BCS-011 : COMPUTER BASICS AND PC SOFTWARE

December 2014

1.

(a) What is a computer system ? Explain Von-Neumann architecture of computer systems with the help of a diagram. 7

Ans: Computer system: It is a set of integrated devices that input, output, process and store data and information.

Different definitions for computer are:

- It's an electronic device that receives input, stores and manipulates data and provides output in a useful format.
- It’s an electronic device which converts data into information.
- It’s an electronic device that operates under the control of instructions (called PROGRAM) stored in its own memory.

They are used as tools in every part of society. Computers nowadays are complex; there are a lot different components inside them and they all serve different purposes. It consists of two main components :

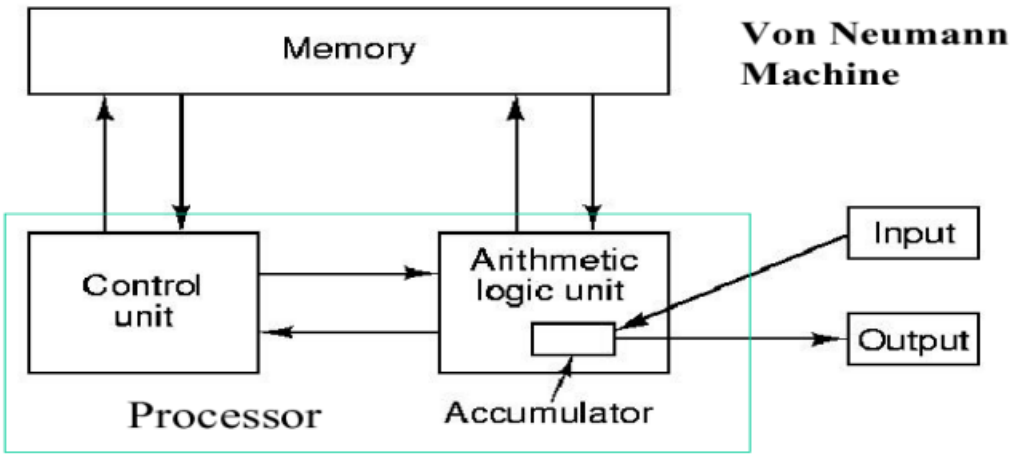
- Hardware
- Software

These two components together make up a computer system.

Von- Neuman architecture:

Von-Neuman architecture was first conceived by John von Neumann in 1945. It is based on the stored-program concept, where instruction and data both are stored in the memory. It is a design model for the modern computers which has central processing unit (CPU) and the concept of memory used for storing both data and instructions.

Based on Von Neumann Architecture, the basic components of a computer are : memory, an I/O system, arithmetic logic unit (ALU) and control unit (CU).



Memory: It is an important component of a computer where all the data and information are stored in the form of binary digits. Computer systems use a variety of devices for storing instructions and data. The computer memory is the place where the computer holds data and programs that are in use. Computer memory refers to the physical devices in a computer. Two major types of memories are used in computer systems:

1. RAM (Random Access Memory)
2. ROM (Read Only Memory)

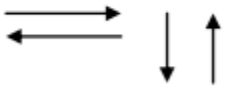
I/o system: Under the control of CPU input instructions, the programme or the data is read into the main memory from the secondary storage or the input device. The data from a computer is output using output devices. If some results are evaluated by the computer and it is stored in the computer, then with the help of output devices, we can present them to the user.

Arithmetic Logic Unit (ALU): The ALU is an important component which carry the actual extension of the instructions. The processing of the data and instruction are performed by the ALU. The Arithmetic and Logic Unit performs the required micro-operations for executing the instructions. ALU allows arithmetic (add, subtract, divide, multiply) and logical operations (AND, OR, NOT etc.) operations to be carried out.

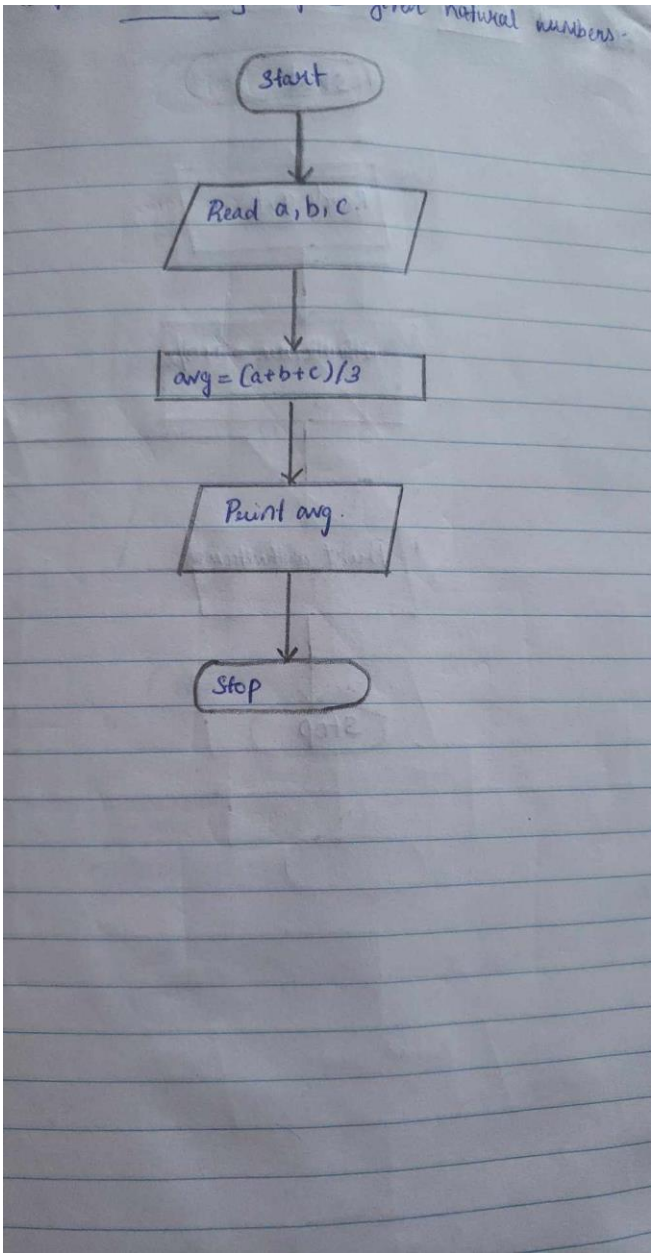
Control Unit: The control unit controls the operation of the computer's ALU, memory and input/output devices. The control unit consists of a program counter that contains the address of the instructions to be fetched and an instruction register into which instructions are fetched from memory for execution. It also provides the timing and control signals required by other computer components. The control unit determines the sequence in which computer programs and instructions are executed.

(b) What is a flow chart ? Draw a flow chart to find the average of three given natural numbers. 7

Ans: A flowchart is a graphical representation of an algorithm. It is a type of diagram that represents a workflow or process. A programmer refers to a flowchart for writing the program which describes what operations are to be carried out and in what sequence to solve a problem.

Terminal	Start, End	
Computational or processing	Process	
Input/Output Operation	Input-Output	
Decision making or Branching	Decision	
Flow Lines	Flow Direction	
Joining of two parts	Connector	

Flowchart to find average of three numbers:



(c) What is open source software ? Explain open source development model. 7

Ans: Open Source Software is a computer software which is available along with the source code and software license that permits the code to be studied, modified and improved. It is often developed in public and collaborative manner. Open source development, follows the model of the bazaar. In an open source development model, roles are not clearly defined. The best features and functionality evolve into popular use much as good ideas evolve into popular use in the marketplace of ideas. Development is a collaborative process, resources are not scarce, and no one person or organization directs

the project. The users are treated like co-developers and so they should have access to the source code of the software.

There are two competing definitions.

The Free software definition is based on the following four freedoms:

1. The freedom to run the program, for any purpose.

2. The freedom to study how the program works, and adapt it to your needs.

3. The freedom to redistribute copies so you can help your neighbor.

4. The freedom to improve the program, and release your improvements to the public, so that the whole community benefits.

The other definition is the Open source definition promulgated by OSI. This broader definition includes permissive software licenses.

The elements are:

- Free redistribution
- Source code available
- Derivative works permitted
- Integrity of the author's source
- No discrimination against persons or groups
- No discrimination against fields of endeavor
- Distribution of license with derivative works
- License must not be specific to a product
- License must not restrict use of other software
- License must be Technological-natural

Open Source Development Model:

The Open source development model is a collaborative model. It anticipates the participation of many developers in the development of a single product or module. In an open source development model, roles are not clearly defined.

The Open source software development model supports all aspects of various processes like defining requirements, system- level design, detailed design, implementation, integration, field testing, and support in order to produce high quality products implementing client requirements.

Main features of open source development model are:

Features of open source development model are:

* Users should be treated as co-developers. The users are treated like co-developers and so they should have access to the source code of the software.

* Early releases The first version of the software should be released as early as possible so as to increase one's chances of finding co-developers early.

* High modularization: The general structure of the software should be modular allowing for parallel development on independent components.

* Several versions: There should be at least two versions of the software. There should be a buggier version with more features and a more stable version with fewer features. The buggy version (also called the development version) is for users who want the immediate use of the latest features and are willing to accept the risk of using code that is not yet thoroughly tested. The users can then act as co-developers, reporting bugs and providing bug fixes.

* Dynamic decision making structure There is a need for a decision making structure, whether formal or informal, that makes strategic decisions depending on changing user requirements and other factors.

(d) What is software project management ? Explain the following with respect to software project management : 3

(i) Scheduling

(ii) Timesheet Management

(i) Scheduling

Ans: Project Management is the art and science of planning and leading software projects. It is a sub-discipline of project management in which software projects are planned, monitored and controlled. It is the organized approach of planning, exciting, monitoring and closing projects.

The purpose of project planning is to identify the scope of the project, estimate the work involved and create a project schedule. Project planning begins with requirements that define the software to be developed. The project plan is then developed to describe the tasks that will lead to completion.

The purpose of project monitoring and control is to keep the team and management up to date on the project's progress. If the project deviates from the plan, then the project manager can take action to correct the problem. Project monitoring and control involves

status meetings to gather status from the team. When changes need to be made, change control is used to keep the products up to date.

Key project management responsibilities include creating clear and attainable project objectives, building the project requirements, and managing the triple constraint for projects, which is cost, time, and scope.

(i) Scheduling: One of the most common purposes is to schedule a series of events or tasks. The complexity of this schedule can vary considerably depending on how the tool is used. Some common challenges include:

1. Events which depend on one another in different ways

2. Scheduling team members tasks along with the resources required by them commonly termed resource scheduling.

3. Dealing with uncertainties in the estimates of the duration of each task.

(ii) Timesheet Management

Ans: A good timesheet management system is essential both for the customer projects as well as internal activities within the organization. Timesheets not only help the Project Manager in managing the project in a better manner but is also useful for maintaining employee records for payroll calculations as well as helps in improving the overall productivity of the organization.

A timesheet is a record of the number of hours an employee spends in completing a certain task. This task could be associated with a customer project or with internal business activities. The timesheet not only provides the number of actual hours that the employee may have spend on the task but also mentions details of the task involved and the kind of operations that the task involved completing. Another benefit of a good timesheet management system is that it can help management track the efficiency of employees and find ways in which they can improve the productivity in various areas.

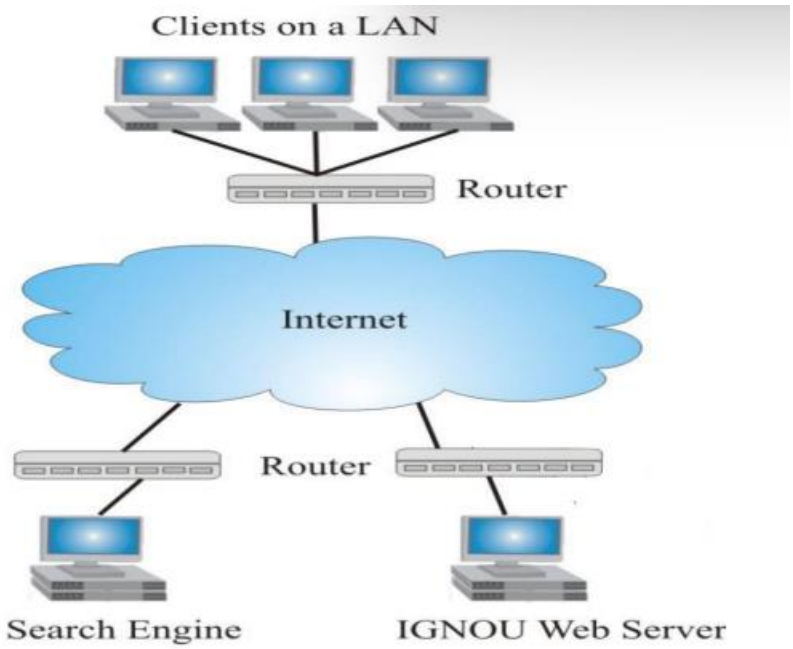
Timesheet management systems can also help employees evaluate their own performances and understand how they can perform their tasks better.

(e) What is Internet ? Explain the basic structure of Internet with the help of a diagram. 7

Ans: Internet is an interconnection of thousands of networks. It is a global network that connects billions of computers across the world with each other. One of the major applications of the Internet is the World Wide Web (WWW). The Internet is a collection of various services, tools, applications and resources. Some of the popular services on the internet are – browsing, searching, e-mail, chat, e-learning and lots more. Internet is the

fastest mean of sending or exchanging information and data between computers across the world. Several activities can be performed if you have access to the Internet; like you can use it for learning or teaching, you can be part of an online distributed project, you can use it for publicity and advertisement, for booking railway or air tickets, for shopping etc.

Structure of Internet:



Internet is a global connection of networks. The Internet is basically built up of multiple smaller networks called the subnets. Each computer systems on a subnet must have a unique address. All these subnets are connected with network devices called routers, and each subnet may also contain its own subnets.

One may be able to connect to any of the search engines that allows you to locate information on Internet or any of the web servers like IGNOU web server through many alternative routes. A client may be a part of LAN, WAN or wireless network. . This basic communication protocol on Internet is the Transmission Control Protocol/ Internet Protocol (TCP/IP). This protocol ensures reliable delivery of information from one source identified by a unique IP address to a destination also identified by a unique IP address.

To connect to a physical network, all devices irrespective of being wired or wireless uses an interface card. An interface card may have its own unique physical address.

One cannot locate a device just by its unique physical address, as these addresses do not provide any indication about the location of the device. Thus, you require a protocol that uniquely identifies a device on the Internet and Internet protocol version 6 (IPV6).

TCP and IP (TCP/IP) are the two core protocols of the Internet Protocol suite. The TCP primarily provides the reliable delivery of stream of bytes from a computer or a program to another computer or a program. It breaks the data stream into packets at the source and makes sure that all the packets are assembled orderly at the destination. The IP protocol on the other hand identifies the location of source and the destination. Any computer on Internet is identified by its unique IP address.

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.

(f) What is social networking? Briefly explain its advantages and disadvantages. 6

Ans: A social network is a network of individuals which have some sort of interdependence on each other. This interdependence may be in the form of friendship, kinship, common causes and so on. A Social networking service may be offered through a web site on the Internet. Some of the popular social networking services are – Orkut, Facebook, Twitter, Linkedln, MySpace, Friend Finder, Yahoo! 360, Classmates and many more.

We need to register to a social networking service to use it.

Features provided by these services are:

- Creation of a profile page of your own informing others about the information that you would like to share about you.
- Viewing of profile pages of others.
- Creating your own network of friends.
- Searching online friends.
- Putting your albums online for your friends.
- Sharing your thoughts and experiences.
- Sharing of audio and video may be through youTube – a popular website where you can put your videos for general public viewership.

Social networking is a new way for information and knowledge sharing. It helps in generating large scale public response to emergency situations that may occur during disaster.

Social networking sometimes can be unsafe. We should not put any confidential information on such sites.

Some basic security policies for such sites are:

- Do not share your account related information such as username and password.
- Always scan your computer for viruses and spyware.

- Do not add strangers as your friends about whom you are not sure about his/her identity.
- Always make sure to sign out once you have done your intended activities
- Restrict the individuals who may see your profile.
- Do not use bad or aggressive vocabulary on such web sites.
- Do not allow people to use such sites for unlawful purposes.

Advantages of Social networking:

- One of the most important benefits of social networking is connecting people worldwide.
- Networking allows us to stay in touch with one another irrespective of the location.
- Your advertising expense can be significantly decreased by using social networking for marketing.
- They have the added benefit of reaching a larger audience. Users can easily share news, updates, and important information with a wide audience quickly and efficiently.
- Many social networking sites incorporate an instant messaging feature, which means you can exchange information in real-time via a chat.
- It provides a platform for businesses to interact directly with customers, addressing inquiries, providing support, and gathering feedback.

Disadvantages of Social networking:

- Social networking sometimes can be potentially unsafe. You are advised not to put any confidential information about you on such sites.
- They reduce or eliminate face-to-face socialization.
- It can become addictive if you are constantly glancing at your posts to see who commented or shared your content.
- It can distract users from real-life activities, and negatively impact mental health.

2.

(a) What is URL ? Explain the parts of a URL with the help of an example. 7

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.

(b) What is ASCII ? Explain how Unicode is different from ASCII. 6

Ans: ASCII stands for American Standard Code for Information Interchange. ASCII is an alphanumeric code used for representing numbers, alphabets, punctuation symbols and other control characters. It is a seven-bit code that is used to identify key press on the keyboard. ASCII codes represent text in computers, communications equipment, and other devices that use text. ASCII is used for representing 128 English characters in the form of numbers, with each letter being assigned to a specific number between 0 and 127. Most computers use ASCII encoding scheme that makes the data exchange much easier.

For example:

ASCII for A: 65

ASCII for B: 66

ASCII vs Unicode:

- ASCII is an alphanumeric code used for representing numbers, alphabets, punctuation symbols and other control characters. Whereas Unicode is a

computing industry standard for the consistent encoding, representation and handling of text expressed in most of the world's writing systems.

- ASCII can only be used to encode characters in the English language, making it impractical for languages that use different alphabets and characters, such as Hebrew, Arabic etc. Unicode was introduced to address the limitations of ASCII. It provides a standardized, universal character set that covers various characters in different languages such as Hebrew, Chinese etc.
- ASCII supports only 128 characters using 7-bit encoding scheme. On the other hand, UNICODE supports a wide range of characters. It encodes 154 written scripts.
- ASCII consumes less memory as compared to Unicode.

(c) What is a motherboard ? List and briefly explain any five parts of a motherboard. 7

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.

3.

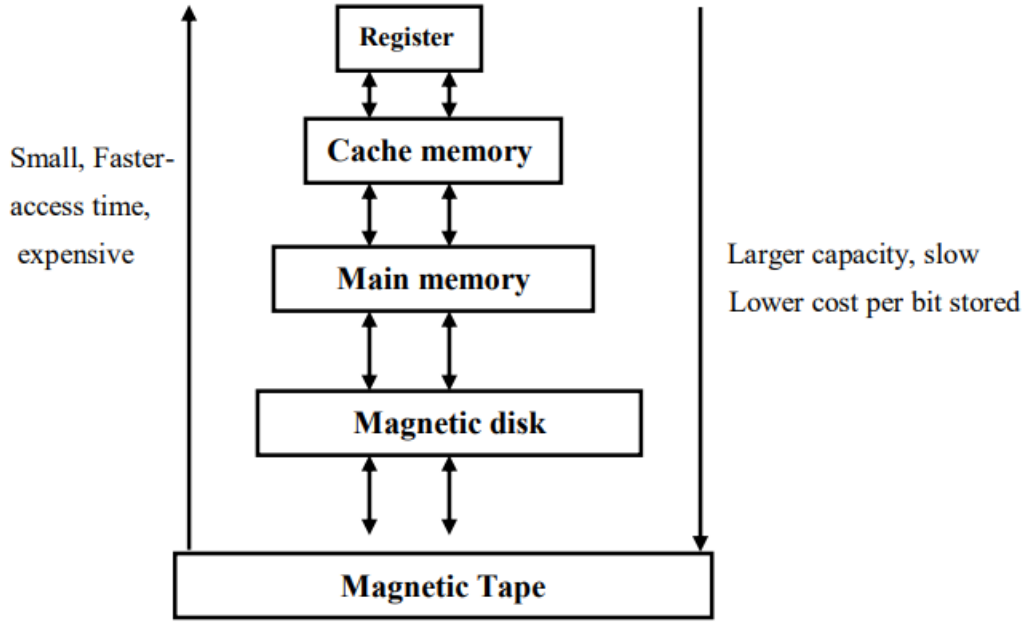
(a) What is the need of memory hierarchy in computer systems ? Compare magnetic memory with semiconductor memory in terms of speed and cost. 6

Ans:

Most computer systems make use of a hierarchy of memory technologies, this hierarchy is known as the memory hierarchy. Memory hierarchy helps in organizing the memory in a way that it can minimize the access time. The memory hierarchy in OS is an essential concept in computer science.

The overall goal of Memory Hierarchy is to obtain the highest possible access speed while minimizing the total cost of the memory system.

A computer system uses a variety of devices for storing the instructions and data. A storage devices (or units) may vary according to the access time, storage capacity, and cost-per-bit of storage. CPU registers hold the most frequently used data. Small, fast cache memories nearby the CPU act as staging areas for a subset of the data and instructions stored in the relatively slow main memory. The main memory stages data stored on large, slow disks, which in turn often serve as staging areas for data stored on the disks or tapes of other machines connected by networks.



Memory hierarchy

As we move up the storage hierarchy we have faster access time, less capacity and higher cost per bit stored. When we move down, we have a larger storage capacity, slower access time and lower cost per bit stored.

Thus, CPU storage components generally have the fastest access time, the smallest storage capacity and the highest cost per bit stored. The cache memory which is placed in between the CPU and the main memory is a very high speed semiconductor memory used to enhance the speed of main memory. The main (primary) memory falls next in the memory hierarchy list. Secondary storage media such as hard-disk/magnetic disk memories make up the level of hierarchy just below the main memory. Secondary storage devices are at the bottom of the memory hierarchy. Secondary storage devices such as magnetic tapes are used for archival storage. They are very cost effective and so are used for mass storage of data, when fast access time is not required.

Need for Memory hierarchy based on access time and cost balance: The main reason for using a memory hierarchy is to balance access time and cost. Less access time means more cost. Like registers are the smallest of all, their access time (time to fetch the data) will be faster, and their cost will be expensive. In the same way, secondary memory is the largest, so the access time will be more, but the cost will be less than other memories. In a nutshell, as the size increase, the access time also increases but the cost decreases.

Need for memory hierarchy based on Speed of communication: The CPU is responsible for fetching instructions, executing them, storing data, and controlling all other devices in the computer system. The speed at which the CPU can process data and execute instructions is much higher than the input rate of data from a hard disk. To solve this, computer system designers came up with a mechanism called a memory hierarchy that allows the CPU to get instructions and data from fast memory like registers and cache and process them at a higher speed so that the CPU can keep up with the data rate.

Memory hierarchy based on capacity: It is the volume of information the memory can store. As we move from top to bottom in the hierarchy, the capacity increases.

Performance: Increases when users need to access lower memory hierarchy levels less frequently. Without the memory hierarchy, a speed gap exists between the main memory and CPU registers.

Magnetic memory vs semiconductor memory:

Based on speed:

Semiconductor memory, such as RAM is faster than magnetic memory like hard disk drives. Semiconductor memory allows for quick access to data because of its electronic nature and lack of moving parts, resulting in faster read and write speeds.

Magnetic memory devices use physical movement of components like spinning disks in HDDS which can introduce latency in data access, making them relatively slower compared to semiconductor memory.

Based on cost:

Semiconductor memory is more expensive than magnetic memory on a per-unit basis. The manufacturing process for semiconductor involves intricate technologies and material, leading to higher production costs.

Magnetic memory such as HDDs are more cost effective on the basis of storage capacity per dollar. Asa a result, magnetic memory is commonly used for high-capacity storage needs where cost efficiency is a priority, while semiconductor memory is favored for high-speed, low latency applications despite its higher cost.

(b) What are malwares ? Explain any three malwares, in brief, with the help of an example of each. 7

Ans: Perverse Software is also known as Malicious software or malware. Perverse software is a program which causes hindrances in other programs execution in such a way resulting in modification or complete destruction of data without the user's intention or even sabotaging the operational system. It is a type of software that is designed to secretly

access a computer system, without the owner‘s consent, and damage the system. The impact can be as damaging as shutting down a business, pulling down computer network or significantly impacting regular use of individual computer systems etc. The damage done can vary from something as little as changing the author's name in a document to full control of one‘s machine without the ability to easily find out.

It is a type of software that is designed to secretly access a computer system, without the owner‘s consent, and damage the system. The impact can be as damaging as shutting down a business, pulling down computer network or significantly impacting regular use of individual computer systems etc. The damage done can vary from something as little as changing the author's name in a document to full control of one‘s machine without the ability to easily find out.

These are destructive software meant for damaging the data or applications by some anti-social elements and enter in the system without the consent of the owner. Malware can harm the system badly by damaging the useful data and application software, even it does not spare the operating system of the computer.

Early infectious programs, such as Internet Worm and MS DOS viruses, were written as experiments and were largely harmless or at most annoying. With the spread of broadband Internet access, malicious software has been designed for a profit, for forced advertising.

Typical types of malicious software are - Computer virus, Computer Worm, Trojan horse, Rootkits, Spyware etc.

1. 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. 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.

2. Keystroke loggers: This is a program, once installed on the system, which intercepts the keys when entering the password or the Credit Card number while shopping online. This can be used for Credit Card fraud.

3. Spyware : These programs gather information about the user in a concealed manner, show pop-up advertisements, redirects the search engine results to paid advertisements etc.

(c) What is a Compiler ? How is it different from Interpreter ? List any two high level languages, that use a Compiler. 7

Ans: A language processor that converts a program written in high-level language into machine language, entire program at once, is called a compiler. Compilers produce better optimized code that generally runs faster, and compiled code is self-sufficient and can be run on their intended platforms without the compiler present.

A compiler scans whole program and then check it for syntactic and semantic error, once the code is checked for errors, it is converted into an object code. Then, it can be processed by the machine to perform the corresponding task. The common programming languages that use compilers are C, C++, C#, etc..

Compiler vs Interpreter:

Compiler	Interpreter
A language processor that converts a program written in high-level language into machine language.	A language translator that converts a high-level language program into a machine language program.
Compilers scan the entire program in one go.	The program is interpreted/translated one line at a time.
Input of a compiler is a high-level language code (called source code), while its output is a machine language code (called object code).	Interpreters convert the source code into machine code during the execution of the program.
Compilers convert the source code to object code.	Interpreters do not convert the source code into object code.
As and when scanning is performed, all the errors are shown in the end together, not line by line.	One line of code is scanned, and errors encountered are shown.
The execution time of compiler is less, and hence it is preferred.	It is not preferred due to its slow speed. Usually, interpreter is slow, and hence takes more time to execute the object code.
Compiler are larger in size.	Interpreters are smaller in size.
Compilers are not flexible.	Interpreters are relatively flexible.
Compilers are more efficiently.	Interpreters are less efficient.
The common programming languages that compilers use are C, C++, C#, etc..	The common programming languages that use interpreters are Perl, Ruby, Python, METLAB, etc..

High level language that use a compiler:

FORTRAN, C,C++,Java

4. (a) What is a Web Browser? Explain how a Web Browser works. Also, explain the types of Web Browsers. 8

Ans: A Web browser is a software application that enables you to find, retrieve, and display information available on the World Wide Web (WWW). A web browser takes you anywhere on the internet. It retrieves information from other parts of the web and displays it on your desktop or mobile device. It provides an interface between the server and the client and it requests to the server for web documents and services.

Browser also allows you to traverse information resources on the WWW. A web browser converts the HTML tags and their content into a formatted display of information. The information on the Web is organized and formatted using tags of a Markup language called Hypertext Markup Language or HTML. A web browser allows you to see the rich web contents from a website.

Some of the popular web browsers are - Internet Explorer, Mozilla Firefox, Apple Safari, Google Chrome, and Opera.

Working of a web browser:

A web browser takes you anywhere on the internet. It retrieves information from other parts of the web and displays it on your desktop or mobile device. The information is transferred using the Hypertext Transfer Protocol, which defines how text, images and video are transmitted on the web. This information needs to be shared and displayed in a consistent format so that people using any browser, anywhere in the world can see the information.

Internet is characterized by the Client Server Computing that consists of three basic components:

- The Web client which may be the web browser;
- The web server that services the request of the web client; and
- The network that connects the client and the servers through a network such as LAN, WAN or the Internet.

For exchanging information between the client and the server, an application level protocol Hypertext Transfer Protocol (HTTP) is used. This protocol uses the services of TCP/IP for communication of reliable information over the Internet. However, HTTP is not suitable for all kinds of applications especially that requires large amount of data transfer in real time, for example, Voice over IP (VoIP) application which requires real time transfer of voice data. For such applications, different application level protocols have been designed, for example, for VoIP a protocol named Realtime Transport protocol (RTP) has been designed. Such protocols instead of reliable TCP may run over unreliable User Datagram Protocol (UDP).

The HTTP protocol allows us to access a web page by a web client running a browser. A Web page is a document or resource of information that may be available on a Web Server.

Types of web browser:

Different types browsers are:

- Line Mode Browsers
- Graphical User Interface based Browsers
- Java enabled web browsers

Line Mode Browsers: The initial browsers were line mode text browsers. These browsers were simple and used to display text line by line. They used to provide command line interface to the user on less sophisticated computers and terminals. These browsers provided fast access to websites as they displayed only the text part. Lynx is a line mode browser.

Graphical User Interface based Browsers: These browsers run under graphic user interface systems such as Windows, Macintosh etc. A graphical browser, in addition to text can handle images, audio, video and animation. These browsers are very easy to use – You just need a point and click device like mouse. They have good display features.

Java enabled web browsers: These browsers include a Java Runtime Environment that support Java programming language. These browsers can dynamically load java applet from web server to web client. These browsers are portable, extensible and secure. The example of java enabled browser is —LOBO‖. It is open source software written completely in java.

(b) What is a programming language ? Briefly explain the following elements of a programming language : (i) Variable (ii) Data type 6

Ans:

Programming language: A programming language is a set of instructions and syntax used to create software programs. It is used to perform specific tasks. It is a way for programmers(developers) to communicate with computers. It's used to write software programs and applications, and to control and manipulate computer systems.

Examples of popular programming languages include Python, Java, C, C++ etc.

A programming language is mainly used to develop desktop applications, websites and mobile applications.

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) Data type

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.

(c) What is an operating system ? Explain the following functions of an operating system : (i) File Management (ii) Memory Management 6

Ans: An operating system is system software which may be viewed as an organized collection of software consisting of procedures for operating a computer and providing an environment for execution of programs. It acts as an interface between users and the

hardware of a computer system. Operating system is the software that manages all the computers‘ resources to optimize its performance provides common services for efficient execution of various application software and acts as an interpreter between the hardware, application programs and the user.

An operating system is essential for any computer to be useful to us. Operating systems performs basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk and controlling peripheral devices.

The basic objectives of an operating system are to make the computer system convenient to use and to utilize computer hardware in an efficient manner.

operating system is a large collection of software, which manages the resources of the computer system, such as memory, processor, file system and input/output devices. It keeps track of the status of each resource and decides which will have control over computer resources, for how long and when.

Most operating systems perform the functions given below:

* Process Management

* Memory Management

* File Management

* Security

* Command interpretations

(i) File Management

Ans: 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.

(ii) Memory Management

Memory Management: The operating system manages the Primary Memory or Main Memory. The purpose of the memory management system is to load programs into memory in such a way as to give each program loaded the memory that it requires for execution. An operating system manages the allocation and deallocation of memory to various processes and ensures that the other process does not consume the memory allocated to one process. An operating system performs the following activities for memory management:

1. It keeps track of which parts of the memory are currently being used and by which process into memory together with the space being used and also keeps track of available space.

2. It maintains one or more queues of programs waiting to be loaded into memory as space becomes available, based on such program criteria as priority and memory requirements.

5.

(i) Input Output Devices

Ans: Input and output devices allow the computer system to interact with the outside world by moving data into and out of the computer system.

Input and output devices of a computer system are the devices that connect you to computer. Input devices let you to transfer data and user command into the computer system. I/O devices are used to interact with the computer system. For example, you can

type in data by using a keyboard, or you can input data in picture form by using a scanner in computer system.

On the other hand, output devices display the result of input data or signals after processing it. Examples of these could be your computer's monitor, which displays all the programs which are running on the computer, as well as the printer, which will print out a hard copy of the information which is saved in your computer.

Input and output devices allow the computer system to interact with the outside world by moving data into and out of the computer system.

Examples of some input devices are:

* Keyboard

* Mouse

*Joystick

* Microphone

* Bar code reader

* Graphics tablet

* Pen drive

* CD/DVD

* Digital Camera

An output device is used to send data out of the system. s. Examples of some output devices are:

* Monitor

* Printer

* Plotter

* Speaker

Keyboard: It is the most common input device used for entering data and information into the computer system. This is the standard input device attached to all computers. The keyboard is a primary device for inputting text by pressing a set of keys. The layout of keyboard is just like the traditional typewriter of the type QWERTY. Keyboard devices can be classified into two types general purpose keyboards and special purpose keyboards.

General purpose keyboard are standard keyboards used with most computer system. They are called general purpose because that have enough keys to make them useful for any type of application.

Mouse : A Mouse is a handy device which can be moved on a smooth surface to cause the movement of a cursor on the screen. It is a pointing device which is used to input data and information into the computer system by pointing on it. A mouse contains a small case, held under one of the user's hands with one or more buttons. For GUI-based systems a mouse is an essential pointing-device. The cursor of the mouse moves in the same direction in which the mouse ball rolls. Different types of mouse are: mechanical mouse, optical mouse, cordless mouse.

Trackball: Trackball is a moveable ball mounted on a stationary device, which can be rotated manually by using fingers. It is also a pointing device. In a trackball, the ball is placed on the top along with buttons which can be rolled with the fingers. These are used in playing video games. Mouse and mobile phones are equipped with trackballs to navigate addresses as well as play games.

Joystick: Joystick is a remote control device for a computer which is used for playing video games to indicate the position. It has a stick that pivots on a base and is used for controlling the action in video games. The User moves a spherical ball with the help of a stick in the joystick as opposed to the trackball where fingers are used for moving the ball. Joysticks are also used for controlling machines such as cranes, trucks, underwater unmanned vehicles, flight simulators, industrial robots etc.

Plotters: A Plotter is a device that draws pictures on a page as output, after receiving a print command from the computer. It is also called a graph plotter. In plotters pens are used to draw lines on the paper, which is placed in the plotter. Plotters produce high quality diagrams on the paper and their output quality is good. Engineers, architects and planners use plotters to generate high quality, high-precision graphic output of different sizes. For several design applications such as design of layout of an aircraft, car, and architectural design of a building and in other computer-aided design applications plotter are very useful. Plotter is of two types:

- Drum Plotter
- Flat-Bed Plotter

Speaker: Computer speakers, or multimedia speakers, are external speakers, commonly equipped with a low-power internal amplifier which produces sound as output. External speakers are connected to a computer by using a plug and socket. Computer speakers range widely in quality and in price. Laptop computers have inbuilt speakers.

Microphone: A Microphone is an acoustic-to-electric transducer or sensor and is used to convert sound signals into electrical signals. It was originally invented by Emile Berliner in 1877, and allows you to record voices or sounds and place them onto computers, generally as a wave file. To connect a microphone we insert the plug of it into the back of the computer system. Integrated microphones can be found on laptops and some desktop monitors. These microphones are usually a small hole in front of the computer which when spoken into, will record your voice.

Bar Code 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. 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.

(ii) Binary Number System

Ans: A binary number system is one of the four types of number system. It is a number system that is used to represent various numbers using only two symbols "0" and "1". The word binary is derived from the word bi which means two. In the binary number system we have a base of 2. It is most popular and used in digital systems.

Each position in the Binary system is 2 times more significant than the previous position, that means numeric value of a Binary number is determined by multiplying each digit of the number by the value of the position in which the digit appears and then adding the products.

Example:

1111101

$1x2^6+1x2^5+1x2^4+1x2^3+1x2^2+0x2^1+1x2^0= 125 =$

Decimal to binary:

The number is divided by 2 and the remainder part is extracted. The quotient obtained is again divided by 2 and this process is repeated until the quotient becomes 0. Every time the remainder obtained is recorded. The set of remainders obtained, read from the bottom to top form the binary equivalent of the integer part of the number.

Operation	Quotient	Remainder
41 / 2	20	1
20 / 2	10	0
10 / 2	5	0
5 / 2	2	1
2 / 2	1	0
1 / 2	0	1

Thus (41)10 = (101001)2.

In order to convert the fraction part, it is multiplied by 2 to obtain resultant integer and fraction parts. The integer part in the resultant is extracted and the fraction part is again multiplied by 2. This multiplication process is repeated till the fraction part becomes 0 or a desired precision is achieved. The integer part of the given number (.6875) can be converted to binary as follows:

Operation	Resulting Integer part	Resulting Fraction part
0.6875 X 2	1	.3750
0.3750 X 2	0	.7500
0.7500 X 2	1	.5000
0.5000 X 2	1	.0000

The binary equivalent of fraction 0.6875 is 1011, obtained by reading the integer parts from top to down.

iii) Utility Software

Ans: Utility programs are also known as utilities. Utilities help a user for system maintenance and performing routine tasks. It basically deals with optimizing, managing, configuring and analyzing the computer system. Utilities are included with the operating systems. While application software are user and application oriented utilities software

focuses on system infrastructure. These utilities are specialized programs capable of doing a particular type of tasks. Some of the common tasks of utility software are: * Formatting of drives

*Scanning system for viruses

* Checking the free space available in a memory

*Checking the free space available in hard disk

*Searching files

*Taking backup of files

The utilities software can be categorized in following types:

- Disk Checkers
- System restore
- Disk Defragmenters
- Disk Management
- Backup
- Anti-virus
- Disk cleaners
- Network utilities
- Data compression etc.

Disk checkers: Disk Checkers are used to check the integrity of the hard disk and Pen Drive/ Flash Drive. CHKDSK is a command which is used for this purpose. This command can be used on a computer running Windows operating system. It fixes the logical file system errors found in the disk/drive. It is a command line tools which is used to check the volumes for any potential errors. This command can be used to repair the problems related to bad sectors, lost clusters, directory errors etc. We can run CHKDSK command from either My computer or windows explorer and from command prompt.

System restore: System restore roll backs system files, registry keys etc in case of system malfunction or failure, for later use. System restore is a facility available with modern windows operating system like Windows XP, Windows vista, Windows ME, Windows 7. System restore backs up system files such as .dll, .exe etc and saves it for later use. System restore helps us to restore computer's system files to an earlier state. Sometimes it happens that while installing a program or during use of any other software in the computer, there may some problem occurs and the system starts malfunctioning. One way to get rid of such type of problem is to re-install the software or drivers. But if

uninstalling the software doesn't fix the problem then we can restore the computer to an earlier date when the system was working properly. Restore points are used for this purpose which contains information related to registry settings and system information. System restore is not able to take back ups of personal files such as images, e-mails, documents etc. so if these personal files got accidentally deleted or lost it cant be restored using system restore.

Disk defragmenters: Disk defragmenter is a utility provided with windows operating system. It re-arranges the files stored on the disk so that it can occupy contiguous memory locations. This process is known as defragmentation.

It minimizes the head movements of the hard disk , in turn which reduces the time taken to read files from and write files to the disk. It increases the access speed. With this process files are stored in contiguous locations. The defragmenter reduces the fragmentation in the file systems. Fragmentation of the memory slows the performance of the system. Large number of files and some larger files contribute to fragmentation. When files are stored neatly it speeds up reading and writing to the disks. One should run defragmenter in the PC at regular intervals. It keeps the computer running quickly and efficiently.

Disk Management: Disk Management is a tool used to manage system disks and their partitions locally or remotely. With disk management utility we can perform most disk related tasks such as initialization of disks, creation of volumes, formatting volumes, etc. it allows one to create fault-tolerant disk systems. Disk management is easy to use and its user interface and wizards allow us to carry out various disk related functions very efficiently.

Data compression: It is the process of encoding, restructuring or otherwise modifying data in order to reduce its size. Data compression is the process in which information is encoded with lesser bits in compared to the original representation. Data compression is very useful, as it reduces the size of the file, so it consumes fewer resources like disk space. For this purpose, you can use zip/unzip utility.

Zipping a file creates the compressed version of the file which takes much less space than the original file. A zipped file has .zip file extension.

The main advantages of compression are reductions in storage space, data transmission time and communication bandwidth.

This can result in significant cost savings. Compressed files require significantly less storage capacity than uncompressed files, meaning a significant decrease in expenses for

storage. A compressed file also requires less time for transfer while consuming less network bandwidth. This can also help with costs and increases productivity.

(iv) Spreadsheet

Ans: A Spreadsheet is a grid made of columns and rows known as cells and is used for making tables and charts used for mathematical and statistical analysis as well as business calculations. One of the widely used spreadsheet software is MS-Excel.

Each cell on a spreadsheet can have any of the following data:

* Text or Labels

* Numbers or Constants

* Formulae which are mathematical equations to do all calculations

Each cell is designated with a name which is actually the COLUMN Name and ROW NUMBER.

Few features of spreadsheets are:

* Cells and Grinds: Spreadsheets are made up of cells organized in rows and columns. Each cell can hold data such as numbers, text, or formulas.

* Formulae and function: Spreadsheets allow users to perform calculations using formulas. Formulas can be simple addition or complex functions involving multiple cells. Spreadsheets come with built-in functions for SUM, AVERAGE and COUNT. These functions can automate data analysis and calculations. There are different categories of functions that can be incorporated in the sheets like Date & Time, Mathematical, Statistical, Logical, Text functions etc.

The different categories of functions are:

Date and Time:

MONTH - Converts a serial number to a month

NOW - Returns the serial number of the current date and time

Math and Statistical:

SUM – Adds its arguments

COUNTIF - Counts the number of cells within a range that meet the given criteria

Logical:

IF - Specifies a logical test to perform

AND - Returns TRUE if all of its arguments are TRUE

* Charts and Graphs: Spreadsheets have charting and graphing tools that allow users to create visual representations of data such as bar graphs, pie chart etc.

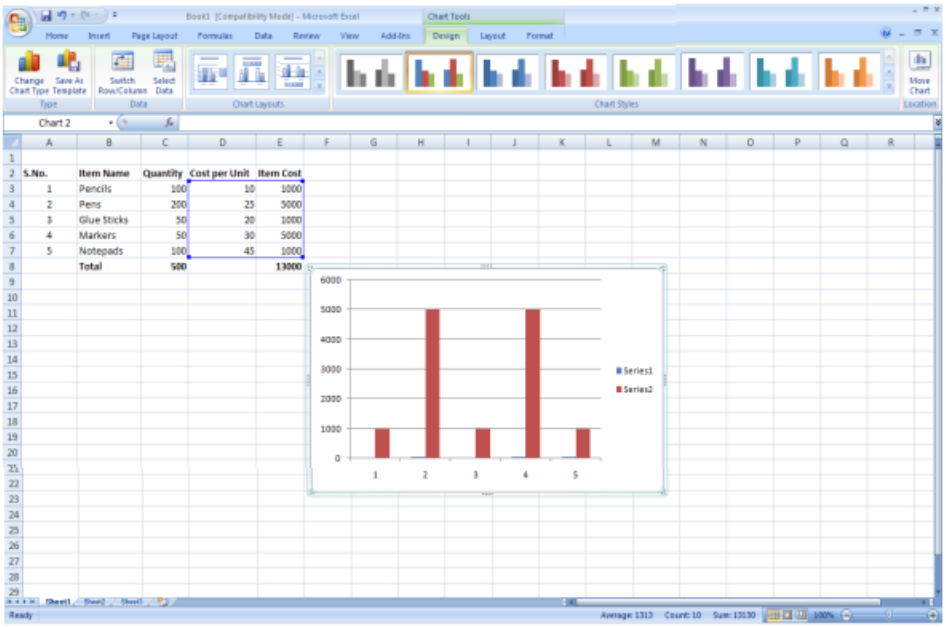
Charts and Graphs can be created based on data in the sheets. To create a chart to represent data graphically:

1. Select the data

2. Go to Insert

3. Select the chart type from the options available like Bar, Line, Pie, Scatter etc.

4. The chart will get automatically populated with the selected data on which the chart is to be based.



*Macros

A macro is a short program written using VBA that can be used to carry out a specific task. VBA is the language that Excel macros are written in. It is a programming language that is included with all of the Microsoft Office applications e.g. Word, Access, Power Point, Excel as well as others.

The Macro has to be recorded as follows:

1. Go to the Tools menu, go to —”macro” and then —”Record New Macro”

2. Assign a name to your macro if you'd like, as well as type a short description.

3. You can also assign a keyboard shortcut to it (so you can press a sequence of keys to run the macro).

4. Now click on OK. You'll be returned to Excel.

5. Simply perform the actions you want the macro to do.

6. Once you're done recording your macro, press the Stop button which should now be visible on your screen.

Once the Macro is recorded it can be executed in the following ways:

1. Run a macro by using the menu command

2. By pressing a CTRL combination shortcut key

3. Clicking a toolbar button or an area on an object, graphic, or control

4. Run a macro automatically when the workbook is opened.

(v) Object Oriented Language

Ans: Object oriented language (OOl) is a high-level language that implements objects and their associated procedures within the programming context to create software programs. The popular object-oriented languages are Java, C#, PHP, Python, C++ etc.

It is a paradigm that provides many concepts such as inheritance, data binding, polymorphism etc.

It is the most popular programming model among developers. It is well suited for programs that are large, complex and actively updated or maintained.

The OOPs concept includes the following:

* Object: It is a basic unit of Object-Oriented Programming and represents the real-life entities. An object is a real-world entity that has attributes, behavior and properties. It is referred to as an instance of the class. It occupies space in the memory.

* Class: A class is a blueprint or template of an object. It is a user-defined data type. Inside a class, we define variables, constants, member functions and other functionality. It binds data and functions together in a single unit.

* Inheritance: It is an important pillar of OOP. It is the process by which a new class is created using an existing class. It is a way to compartmentalize and reuse code since it

allows classes to inherit commonly used state and behavior from other classes. The new classes are called the derived classed and the main class is called the parent class.

* Data Abstraction: It is one of the most essential and important features of object-oriented programming. Data abstraction refers to providing only essential information about the data to the outside world, hiding the background details or implementations.

Encapsulation: is a mechanism through which a protective wrapper is created to hide the implementation details of the object and the only thing that remains externally visible is the interface of the object. (i.e.: the set of all messages the object can respond to). Encapsulation prevents code and data from being arbitrarily accessed by other code defined outside the wrapper.

* Polymorphism: Polymorphism is the characteristic of being able to assign a different meaning specifically, to allow an entity such as a variable, a function, or an object to have more than one form. It is the ability to process objects differently depending on their data types and to redefine methods for derived classes.

(vi) Networking Devices

Ans: Network devices are also known as networking hardware. These are physical devices that allow hardware on a computer network to communicate and interact one another. In other words, network devices in computer networks can be described as the devices that connect computers, printers and other electronic devices to the network. Network devices enable information exchange on a computer network. Network Interface cards, Hubs, bridges, repeaters, and routers are the devices that let you connect one or more computers to other computers, networked devices, or to other networks.

Some of the functions of networking devices are:

- Traffic control: Network devices such as routers and firewalls monitor and control traffic flow in different network segments or subnets. Such devices also help admins block unauthorized connection requests.
- Connectivity: Networking devices like routers can connect different networks using unique protocols. Gateways can enable communication between different protocol-based systems with data format translation.
- Segmentation: Dividing a network into distinct zones or subnets is one important function of networking devices.

Different types of networking devices are :

- Network interface cards: 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. The network interface card (NIC) provides the physical connection between the network and the computer. Network interface cards are a major factor in determining the speed and performance of a network. Most NICs are internal, with the card fitting into an expansion slot inside the computer. The most common network interface connection today is Ethernet cards. 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.
- Modem: Modem stands for Modulator/Demodulator. The modem is defined as a networking device that is used to connect devices connected in the network to the internet. The word "modulator" means to change and the meaning of word "demodulator" is to restore to an original form. The main function of a modem is to convert the analog signals that come from telephone wire into a digital form. The modem can perform both the task of modulation and demodulation simultaneously.
- Repeater: When a signal travels a network cable (or any other medium of transmission), they lose strength, degrade and become distorted in a process that is called attenuation. Repeater is a device that electrically amplifies the signal it receives and re-broadcasts it. They are used when the total length of your network cable exceeds the standards set for the type of cable being used. Repeaters work at the physical layer of the OSI model. A repeater's main function is to increase signal strength and quality over vast distances.
- Bridge: A bridge in a computer network is a device used to connect multiple LANs together with a larger Local Area Network. A bridge can also divide a network to isolate traffic problems. A bridge is operated at the data link layer. The primary responsibility of a bridge is to examine the incoming traffic and filter content by reading the MAC addresses of the source and destination. Bridges are used to divide large busy networks into multiple smaller and interconnected networks to improve performance. Bridges are highly reliable and maintainable. Installation of bridge is easy and requires no extra hardware or software except the bridge itself. When compared to repeaters, these are more expensive.
- Hub: A hub sends any data packet coming from one port to all other ports. It is up to the receiving computer to decide if the packet is for it. Typically used to connect segments of a local area network (LAN), a hub contains multiple ports. The biggest problem with hubs is their simplicity. Since every packet is sent out to every computer on the network, there is a lot of wasted transmission. This means that the

network can easily become bogged down. Hubs are typically used on small networks where the amount of data going across the network is never very high. A hub is typically the least expensive, least intelligent, and least complicated of the hub, router and switches.

- Switches: A switch is also known as switching hub. It is a device that can segment a larger local area network to reduce the traffic load. A network switch connects devices in a network to each other, enabling them to exchange data packets. One should implement a switch when you have a network with 20 or more users that have bogged down the network by excess traffic. It splits the network into two or more segments with devices that normally talk with each other. Conceptually – switching takes data from one interface and delivers it to another interface. A switch operates on the data-link layer of the OSI model.
- Router: A router is a networking device that forwards data packets between computer networks. A router translates information from one network to another; it is similar to an intelligent bridge. Router selects the best path to route a message, based on the destination address and origin. The router can direct traffic to prevent head-on collisions, and is smart enough to know when to direct traffic along shortcuts. Routers can even —listen‖ to the entire network to determine which sections are busiest—they can then redirect data around those sections until they are removed. Routers maintain a map of the physical networks on a Internet (network) and forward data received from one physical network to other physical networks.
- Gateways: A gateway is a network device that connects two networks that use different transmission protocols. Gateway, also called d protocol converters, can operate at any layer of the networking model. The main function of a gateway is to convert protocols among communications networks. It accepts data formatted for one protocol and convert it to data formatted for another protocol before forwarding it. A gateway can be implemented in hardware, software or both, but they are usually implemented by the software installed within a router.

(vii) Search Engine

Ans: A search engine can be defined as a tool to search diverse and disorganized sources of information available on the Internet. It is a software program that helps people find the information they are looking for online using keywords or phrases. Search engines have some automated programs that need to continuously keep visiting the web pages about the content they have and organize the information about web pages in some format.

These programs are called spiders, robots, crawlers, wanderers and worms. Search engines finds, classifies and stores information about the contents of various websites on the Internet.

Search engines are very useful to find information about anything quickly and easily. Using more keywords or different keywords improves the results of searches.

Different types of search engines available are:

a. Primary Search Engines:Such search engines use web crawlers or spiders to traverse the web and scan websites for key words, phrases, to generate database of web pages having some indexing or classification. Google and Alta Vista are examples of primary search engines.

Web directory: Web directories organize information into categories and subcategories or directories. You can search a web directory for all those entries that contain a particular set of keywords. Directories differ from search engines in the way they organize information. Yahoo is an example of web directory.

c. Meta search engines: This type of search engine does not compile databases. Instead, they search various individual search engines simultaneously on behalf of the user and retrieve hits from each of those databases. It passes your queries to many search engines and web directories and presents summarized results to the users. Some of the examples of meta search engines are — Dogpile, Infind, Metacrawler, Metafind and Metasearch.

Ans: A search engine performs, the following three actions:

1. Spidering or Web crawling

2. Indexing

3. Searching

Spidering: Spidering is also known as web crawling. Spider or Web crawler is a computer program that browses the web pages of WWW in a systematic, automated manner. They may do this every few days, so it is possible for content to be out-of-date until they crawl your website again. Search Engines use spider for getting up-to-date data on web sites. They are used to create a copy of the pages visited by them for later processing to create Index. These programs are also useful in validating HTML code to a particular standard like XHTML or checking or validating the hyperlinks.

Indexing: : Once, the spiders have completed the task of finding information about Web pages, the search engine must store the information in such way that you are able to use it. The search engine may provide some information relating to relevance of information may

be in the form of Ranking. The search engine will try to understand and categorize the content on a web page through keywords. Thus, a search engine may store the keywords of a web page, the number of times that word appeared on the page, the URL of the page. A weighting factor that gives more weightage in case a word is found at the top of the document. Each commercial search engine uses a different formula for assigning weight to the keywords in its index. This is one of the reasons that a search for the same word on different search engines will produce different results. Since the data that is to be stored for indexing is large, therefore, search engine may encode it. The Index is created with the sole purpose, that is, it allows you to find information on the Internet quickly. In general, Index uses hashing.

Searching: When a user enters a query into a search engine, the engine examines its index and provides a listing of best-matching web pages according to its ranking criteria. This short list, usually, have a short summary containing the title of the document and small part of the text. Most search engines support Boolean search.