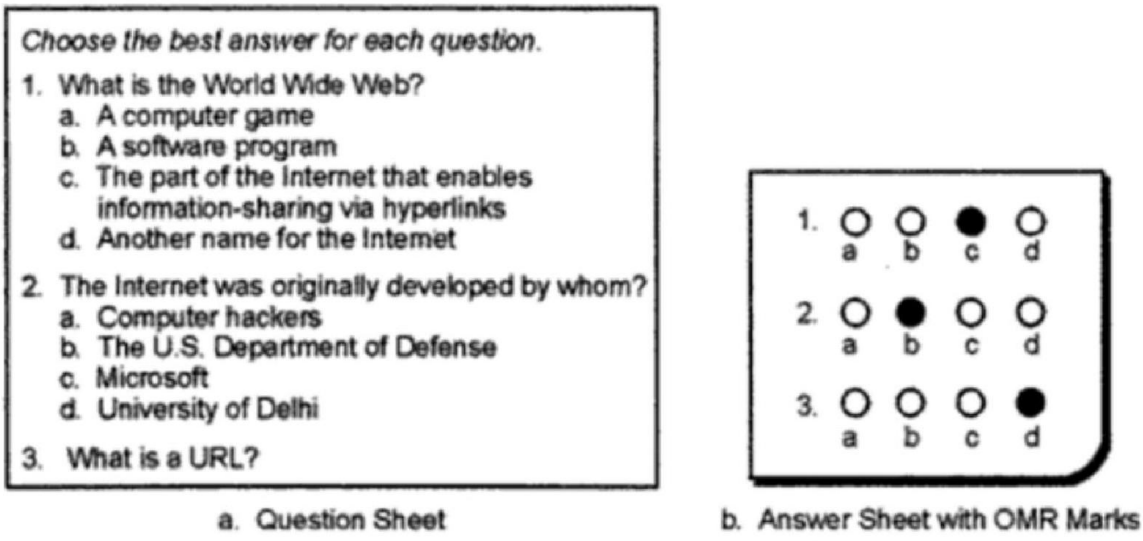


Figure 6.24 Questionnaire using OMR Marks

Working of an OMR Essentially a method of mark reading, it can be performed in two different ways:

1. The first method is based on the conductivity of graphite in order to determine the presence of pencil mark. The marks must be made only in pencil because the number of magnetic particles in the lead pencils is large.

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, **p rice scanner, point-of-sale (POS) scanner** or **barcode scanners**are generally found in supermarkets and large depart mental stores. It is a t ype of scanner which is used for reading printed barcodes.

Barcode Reader (BCR) definition

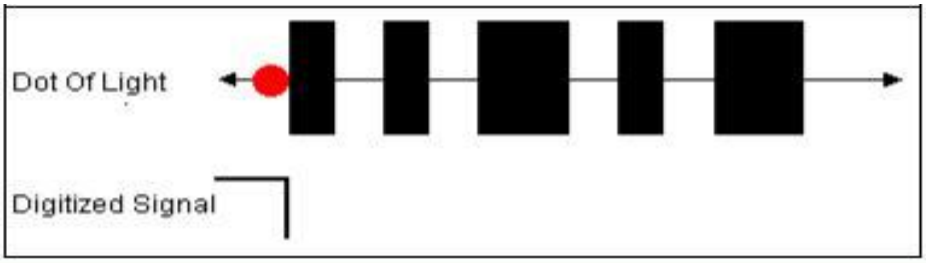
A barcode reader is a hand -held or stationary input device used to capture and read informat ion contained in a barcode.

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.

11. Webcam

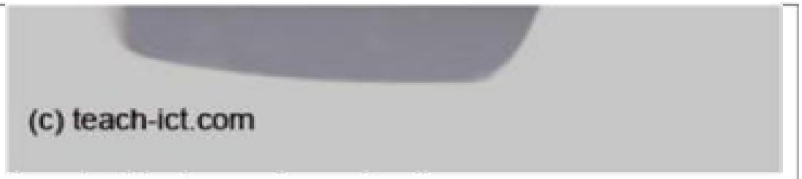
A webcam is short for 'web camera'.

A webcam is an input device because it captures a video image of the scene in front of it. It is either built in to the computer (e.g. laptop) or it is connected through an USB cable.

The video signal is made up of a series of individual 'image frames' which are an instant snapshot of the scene in front of it. Each image frame is sent to the computer for further processing by webcam software. If the 'frame rate' is fast enough (more than 25 frames per second) it appears as motion video.

Many webcams are also used to catch an image frame every now and then, perhaps every minute or even every hour.

Chatting



Webcams are commonly used to allow people to see each other whilst chatting over the internet. Formally this is called 'teleconferencing'

Tourists

There are hundreds of webcams dotted around the world that are pointed to an interesting scene such as the outside view of a lab in the Arctic or maybe the Niagara Falls. The web cam is attached to a computer which sends an image to a server on the internet on a regular basis. People then connect to the server to see the latest image.

Security

Webcams can also be used to capture an image only if movement is detected in the scene in front of it so they are widely used in burglar alarm and other security equipment

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.

13. Discuss about Plotters with neat diagram.

KARPAGAM ACADEMY OF HIGHER EDUCATION

Enable | Enlighten | Enrich
(Deemed to be University)
(Under Section 3 of UGC Act 1956)

DEPARTMENT OF COMPUTER SCIENCE ,CA & IT

COMPUTER FUNDAMENTALS -One Mark SUBJECT CODE :19CSU103

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	1	page Scan	scan one line	image	**1**
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 tasks	**programs involving public input and simple tasks**
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**

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed University Established Under Section 3 of UGC Act 1956)
Coimbatore - 641021.
(For the candidates admitted from 2019 onwards)

DEPARTMENT OF COMPUTER SCIENCE,CA & IT

SUBJECT : COMPUTER FUNDAMENTALS	**SEMESTER**: I	**L T P C**
SUBJECT CODE: 19CSU103	**CLASS** : I B.Sc.CS	**4 0 0 4**

UNIT-III

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

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/

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.

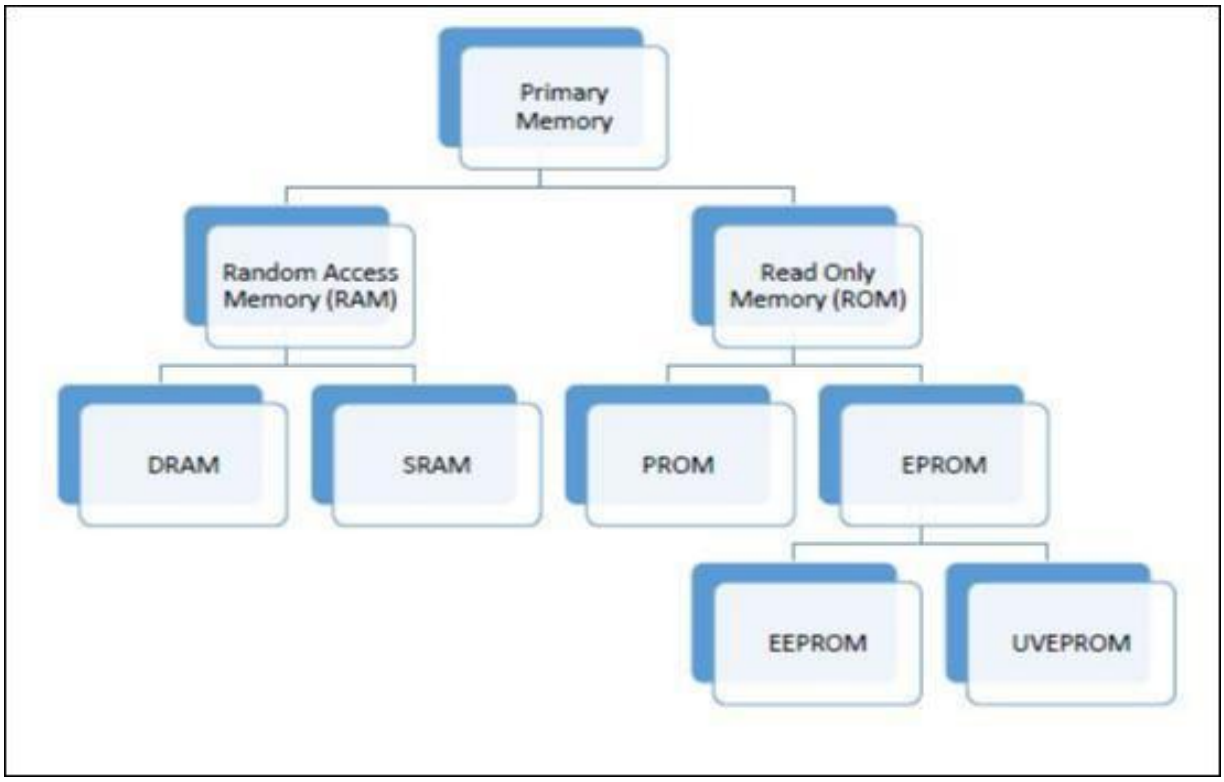
The main features of primary memory,

- 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

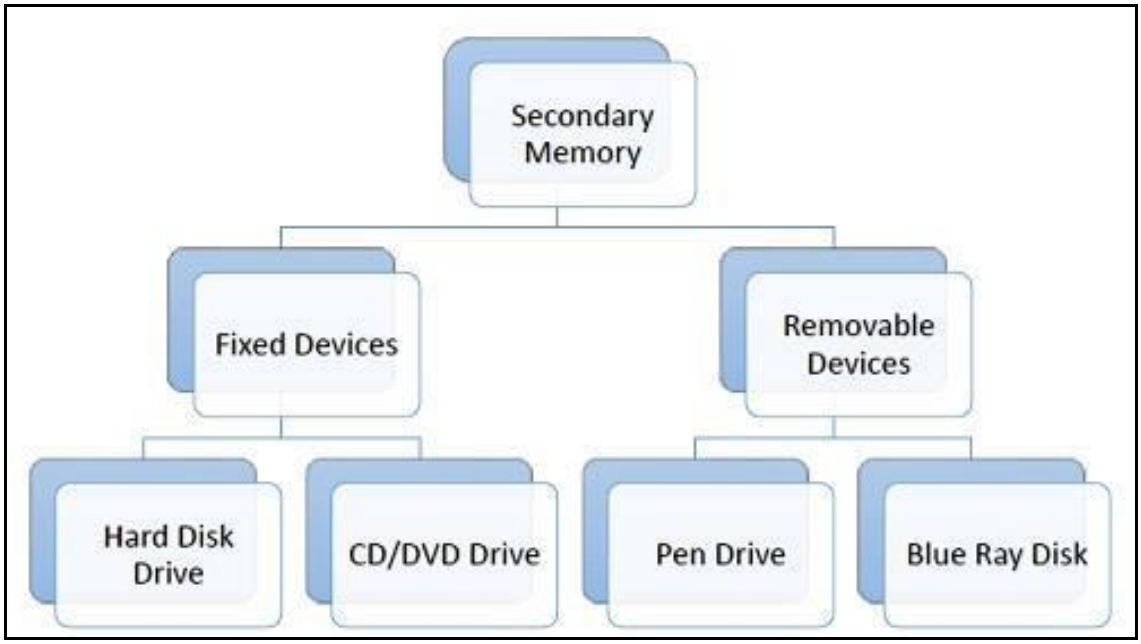
Alternatively referred to as external memory, secondary memory, a secondary storage device is a non-volatile device that holds data until it is deleted or overwritten. Secondary storage is about two orders of magnitude cheaper than primary storage. The faster primary memory is also volatile. If we need 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.

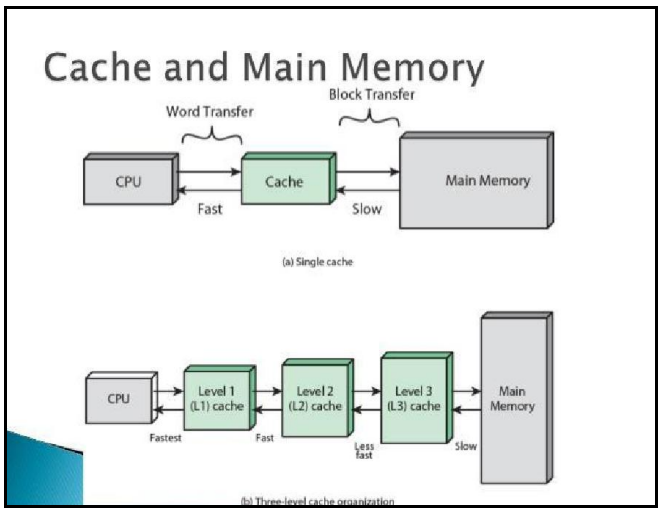
CACHE MEMORY

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

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.

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 binar y 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.

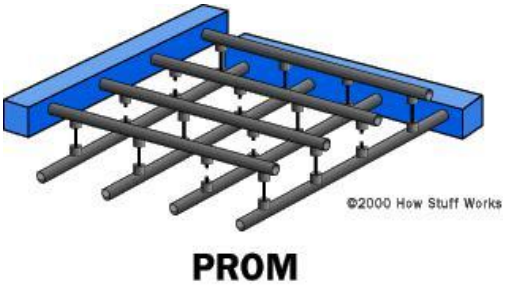


Figure 2

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

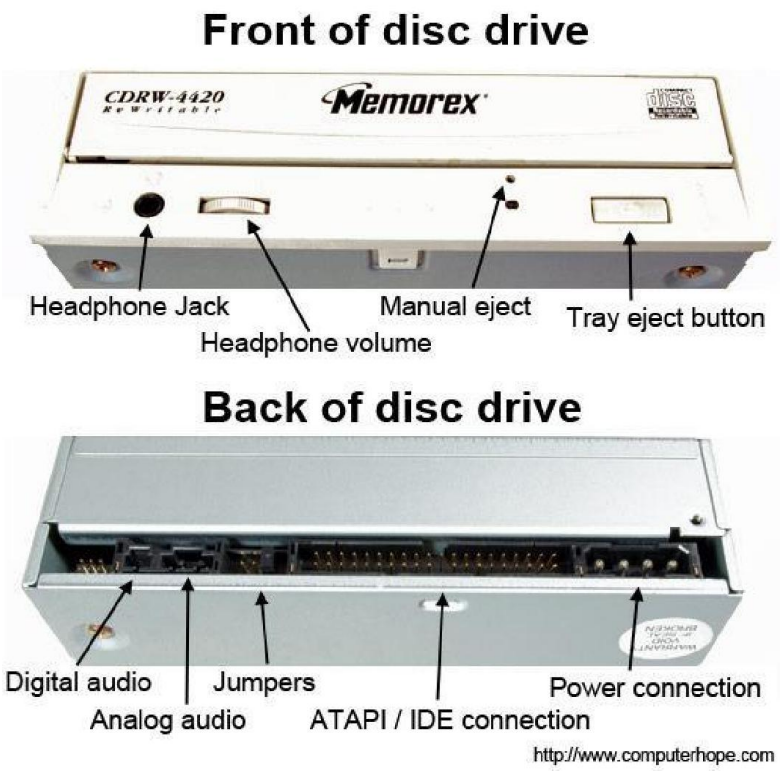
Alternatively referred to as **optical media**, **optical storage**, **Optical disc drive** (**ODD**), and **optical disk**, an **optical disc** is any media read using a laser assembly. The most common types of optical media are Blu-ray, CDs, and DVDs. Computers can read and write to CDs and DVDs using 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.

http://www.computerhope.com 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

What are the parts in a hard drive?

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

DEPARTMENT OF COMPUTER SCIENCE ,CA & IT

COMPUTER FUNDAMENTALS -One Mark SUBJECT CODE :19CSU103

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	1	0	bytes	records	**1**

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**

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed University Established Under Section 3 of UGC Act 1956)
Coimbatore - 641021.
(For the candidates admitted from 2019 onwards)

DEPARTMENT OF COMPUTER SCIENCE,CA & IT

SUBJECT : COMPUTER FUNDAMENTALS **SEMESTER**: I **L T P C**
SUBJECT CODE: 19CSU103 **CLASS** : I B.Sc.CS **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.

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/

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.*

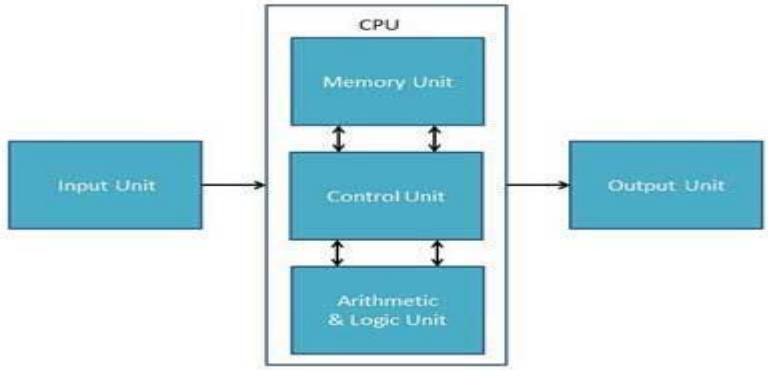
Central processing unit (CPU) is the central component of the Pc. Sometimes it is called as processor. It is the brain that runs the show inside the Pc. All work that is done on a computer is performed directly or indirectly by the processor. Obviously, it is one of the most important components of the 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

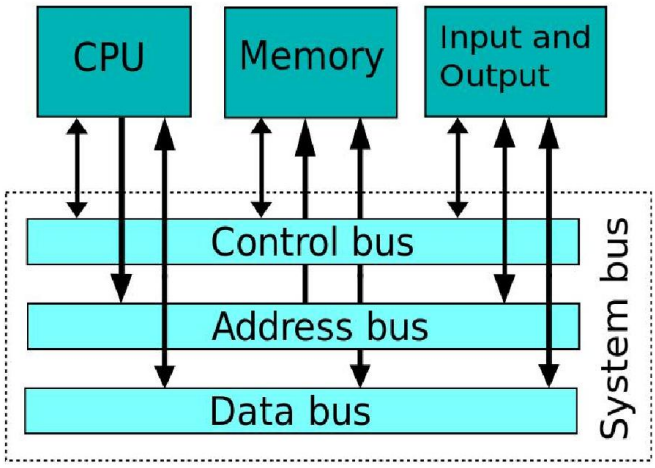
A register used in microcomputers to temporarily store data being transmitted to or from a peripheral device.

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

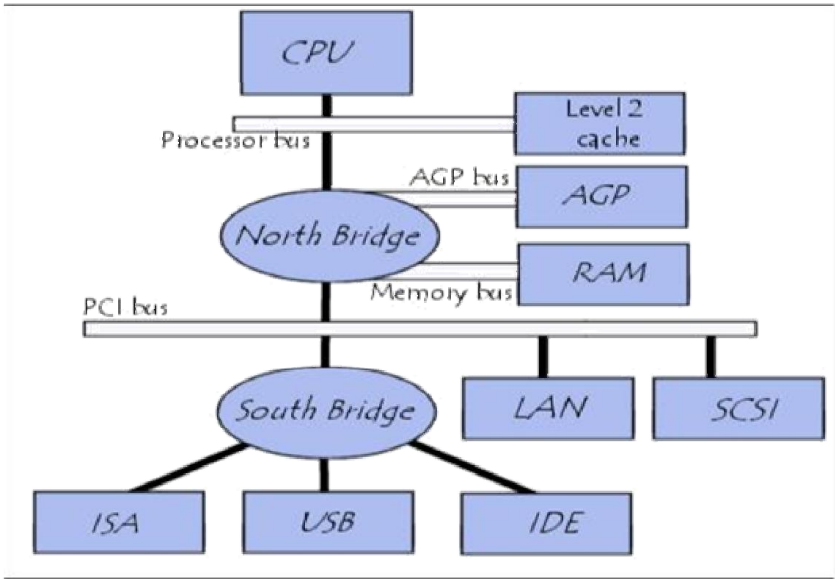
There are generally two buses within a computer:

- 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.

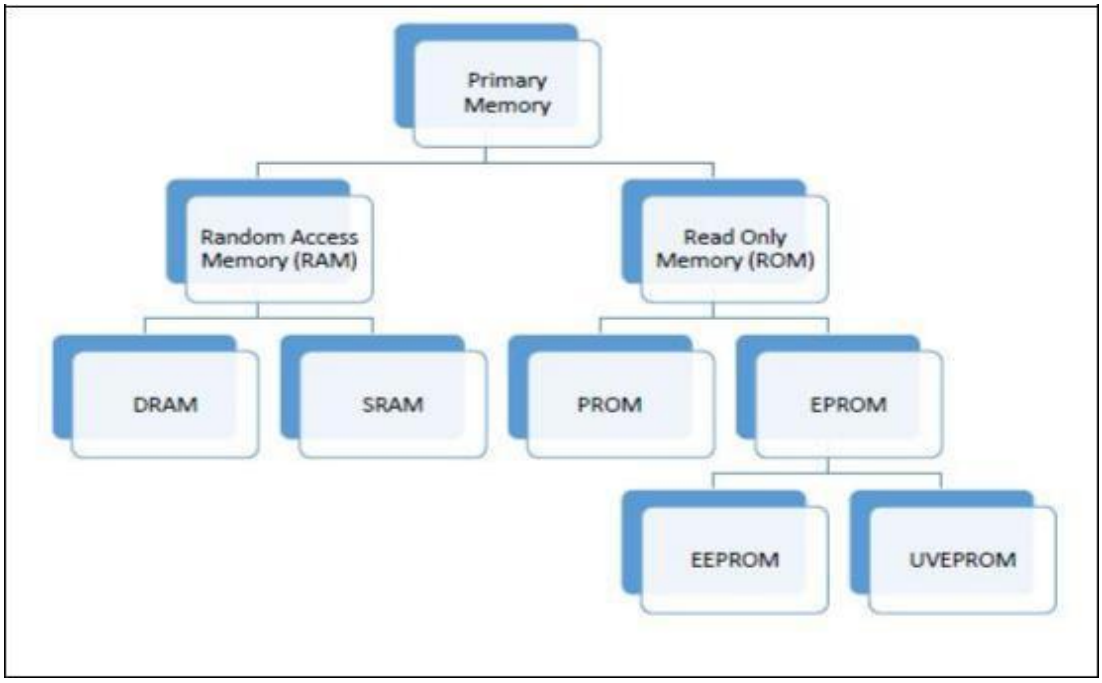
The main features of primary memory,

- 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

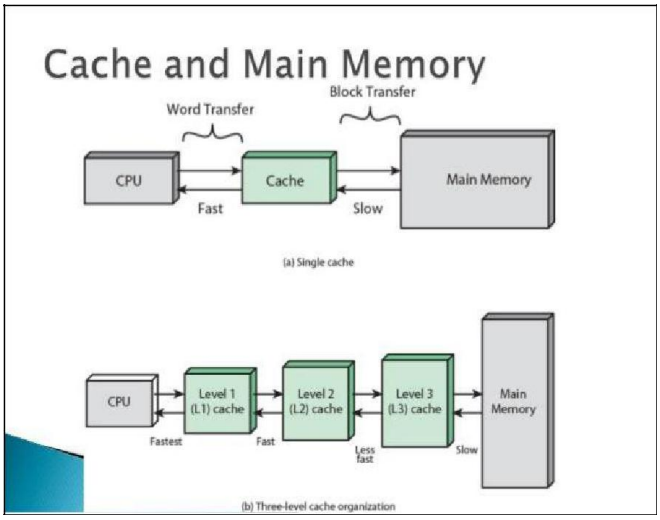
Cache memory, also called CPU memory, is random access memory (RAM) that a computer microprocessor can access more quickly than it can access regular RAM. This memory is typically

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**.

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.

KARPAGAM ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF COMPUTER SCIENCE ,CA & IT

COMPUTER FUNDAMENTALS -One Mark SUBJECT CODE :19CSU103

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	_____lsigna_ 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.	1	0	few	none	**1**
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	Ellaborate 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.	1	0	few	none	**1**
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

(Deemed University Established Under Section 3 of UGC Act 1956)
Coimbatore - 641021.
(For the candidates admitted from 2019 onwards)

DEPARTMENT OF COMPUTER SCIENCE,CA & IT

SUBJECT : COMPUTER FUNDAMENTALS **SEMESTER: I** **L T P C**
SUBJECT CODE: 19CSU103 **CLASS : I B.Sc.CS** **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.

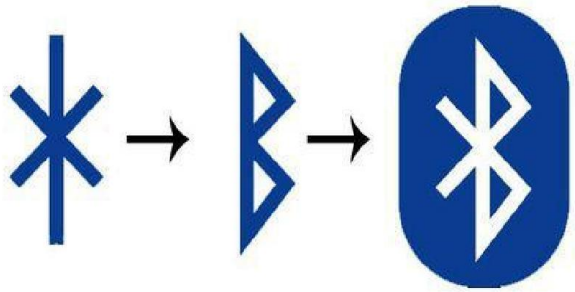
How Did Bluetooth Start and Why Is It Named So?

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

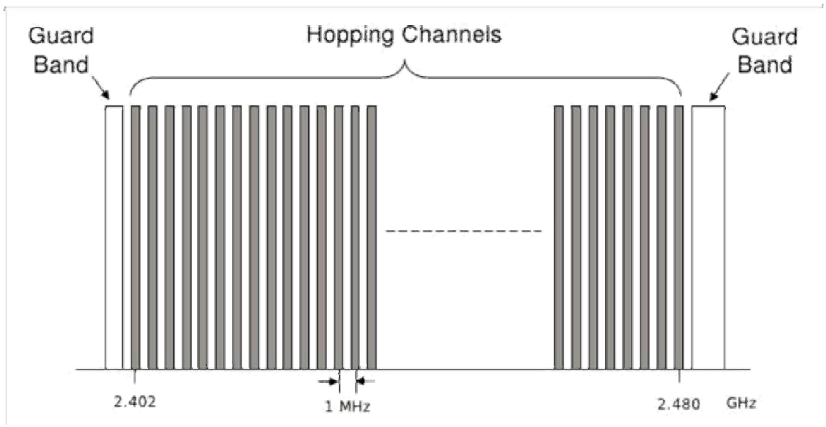
The Bluetooth Special Interest Group has a set of terms and conditions that must be followed by all members, and also has a set of compliance guidelines for all devices.

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.

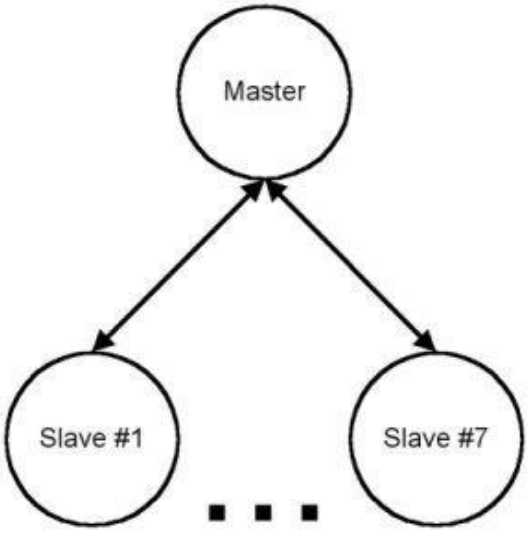


How Does Bluetooth Work?

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.

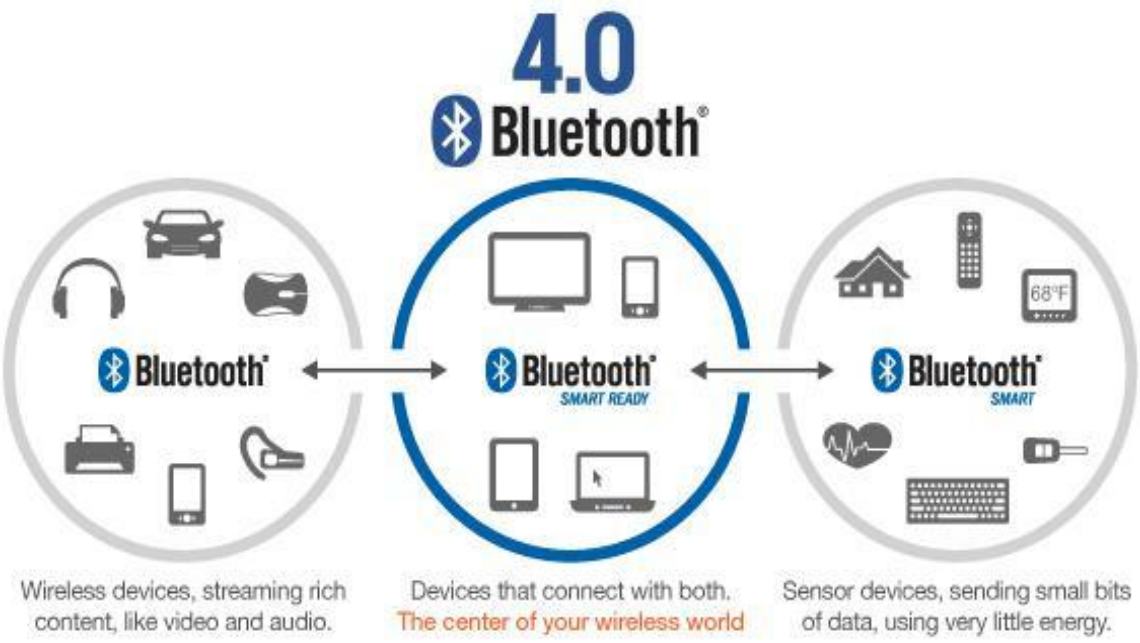
Bluetooth Versions Throughout the Years

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

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 sensing 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.

OVERVIEW OF EMERGING TECHNOLOGIES 2019

Batch

- 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**

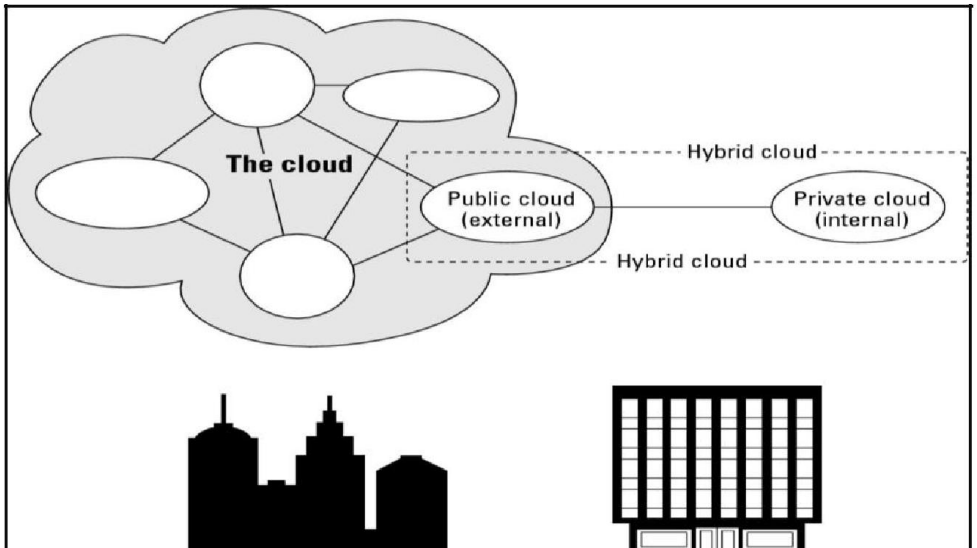
A deployment model defines the purpose of the cloud and the nature of how the cloud is located.

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.



KARPAGAM ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF COMPUTER SCIENCE ,CA & IT

COMPUTER FUNDAMENTALS -One Mark SUBJECT CODE :19CSU103

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	Multimedia Message Service	Multimedia Method Service	Multimedia Message Security	None of these	**Multimedia 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	Wireless Application Protocol	Wired Application Protocol	Wireless Application Provider	None of these	**Wireless 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	Wireless Application Environment	Wireless Application Entity	Wired Application Environment	None of these	**Wireless 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