June 2013

1.

(a) Convert the following decimal numbers to equivalent binary and hexadecimal numbers:
5

(i) 225

Ans:

Decimal to binary:

Decimal to hexadecimal:

$(225)_{10}$ to hexadecimal.

16 | 225   1

14       $\left[(14)_{10} = (E)_{16} \right]$

∴ $(225)_{10} = (E1)_{16}$

(ii) 62.5

Ans: decimal to binary:

$(62.5)_{10}$ to binary.

Integer part $(62)_{10}$

2 | 62   0
2 | 31   1
2 | 15   1
2 | 7   1
2 | 3   1
   1

$(62)_{10} = (111110)_2$

Fraction part $(0.5)_{10}$ = $(0.5) \times 2 = (1.0)_2$

∴ $(0.5)_{10} = (0.1)_2$

∴ $(62.5)_{10} = (111110)_2 + (0.1)_2 = (111110.1)_2$.

Decimal to hexadecimal:

$(62.5)_{10}$ to hexadecimal.

Integer part $(62)_{10}$

$16\ \underline{|\ 62\ }\quad 14$
$\qquad 3$

$\therefore (62)_{10} = (3E)_{16}$
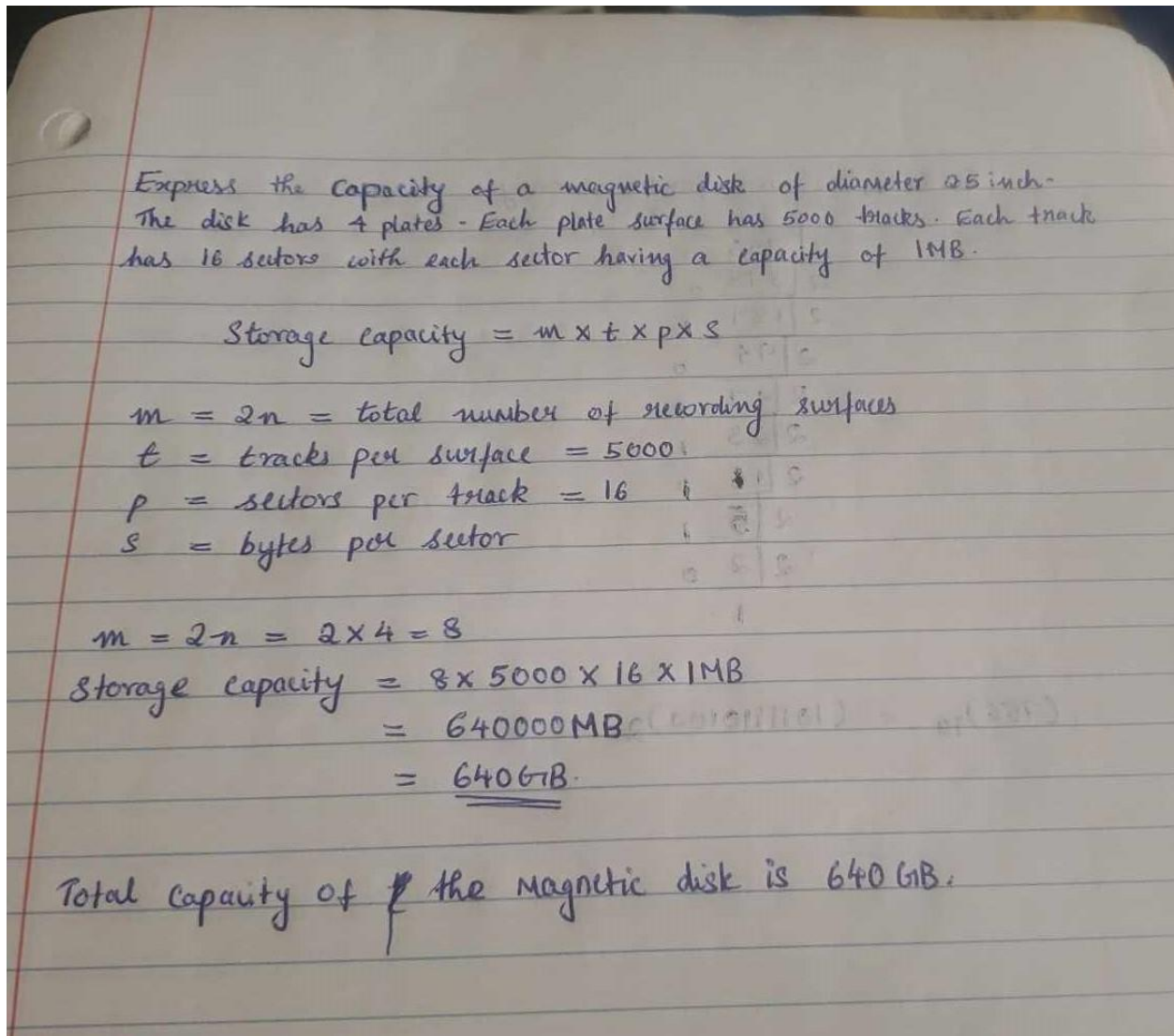
Fraction part $(0.5)_{10}$

$(0.5)_{10} = (0.5) \times 16 = (8)_{16}\qquad (0.8)_{16}\quad (8)_{16}$

$\therefore$ adding both, $(3E)_{16} + (0.8)_{16}$

$(62.5)_{10} = (3E.8)_{16}$

(b) Express the capacity of a magnetic disk of 4 diameter 2.5 inch. The disk has 4 plates. Each plate surface has 5000 tracks. Each track has 16 sectors with each sector having a capacity of 1 MB.

Express the capacity of a magnetic disk of diameter 25 inch. The disk has 4 plates. Each plate surface has 5000 tracks. Each track has 16 sectors with each sector having a capacity of 1MB.

Storage capacity $= m \times t \times p \times s$

$m = 2n =$ total number of recording surfaces
$t =$ tracks per surface $= 5000$
$p =$ sectors per track $= 16$
$s =$ bytes per sector

$m = 2n = 2 \times 4 = 8$

Storage capacity $= 8 \times 5000 \times 16 \times 1MB$
$= 640000 MB$
$= 640 GB$

Total capacity of the magnetic disk is 640 GB.

(c) What is the purpose of Central Processing Unit in a Computer ? What are the components of a CPU ? What effect did Integrated circuit technology had on the CPU ? Explain your answer. 5

Ans: Central Processing Unit (CPU) is considered as one of the most important component of a computer system. It is also known as the brain of a computer. It contains all the circuitry needed to process input, store data, and other results. The main function of a CPU is to execute a series of instructions called as program in a specific sequence. Normally there are four steps that all CPU use in order to perform their operation these are: fetch, decode, execute and output. The CPU is constantly following instructions of computer programs that tell it which data to process and how to process it. Without a

CPU, we could not run programs on a computer. The CPU performs arithmetic, logic, and other operations to transform data input into more usable information output.

Components of a CPU:

CPU contains Arithmetic Logic Unit (ALU) and Control Unit(CU). ALU and CU are jointly known as the central processing unit (CPU).

CPU has three major identifiable parts: Control Unit (CU), Arithmetic & logic Unit (ALU) and a set of Registers. The below figure presents the components of a computer:
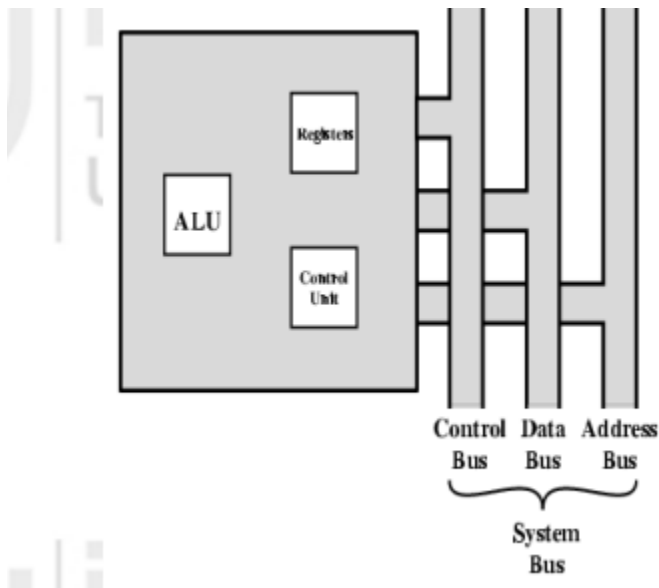
Arithmetic Logic Unit(ALU) : The Arithmetic and Logic Unit is that part of the CPU that actually performs arithmetic and logical operations on data. It performs the basic arithmetic, logical operations specified by the instructions. Arithmetic operations includes addition, subtraction, multiplication, and division. Logical operations includes comparison, selection and merging of data. The CU, CPU registers and memory help in bringing the data into the ALU and then taking the results back.
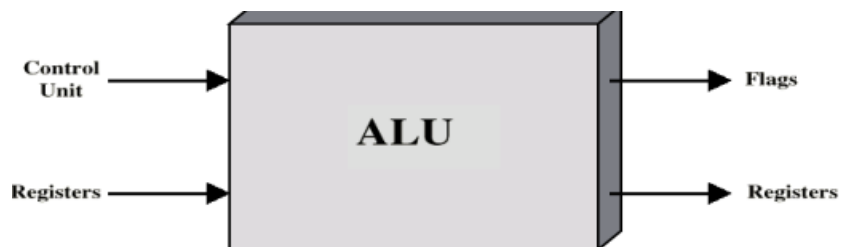
Control Unit: - The CU controls the execution of instructions by decoding the instruction and generating micro-operations to be performed for executing that instruction. It controls the operation of other parts of the computer. Control Unit (CU) is the unit which manages and coordinates the entire operation of a computer system. It controls the operation of the other components of a computer system. The Control Unit of the processor is that unit which controls and coordinates the execution of instructions by the processor. It is responsible for defining and controlling the instruction cycle. In essence, it causes things to happen in the processor. It issues control signals external to the processor to cause data exchange with memory and I/O modules. It also issues control signals internal to the processor to move data between registers, to cause the ALU to perform a specified function, and to regulate other internal operations. It generates timing signals and initiates the Fetch cycle of instruction execution. When the instruction is fetched, it generates the sequence of micro-operations which need to be executed in order to execute the instruction. CU also generates timing signals for executing set of micro-operations. There are three different ways in which CU can generate these micro-operations: through a hardwired logic, by reading a programmable Array (PLA) table or by reading a Programmable Read Only Memory (PROM).

 Functions of CU:

* It controls transfer of data and instructions among other units of computer.

* It does not store or process data.

* It fetches the instructions from the memory, decodes them, and executes them.

CPU has a set of Registers which is used to store some data temporarily. Register lies above Cache and Main memory in memory hierarchy of the system. The registers in CPU perform two roles:

- User-visible registers: used to store temporary data items and other user accessible information useful for machine or assembly language programmers.
- Control & Status Registers: used by control unit to control and coordinate the operation of the processor.

The CPU chip is interfaced with other components of the computer through a system bus which has three sets wires forming Control Bus, Data Bus and Address Bus.

Effect of integrated circuit technology on CPU:

The CPU is a semiconductor integrated circuit chip consisting of many transistors. The small size of these circuits allows high speed, low power dissipation, and reduced manufacturing cost. These digital ICs use Boolean algebra to process "one" and "zero" signals. In personal computers, the CPU is also referred to by the term Microprocessor. Every CPU can perform certain instructions (known as machine instruction). Modern CPUs have the logic built in to perform 400-550 machine instructions. The machine instructions that a CPU can execute demonstrates its capability. Every processor can perform certain operations. An instruction refers to an operation that can be performed by the processor directly. The entire set of instructions that can be executed by the processor directly, through the logic in hardware, form the instruction set of the processor. An instruction tells the processor what task is to be performed and what microoperations need to be completed to perform the task.

Modern processors nowadays have two identifiable trends which improve their performance to a much higher level. These are use of on chip Cache memory and having more than one processor core on the same IC chip. Cache memory is a fast semiconductor memory which can be used to temporarily store instructions and data that are frequently referred by the processor. By having frequently referred instructions and data available in the processor, the wait cycles introduced due to memory references are minimized and hence the processor performance improves a lot. Another modern technique of having more than one processor core on the same IC chip tries to perform the execution of instructions in parallel and hence the performance of the processor improves a lot.

(d) Name and explain the purpose of any four types of software used in programming. 6

Ans: 4 types of software used in programming are :

1. System Software

2. Programming software

3. Application software

4. Utility software

1. System software:

System software helps run the computer hardware and system. It is designed to control the operations of a computer and coordinate all external devices like communication

devices, printers, keyboards, display units, etc. It manages all the computer resources like memory and processor time in optimal and stable manner. It is a program designed to run a computer's hardware and applications and manage its resources, such as its memory, processors, and devices. It also provides a platform for running application software, and system software is typically bundled with a computer's operating system.

System software provides a useful link between user and computer. It also assists the computer in the efficient control, support, development and execution of application software. System software is essential for computer hardware to be functional and useful.

Common types of system software are:

- Operating System
- Server Programs
- Device drivers
- Communications software

2. Programming software usually provides tools to assist a programmer in writing computer programs, and software using different programming languages in a more convenient way.

Common types of programming software:

* Compilers

* Debuggers

* Interpreters

* Linkers

* Text Editors

3. Application Software: Application software is designed and developed to accomplish one or more specific task or solve a particular problem. Application software may be for commercial or scientific use. There is wide range of application software available for varied purposes.

Some major categories of these applications include:

- Database Software
- Spreadsheet Software
- Presentation Software

- Graphics Software

4. Utility Software: Utility software is a program or tool that performs specific tasks to enhance productivity, efficiency, functionality, or maintenance of a computer system. Some of the utility programs are:

* Anti-virus software

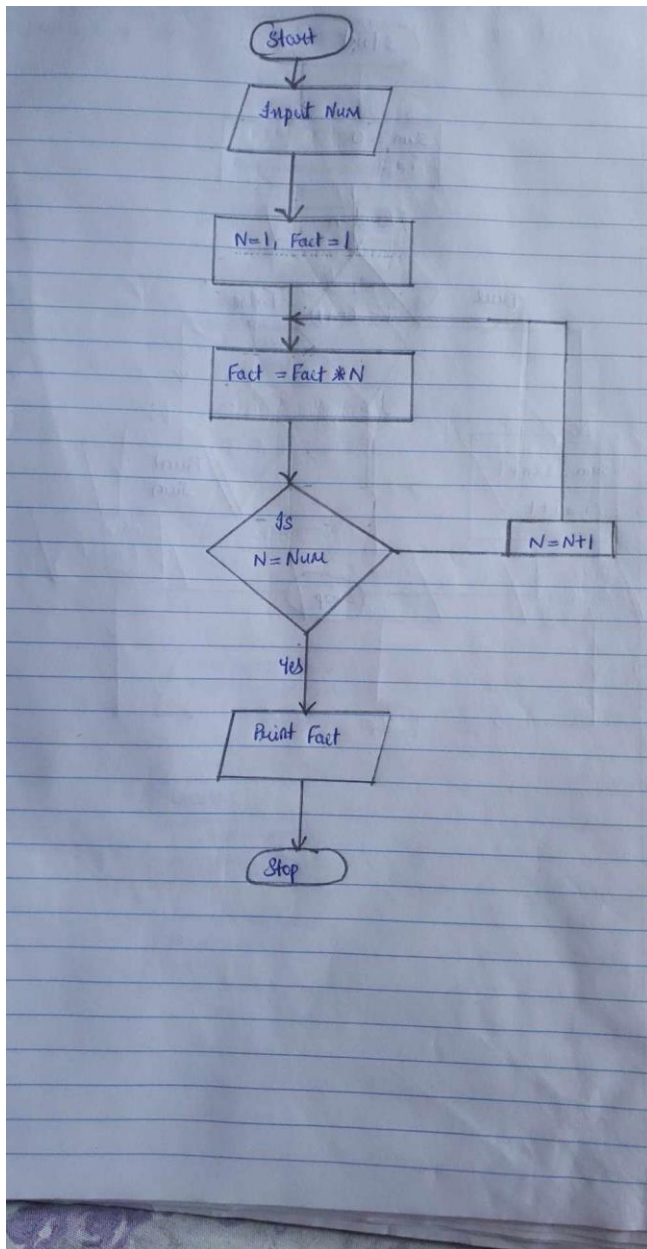* Backup utilities

* Diagnostics programs

* Full view programs

(e) Draw a flow chart for a program that calculate the factorial of a number. Please note that factorial is defined as n! = n x (n —1) x (n — 2) x 3 x 2 x 1.   6

Ans:

A flowchart with the following elements:

- Start
- Input Num
- N=1, Fact=1
- Fact = Fact * N
- Is N = Num (decision)
  - No → N = N+1 (loops back)
  - Yes → Print Fact
- Stop

(f) What is the use of TCP/IP Protocol ? 8 Describe the TCP/IP (layers) model with the help of a diagram. Explain the function of Transport layer and Internet layer of the model.

Ans: Using the TCP/IP as the basic protocol Internet offers many services and application to it users like work wide web, Email, Chat, Social networking, collaboration etc.

TCP/IP allows communication between a number of computers (called hosts) connected on a network. Using the TCP/IP as the basic protocol Internet offers many services and application to its users like work wide web, Email, Chat, Social networking, collaboration etc.

TCP/IP was originally designed for the UNIX operating system; however, TCP/IP software is now available for every major operating system. In order to be compatible to the Internet, the computer must have TCP/IP compatible software. The major advantage of Internet is information sharing. Since in computers, bits and bytes are basic building blocks of information. Thus, one of the key aspects in network of many computers is to move bits between two specific computers. For such a communication, we require the address of the destination and a safe mean of moving data in the form of electronic signals. As far as safe movement of data is concerned, there exists a set of rules, which governs the sending, and receiving of data on the Internet.

A stack of protocols called TCP/IP (Transmission Control Protocol/Internet Protocol) implements these rules. Its name reflects names of only two protocols called TCP and IP.

The TCP/IP model defines how devices should transmit data between them and enables communication over networks and large distances. The model represents how data is exchanged and organized over networks.

TCP/IP model has many layers as mentioned below:

Application layer

Internet Layer

Transport Layer

Host to Host Network

Internet Layer: This layer routes and delivers data across similar networks or completely different networks. The Network layer is responsible for end to end packet delivery while maintaining routing, flow control, and error control functions. An example of this layer is the Internet Protocol (IP) or the Internet Protocol Security (IPSec).

Transport Layer: The Network layer can be thought of the actual vehicle which transports information. This layer categorizes end to end message transmissions or connecting applications as either Transmission Control Protocol (TCP) or User Datagram Protocol (UDP). TCP is a connection-oriented protocol which is considered to provide a reliable byte stream. Some characteristics of TCP are traffic congestion control, data arrives in order, data has minimal error, and duplicate data is discarded.

(g) Define the terms confidentiality, Integrity and Availability in the context of Internet security. 3

Ans: Confidentiality: It means that the data is only available to authorized parties. No unauthorized person should be able to read or copy information that s/he is not supposed to read.

Integrity: Integrity means that data or information in your system is maintained so that it is not modified or deleted by unauthorized parties. It is the protection of system data from intentional or accidental unauthorized changes. No unauthorized person should be able to modify information.

Availability: It means that systems and data are available to individuals when they need it under any circumstances. No unauthorized person should be able to erase information or make it inaccessible.

(h) What is a blog ? What are its advantages ? What precautions should you follow while blogging ? 3

Ans: Blog is a website where entries are written as information or news on a particular subject. A blog may combine text, images, or other media components; however, most blogs are textual. They may also provide links to other web pages or blogs. In addition, blog allows you to leave comments in an interactive format. Blogging is emerging as wonderful way to share and publish your views.

A blog need not be restricted to a single author; it can merge different kinds of ideas

Some of the types of blogs that are currently in use on Internet are:

- Corporate and organizational blogs – may be used for projecting organizational culture and market branding.
- Category based blogs – blogs on particular subject like travel, health, environment, music, education and many other.
- Blogs having different media and device types – a blog having only videos may be called vlog, having only links may be called linklog, there are many such categories, a log for mobile devices may be called moblog. The collective community of blogs is known as the blogoshere.

Advantages of blog:

- Blogs if used properly can help your expression. It has the potential of preserving your ideas, getting comments on your ideas and developing your ideas.
- In contrast to other businesses on the market, we don't require a capital investment to start blogging.
- Blogs can be shared anywhere in the world, provided you have access to the internet and a monitor to work on.
- Blogs that are published on the internet can be accessed by anyone around the world.

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Precautions while blogging:

- Blogging may result in some unforeseen consequences including legal liabilities, therefore, you should be very careful while blogging.
- You should never release any confidential information about you or any other person or organization.
- Do not use any defamatory language against anybody in a blog.
- Do not discuss office matters through blogs.
- Be very careful of the language you are using on the blog, it should not be offending, aggressive or abusive.

2.

(a) Explain the role and features of :

(i) Processor internal memories

Ans: Role:

It is used as temporary locations where actual processing is done. It is used to store data that is used by the system at start-up and to run various types of programs like operating system. It is used to store small mount of data that can be accessed quickly while the computer is running.

Features :

Processor internal memory consist of small set of high-speed registers which are internal to a processor. It is mostly contained on small microchips that are either attached or connected to the computer's motherboard. The internal memories of the computer are made up of semiconductor material usually silicon. This memory is costlier and is usually small in size when compared to external memory.

(ii) Cache memory

Ans:

Role: It is a type of high speed memory which is used to increase the speed of processing by making current programs and data available to the CPU at a rapid rate. It is a very high-speed semiconductor memory used to enhance the speed of main memory. Cache memory is used to store temporary files, using hardware and software components. It is

used to speed up access to data and applications. It is used to speed up, synchronize with a high-speed CPU and to improve its performance.

Features: It acts as a high-speed buffer between main memory and the CPU. The cache memory is placed in between CPU and main memory. Cache memory access time is about 0.5 to 2.5 ns which is much less than that of the main memory. Because of its very high cost, the capacity of the cache memory deployed is 2 to 3 percent of that of the main memory. Cache memory is a high-speed memory, which is small in size but faster than the main memory. Cache memory can only be accessed by CPU. It holds the data and programs which are frequently used by the CPU.

(iii) Primary memory

Ans:

Role: Primary memory is the part of the computer that stores current data, programs and instructions. It stores programs and data which are currently needed by the CPU. Primary memory temporarily stores data and instructions that the CPU needs while performing tasks. This allows for quick access and processing, as accessing data from main memory is significantly faster than from secondary memory.

Features: It is also known as main memory or semi-conductor memory. It is the computer's main memory and stores data temporarily. Data stored in primary memory can be directly accessed by the CPU. It is a fast and large memory but is slower than processor memory. Primary memory has faster access time, smaller storage capacity and higher cost per bit storage. The size of the main memory is kept small because of its high cost. It is a volatile type of memory.

(iv) Secondary memory

Ans:

Role : Secondary memory is mainly used for bulk storage (mass storage) of programs, data and other information. It is used to store the data permanently at a cheaper cost. It stores system software, compiler, assembler and useful packages, large data files etc. Secondary memory provides large storage space so that one can store large data like videos, images, audios, files etc. permanently.

Features : It is also known as auxiliary memory. It has much larger capacity than main memory but is slower. It is non-volatile type of memory. Secondary memory cannot be accessed directly by the CPU. Hard-disk and floppy disks are the most common secondary memories used in computers. Secondary storage systems offer large storage capacities,

low cost per bit and medium access times. Secondary memory is external memory and saves data permanently.

(b) Define the following terms in the context of a programming languages with the help of an example : (i) Variable (ii) Constants (iii) Data types (iv) Array (v) Expression 7

Ans:

i) Variable: A variable is a symbolic name given to a memory location. Since referencing memory by its physical address is very tedious, variable names are used. Once a variable is assigned to a memory location, the programmer can refer to that location by variable name instead of its address.

Variables are used to store information to be referenced and manipulated in a computer program. They also provide a way of labeling data with a descriptive name, so our programs can be understood more clearly. Their sole purpose is to label and store data in memory. This data can be used throughout the program. A variable is composed of a name, attribute, reference and a value.

Int a,b; //variable declaration.

a and b are the variables.

ii) Constants:

Ans: A constant is a data item whose value cannot change during the program's execution. Constants are symbols used to refer to quantities which do not change throughout the life of a program. No assignment can be done to a constant. This quantity can be stored at specified locations in the memory of the computer.

The most common example which can be considered is "PI".

A numeric constant stands for a number. This number can be an integer, a decimal fraction, or a number in scientific (exponential) notation. Some of the operations which can be performed with numeric constants are addition, subtraction, multiplication, division and comparison.

A string constant consists of a sequence of characters enclosed in double/single quote marks. Chopping off some of the characters from the beginning or end, adding another string at the end (concatenation), copying are some of the operations that performed on the string constants. All these operations can be done on variables also.

Constant declaration:

Const int a=2;

(iii) Data types

Ans: Anything that is processed by a computer is called data. Data type is an attribute associated with a piece of data that tells a computer system how to interpret its value. There are different types of data that can be given to the computer for processing. A data type is a classification identifying the type of data.

It determines:

* the Possible values for that type,

* Operations that can be performed on values of that type,

* The way values of that type can be stored in memory

In each programming language there are some primitive data types.

in the C programming language they are:

- int, both signed and unsigned integers, 2 bytes in size.
- float, floating point numbers, up to 4 bytes in size.
- double, floating point number with double precision. These are organized in 8 bytes (64 bits)
- char, character type size of 1 byte (8 bits) It is used to form the strings i.e sequence of characters.

(iv) Array

Ans: In programming, when large amount of related data needs to be processed and each data element is stored with different a variable name, it becomes very difficult to manage and manipulate. Arrays provide a way to store and manage multiple values or data items under a single variable name, making it easier to work with a large set of related data. An array is a linear data structure where all are arranged sequentially. It is a collection of elements of same data type stored at contiguous memory locations. Each element can be individually referenced by an index.

The two types of array used are:

* One dimensional array

* Two dimensional array

One dimensional array:

One dimensional are: A one-dimensional array is a structured collection of elements that can be accessed individually by specifying the position of a component with index/ subscript value. The index would let us refer to the corresponding value.

Like a regular variable, an array must be declared before it is used. A typical declaration for an array in C++ is:

type name [elements];

where type is a valid data type (like int, float...), name is a valid identifier or variable name and the elements field (which is always enclosed in square brackets []), specifies how many of these elements the array will contain. Therefore, in order to declare an array named as marks, that will store marks for 5 students.

int marks[5];

marks [0]	marks[1]	marks[2]	marks[3]	marks[4]
50	70	80	90	63

Two dimensional arrays: It is a collection of data elements arranged in a grid-like structure with rows and columns. It will have two dimensions and data is represented in the form of rows and columns. Elements of a 2D array are generally represented in the format arr[i][j] where i is the number of rows and j is the number of columns of the array. It can be defined as an array within an array.

Type name [elements] [elements];

Example : int a [3] [3];

	Column1	Column 2	Column 3
Row1	a[0][0]	a[0][1]	a[0][2]
Row2	a[1][0]	a[1][1]	a[1][2]
Row3	a[2][0]	a[2][1]	a[2][2]

(v) Expression

Ans: An expression is a combination of variables, constants and operators written according to the syntax of the programming language. Every expression evaluates to a value i.e., every expression results in some value of a certain type that can be assigned to a variable.

An expression may contain:

    i)   Arithmetic operator
    ii) Relational operator
    iii) Logical operator

Assignment : It is composed of variable name, an assignment operator of the language and a value or variable or some expression as per composition allowed based on rules defined in grammar.

e.g temp=5;

temp=temp+1;

This means to add 1 to the current value of the variable temp and make that the new contents of the variable temp

Arithmetic : These types of expressions consist of operators, operands or some expression. The following is the list of arithmetic operator.

+(addition), -(subtraction), *(Multiplication), /(Division), % (modulo), ++(increment by 1), --(decrement by 1)

Examples of arithmetic expressions. e.g.

x=y+z; /* addition of y and z will be stored in x */

i++; /* i will be incremented by 1 i.e i=i+1 */

 y=x%2; /* remainder after x divided by 2 will be stored in y */

Logical, relational and equality : these types of expression result in a Boolean representation i.e. each expression will result in either True or False. It is composed of operands and relational/logical/equality operator.

The following is the list of operators in the C programming language

== (equal to)

!= (Not equal to)

< (less than)

<= (less than equal to)

> (greater than)

>=(greater than equal to)

&& (logical AND)

|| (logical OR)

! (logical NOT)

Relational expressions result in one of the truth value either TRUE or FALSE. They are capable of comparing only two values separated by any valid relational operator.

e.g. Let x=1, y=3

x==1 /* evaluates to true as x has value 1 */

x!=y /* evaluates to false */

x <y/* evaluates to true */

(c) What is a URL ? What is the need of DNS in Internet ? Explain with the help of an example. 5

Ans: A URL, which stands for Universal Resource Locator. URL is the global address of a document or resource on the WWW .It is the unique web address of a website, image, document or any other resources on the web. A UPL is a type of uniform resource identifier (URI) that provides a way to access information from remote computers, like a web server and cloud storage.

Parts of a URL:

A URL consists of three parts:

The first part is used to tell the browser what kind of server it will connect to. This component of the URL is called protocol. Every URL begins with a protocol. For web pages, this is usually http or https. Other protocols that we can use in this field of an URL are FTP, smtp etc. the protocol is always followed by ”://”.

The second part of the URL is a fully Qualified Domain Name. The fully qualified domain name identifies the site running the server. The domain name (or the domain) is the name of the computer on which the data you are looking for is located (the server). Web servers use port 80 by default, but some servers has been set up to use other ports. The range of Well-Known Ports is in between 0–65535.

The first two parts of an URL are used to identify the web server of the website. Each web server has a home page and a directory to store the entire document related to the web page like images, audio, video files.

The third component of URL is an optional pathname for a particular document itself. File path is used to find the exact location of the resource we want to access.

Example: https://www.exampleurl.com/path/result.html

In the above example, the browser will connect to a web server using Hypertext Transfer Protocol Secure (HTTPS). The fully qualified domain name is www.exampleurl.com. The above is the address of the file result.html.

The Domain Name System is the phonebook of the Internet. DNS translates domain names to IP addresses so browsers can load Internet resources. Domain Name System (DNS) should keep track of address of each computer or any other internet device and email addresses. The name servers translates the web address or email address to respective IP address.

DNS is a fundamental component of the internet that translates human-friendly domain names into IP addresses. This process allows users to access websites using easy-to-remember names instead of having to remember complex addresses.

DNS follows a hierarchical naming scheme that is supported by distributed database system to ensure no duplicate names are issued at all.

DNS allows users to easily navigate the web without needing to memorize complex addresses, which in turn makes internet usage more comfortable.

if we want to visit www.xyz.ac.in , the following steps take place:

1. We first enter www.xyz.ac.in in your browser.

2. The browser finds the IP address using DNS resolution.

3. It connects to the web server at that IP address.

4. The server sends the webpage data back to your browser.

5. The browser displays the webpage for you to see.

3.

(b) What is collaboration in the context of World Wide Web (WWW) ? What are the characteristics of VVIKI ? Can you use Wiki for collaboration ? Justify your answer. 5

Ans: Collaboration is defined as an act or process of working together on a project or some intellectual activity. Collaboration involves both communication and sharing of ideas. Some of the important areas where collaboration is useful are physical science, high-energy physics, Health Science, environmental studies etc.

The collaboration helps in sharing of resources. These resources may be your intellectual efforts, hardware computing power or any other form of activity. Collaboration helps in solving complex problem domains by distributing the problems.

Most of the tools used on the internet can be used for some form of collaboration. For example, google docs is one such tool that may enable you to create a collaborative project report online. One can create a document using it and share it with your colleagues who in turn may be able to add content to it from anywhere, edit it and discuss about it using a discussion group.

Another software that can be used for collaboration is Google Wave. It allows you a shared web space for discussion or working together in a group. You may use text, photographs, maps etc. for this purpose. This software also combines collaboration with email, chat, messaging etc.

Other web-based collaboration tools are:

Zoho: Zoho is a division of ZOHO Corporation, a US-based Software Company. Zoho is a very good site for collaboration. It not only allows simple mundane tasks like group editing, document sharing, group chat, etc. but also provides some management tasks like milestone tracking, invoice creation, and other team tasks.

Volunteer Computing: It allows r hardware resources to be used for the purpose of some online project.

Characteristics of Wiki are:

* A wiki invites all registered users to edit any page or to create new pages within the wiki Website.

* Wiki promotes meaningful topic associations between different pages by making page link creation very easy.

* Wiki promotes discussion and also keeps the history of changes of a document.

Wiki as a collaboration:

Using Wiki for collaboration is a common practice, especially in academic and professional settings. Wikis are online platforms that allow multiple users to contribute, edit and collaborate on content. Using wiki for collaboration can be a valuable tool for sharing information, working together on projects, and creating a collective knowledge base.

Wiki platforms are accessible to a wide range of users, making collaboration easier and more inclusive. Wikis typically have version history features that allow users to track changes, revert to previous versions, and see who made the changes. This helps maintain the integrity and accuracy of the content. Many wikis have built-in discussion features where users can communicate, provide feedback, and resolve conflicts. This fosters communication among collaborators and enhances the quality of the content. Wikis use a structured format with categories, headings and links to ensure that information is organized and easily navigable.

Wikipedia is a well-known example of a wiki used for collaboration on a wide range of topics.

(c) Explain application of computer systems in the area of banking and education. 5

Ans:

Banking :

When there was no computer, every where manual system was followed which was a very complicated and hard work but now with the arrival of computer, every thing has become much more systematic and easy to use. Every bank is now using a computerized system because it is very fast and user friendly. Personal Computer banking lets us view our bank balance, request transfers between accounts and pay bills electronically. Now-a-days, online banking is getting very popular which offers more convenience and ease to the customers. Computers are used in banks for money transfer, voucher, ledger, bank sheet etc.

Education:Computer applications can be used in education for learning and for instruction. Instruction and learning can be divided into two major areas, teachercentered instruction and student-centered learning. Teacher-centered instruction examined the computer as the object of instruction as well as a tool of instruction and the management of instruction. With the advancement in the Technology and Internet, Online Education, e-learning, m-learning are getting very popular which offers more flexibility and convenience to the learners.

Student-centered learning views the computer as a tool for the student to use and create access, retrieve, manipulate, and transmit information in order to solve a problem. Understanding the concept of the computer as an information tool relies on accepting the fact that the computer is a productivity tool for the student and the teacher alike.

Computers are used widely in all educational research. Educational research includes functions relating to information gathering and processing. The teacher/researcher may examine student performance data in new and revealing ways. Bibliographic citations of

studies performed by educators around the world can be acquired and perused by the desktop computer.

There are many uses of computer in schools and colleges e.g. every students details need to be stored so a computer program comes to help in. Multimedia, animations, graphics and charts could be used to teach the students and many boring topics can be made interesting using multimedia. Students could access internet for online help and courses for more information. Computers are used in a variety of ways in the educational field. Computers can be used in school management such as budget, inventory, student records, communications, library circulation, and library public access catalog.

4. (a) What is the meaning of term "topology" in the context of Computer Networks ? Explain any two LAN topologies giving their advantages and disadvantages. 9

Ans: Network Topology is the study of the arrangement or mapping of the elements (links, nodes, etc.) of a network interconnection between the nodes. It also determines the strategy for physically expanding the network, in future. Topologies can be physical or logical. Physical Topology means the physical design of a network including the devices, location and cable installation. Logical Topology refers to the fact that data transfers in a network as opposed to its design. There are different types of the topologies like bus, ring, tree, mesh etc.

Bus topology:

All of the devices in a bus topology network are linked together by a single cable, which is referred to as a bus and the cable is known as backbone cable. It has a single length of cable with a terminator at each end as shown in the figure.
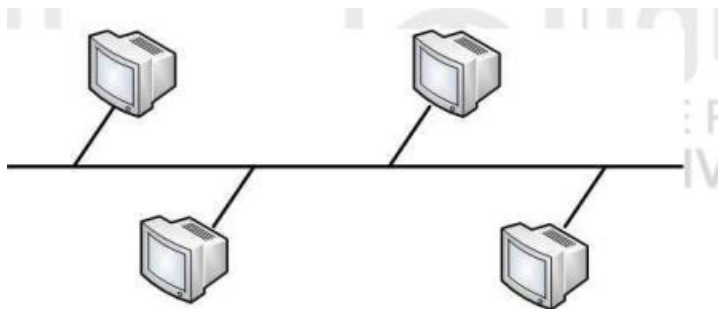
Bus topology

It is a passive topology which means only one computer at a time can send a message. Hence, the number of computers attached to a bus network can significantly affect the speed of the network. A computer must wait until the bus is free before it can transmit.

Each node is connected to others nodes. The network operating system keeps track of a unique address of each node and manages the flow of data between machines.

Advantages of bus topology:

a) It is simple, reliable, and easy to be used in a small sized local area network.

b) It requires least amount of cable to connect computers together and is therefore less expensive than other cabling arrangements.

c) It is easy to implement and extend using connectors.

d) If one computer on the bus fails, it does not affect the rest of the traffic on the bus.

Disadvantages of bus topology:

a) In this topology, no two computers can transmit data at the same time.

b) It does not cope well with heavy load which can slow down a bus considerably.

c) Performance degrades as additional computers are added.

d) Terminators are required at both ends of the cable.

Ring topology:

Ring topology is also known as circular topology. This layout is like the linear bus, except that the nodes are connected in a circle.
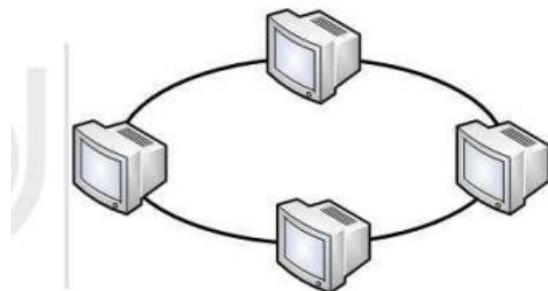
Ring topology

In this topology, each node is connected to two and only two neighboring nodes. The ring does not have an end. It is made of short segments that connect one PC to the next PC and so on Data is accepted from one of the neighboring nodes and is transmitted onwards to another node. Therefore, data travels in only direction from node to node around the rings.

Since each computer retransmits what it receives, a ring is an active network and is not subject to signal loss problems. There is no termination because there is no end to the ring.

This type of topology can be found in peer-to-peer networks, in which each machine manages both information processing and the distribution of data files. An example of ring topology is IBM Token Ring.

Advantages of ring topology:

 a) It is an orderly network where every device has access to the token (control signal) and the opportunity to transmit – because every computer is given equal access to the token, no computer can monopolize the network.

b) Data flows in one direction. This reduces the chance of packet collision.

c) It can create much larger network using Token Ring.

d) It does not require network server to manage the connectivity between the computers.

e) It has the ability to send data at high speeds.

Disadvantages of ring topology:

a) Network adapter cards and Multi Access Units used in this topology are much more expensive than Ethernet cards and hubs used in bus topology.

b) It is much slower than an Ethernet network under normal load.

c) If one workstation gets failure, the entire network will be impacted.

d) It is difficult to troubleshoot.

e) One malfunctioning node or bad port in the Multi Access Units can create problems for the entire network

(b) Differentiate between the following : 6

(i) Desktop Computer versus Mainframe Computer

Ans:

Desktop computer (Personal computer)	Mainframe computer
Desktop computers are smaller, less powerful computers that are used for personal tasks such as word processing, internet browsing and gaming.	Mainframe computers are large, powerful computers that are used for large-scale tasks such as data processing and scientific computing.

They are cheaper than mainframe computers.	They are more expensive than desktop computers.
They offer less processing power and storage space.	They offer more processing power and storage space.
Personal computers are easier to customize than mainframe computers.	Mainframe computers are more difficult to customize than desktop computers.
Desktop computers are less secure when compared to mainframe computers.	They are more secure than desktop computers.
Personal computers are less accessible than mainframe computers.	Mainframe computers are more accessible than personal computers.

(ii) Impact printers versus non - impact printers

Ans:

Impact printers	Non-impact printers
Impact printers create pictures and figures by hitting a device such as a wheel or a print hammer against an inked ribbon.	A non-Impact printer uses chemical, heat or electrical signals to produce symbols on paper.
They produce high level noise as they have many moving parts.	They have a low level of noise.
The print quality of such printers is lower.	The print quality of non-impact printers is higher.
They require continuous paper sheets for printing.	They require individual sheets of paper for printing.
Dot-matrix printers, daisy wheel printers, line printers are examples.	Inkjet printers, photo printers, laser printers are examples.
They are not suitable for printing photographs or any high-quality media.	They are best suited for printing photographs or any high-quality media.

(iii) Open source software versus proprietary software

Ans:

Open Source Software	Proprietary software
It refers to a program in which the source code is available to the general public and also provides rights for use and/or modification from its original design free of charge.	Proprietary software refers to any computer software where the source code is publicly not available, only the company which has created can modify it.
In Open source software the source code is public.	In proprietary software the source code is protected. Only the people who created the software and those who have

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	purchased a license to use it are able to use the proprietary software.
Open source software is mostly free of cost.	Users must have to pay for proprietary software.
Open source is adaptable i.e., it can be used, modified and distributed by anybody.	It is less adaptable because there are constraints placed on how it can be used.
Open collaborative environment is used in the development of open source software.	It is not intended for open collaboration.
The access to open source software is unrestricted.	The access to proprietary software is restricted.
It lacks professional product support.	It has a reliable, professional support and training.
Erratic updates	Regularly and easily updated.
It is managed by an open-source community of developers.	It is managed by an individual or by the organization that developed it.
Highly customizable due to open access to the code.	Limited customization options as the source code is not accessible.
Examples of Open source software: Android, Firefox	Examples of Proprietary software: Windows, Microsoft

(c) What is motherboard ? Briefly explain different parts of a motherboard. 5

Ans: Motherboard is a main component placed inside the computer case. Motherboard holds some of the most important component of the computer system. It is also known as system board, main board etc. The motherboard serves as a single platform to connect all of the parts of a computer together. It can be considered as the backbone of the computer.

In a typical computer microprocessor, main memory and other components are connected to the motherboard.

It acts a s a base for other components. Motherboard also provides connectors for several other devices. A motherboard allows many different parts of our computer to receive power and communicate with one another. The shape , size and layout of a motherboard is called a form factor. The Motherboards usually provides the interface between the CPU memory and input/output peripheral circuits, main memory, and facilities for initial setup of the computer immediately after power-on.

The below is a brief description about some parts of a motherboard:

a) ATX Power Connector: Advanced Technology Extended (ATX) power connector is used to connect computer's power supply to motherboard.

b) AGP Slot: Accelerated Graphics Ports (AGP) is a point-to point channel which is used to attach a video card to a motherboard.

c) CD-in header: At this CD drive is plugged in or connected .

d) FDD Header: Floppy Disk Drive (FDD) header is used for Floppy drive. Now this slot is obsolete because floppy disks are outdated.

e) HDD Headers: Hard Disk Drive header is used for connecting to hard disk .

f) PCI Slots: It is used for connecting the PCI (Peripheral component interconnect) card.

g) USB Headers: It is a group of pins to which an internal USB cable can be attached to provide extra USB ports. These ports are used for attaching external/auxiliary devices such as pen drive, printer etc.

5.

(a) Computer Virus

Ans: Computer Virus: It is a small software program that is designed to enter a computer without users permission or knowledge, to interfere with computer operation and to spread from one computer to another. A computer virus needs to attach itself to a document or program to infect other computers or programs.

Some viruses do little but replicate while others can cause severe harm or adversely effect program and performance of the system. They can destroy files, software, program applications, and cause the loss of data.

There are various types of computer virus that can be classified by their origins, techniques of attack, modes of spreading, forms of infections, hiding locations and the kind of damage caused. Examples of computer viruses are: Randex, Melissa.A and Trj.Reboot.

(b) Network Interface Card

Ans: A network interface card (NIC) is an essential component of any computer that connects it to the network. It is a hardware component without which a computer cannot be connected over a network. It is also known as network interface controller, network adapter or LAN adapter. It provides the physical connection between the network and the computer. Most NICs are internal, with the card fitting into an expansion slot inside the computer. Network interface cards are a major factor in determining the speed and performance of a network.

NIC allows both wired and wireless communications. NIC is both a physical lar and a data link layer device.

The most common network interface connection today is Ethernet cards. Ethernet cards Ethernet cards that contain connections for twisted pair cables have a RJ-45 connection. The Ethernet card is sometimes also called as network adapter card. Each for the Ethernet card is identified by a unique number called the Media Access Control (MAC) address.

Advantages of NIC:

- It provides a secure, faster and more reliable connection.
- It allows us to share bulk data among many users.
- Communication speed is high.
- NICs are not expensive.
- They can be easily upgraded or replaced if needed.

Disadvantages of NIC:

- It needs a proper configuration to work efficiently.
- It is inconvenient compared to the wireless card.
- It may require regular maintenance.
- When several NICs are installed in a system, NICs can use a lot of electricity.

(c) Wide Area Network (WAN)

Ans: Wide Area Network is a network system connecting cities, countries or continents, a network that uses routers and public communications links. The largest and most well-known example of a WAN is the Internet.

WANs are used to connect LANs and other types of networks together, so that users and computers in one location can communicate with users and computers in other locations. Many WANs are built for one particular organization and are private.

WANs are often built using leased lines. At each end of the leased line, a router connects to the LAN on one side and a hub within the WAN on the other. Leased lines can be very expensive. Instead of using leased lines, WANs can also be built around public network or Internet.

PSN = Packet switching node (router)

Local Area Network
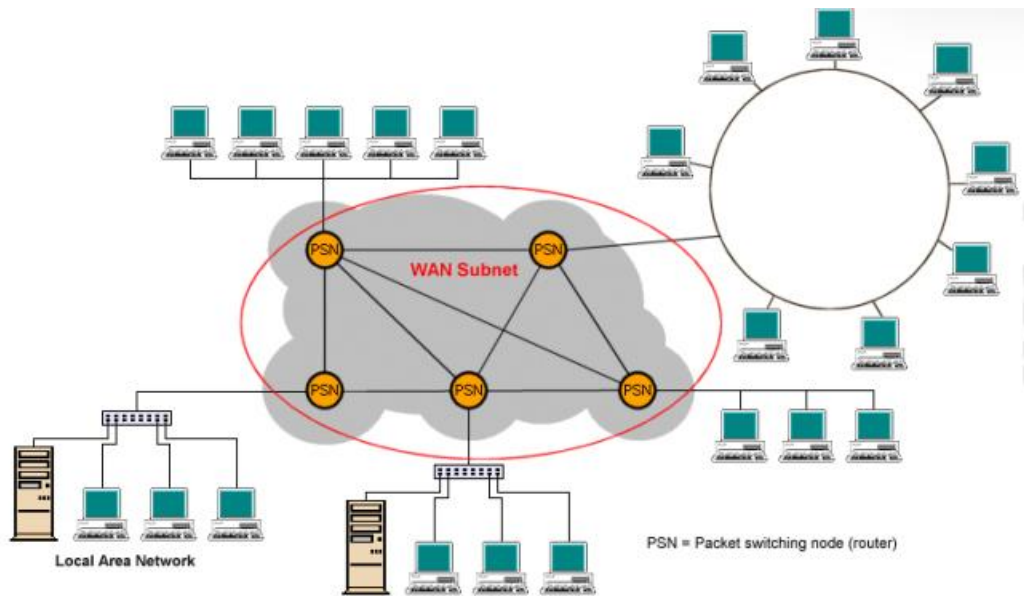
Characteristics of WAN:

1) It generally covers large distances (states, countries, continents).

2) Communication medium used are satellite, public telephone networks which are connected by routers.

3) Routers forward packets from one to another on a route from the sender to the receiver.

Advantages of WAN:

1) Since WANs have a wider coverage area than LANs and MANs, their bandwidth is also higher than other networks.

2) Large area coverage: WAN covers a large geographical area(1000km or more than).

3) Higher bandwidth: WAN networks usually cover large geographical areas.

(d) Guided Transmission Channels

Ans: Guided transmission medium is also known as wired or bounded transmission medium. Guided media provide a physical connection between two devices. Signals being transmitted are directed and confined in a narrow pathway by using physical links. The signal energy propagates through wires in guided media. It is used for point-to-point communication. It provides us with features like higher speeds, and better security and is used preferably for comparatively shorter distances. It is a cost-effective transmission

medium. By adding more wires, the transmission capacity can be increased in guided media. This type of transmission medium is less susceptible to interference.

There are 3 types of Guided transmission Media:

1. Twisted Pair Cable

2. Coaxial cable

3. Fiber optic Cable

Twisted pair cable: Twisted pair cable is still the most common transmission media. Twisted pair is a physical media made up of a pair of copper cables twisted with each other. Each conductor has its own plastic insulation typically 1 mm thick. Twisting is done to reduce crosstalk. Twisted Pairs are very effective for relatively short distances. The performance of the twisted pair can be substantially improved by adding a metallic shield around the wires. Shielded wires are much more resistant to thermal noise and crosstalk effects.


Twisted Pair Cable

Fiber Optic Cable: An optical fiber consists of two concentric cylinders: an inner core surrounded by a cladding. Both the core and the cladding are made of transparent plastic or glass material. It transmit signals in the form of light. Optical fiber use reflections to guide light through a channel. The density of the core and cladding must differ sufficiently to reflect the beam of light instead of refracting.

The core is used for guiding a light beam, whereas the cladding (which has a different refractive index) acts as a reflector to prevent the light signal instead of electrons, it does not suffer from the various noise problems associated with electromagnetic signals. The signal is usually generated by a laser or Light Emitting Diode (LED).

They are being increasingly used as telecommunication carriers for long distance digital trunk lines.

Optical Fiber Cable
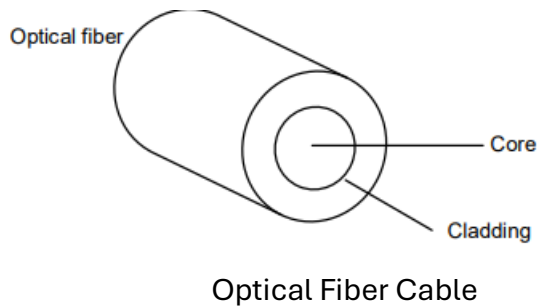
(e) Any two source data entry devices

Ans:

Barcode Reader: A barcode reader is an electronic device which is used to read printed barcodes. Barcodes represent alphanumeric data which is a combination of vertical lines (bars) that vary in width and length. It is a fast and effective way to input data. A Barcode reader uses a laser beam to read the series of thick and thin lines which represent the bar code number.

A bar code reader is an optical hardware input device that is used to read the information from the barcode posted on the product and decode the information in a human-readable format. It is also used to upload the details of the product in the database.

The bar code is 13 digits long and it has four main divisions. The First two digits of a bar code represent the country, the second part represents the manufacturer's code (five digits) the third part represents the product code (five digits) and the last digit is a check digit.

An example of a barcode reader is a supermarket barcode scanner that reads and logs the price of a product.

Digital Camera: A Digital camera is an electronic device which takes video or still photographs or both, digitally by recording images via an electronic image sensor. Digital cameras can e display images on screen immediately after they are recorded.

Images recorded on a digital camera can be cropped for editing, deleted and various types of special effects can be created by using Photoshop software.

Digital cameras look like ordinary cameras but have sufficient memory in the form of chips to store thousands of images, rather than using photographic films. Most digital cameras allow users to choose the resolution needed for a picture. Most of those can connect directly to a computer to transfer data. A USB port is generally used for this purpose. A Wireless connection can also be used for connecting to a computer via Bluetooth.

The joint photographing expert's group standard (JPEG) is the most common file format used for storing data in a camera. Other formats include raw image format, DNG format etc.

(f) File Management in Operating System.

Ans: File Management: A file is a collection of related information. A file may be organized internally into records or it may simply be a stream of bytes. A file system is organized into directories for efficient or easy navigation and usage. The file management system provides and maintains the mapping between a file logical storage needs and the physical location where it is stored. Users and programs simply access the files by the name, and the file management system handles the details. The file management system identifies and manipulates files by the names provided by their users determines the physical requirements of the file, allocate space for it, stores it in that space, and maintains the information about the file so that it may be retrieved partially or in full, later. The file management system keeps track of the available space on each device connected to the system. The user and the user's program need not be aware of the underlying physical storage issues. The file management system allows the retrieval and storage of files by name, keeps track of the mappings, allocates and frees space, allows the mounting and unmounting of file structures, and provides other functions required to maintain the structures of the file system.

- Directory structures for each I/O device in the system and tools to access and move around these structures. The directory structure provisions are made to move easily from one structure to another.
- It also protects files and limit file access to authorized users.

File management systems are particularly important in systems in which secondary storage devices are shared in common by multiple users, since they provide a directory system that assures that there is no duplicate use of physical storage.