1.

(a) Convert the following decimal numbers to equivalent binary number : 2 (i) 37 (ii) 0.125

(i) 37

Ans:


```
(37)₁₀ to binary.

2 | 37    1
2 | 18    0
2 | 9     1
2 | 4     0
2 | 2     0
    1

(37)₁₀ = (100101)₂.
```

(ii) 0.125


```
(0.125)₁₀  to binary
Fraction part : 0.125            Integer part
0.125 × 2          0.25            0
0.25 × 2           0.5             0
0.5 × 2            1.0             1

(0.125)₁₀ = 0 + 0.001
          = (0.001)₂
```

(b) Convert the following hexadecimal number to equivalent binary : 2

(FA3)16

Ans:

(FA3)16   =   1111   1010   0011

(FA3)16 = (111110100011)2

(c) What will the storage capacity of a disk of 2.5 inch diameter 8 plates (16 recording surfaces) with 512 sectors per track and 2048 tracks per recording surface ? Assume that one sector can store 1048 bytes of data. 2

Ans:

(d) Differentiate between the parallel port and serial port of a computer. 2

Ans: Parallel port vs serial port

Parallel port	Serial port
Parallel port is used to achieve parallel transmission.	Serial port is used to achieve serial transmission.
A parallel port transmits 8 bits of a byte of data in parallel.	Serial port transmits one bit of a byte.
A parallel port can transfer multiple data streams.	A serial port can transfer a single data stream.
It is used for transmitting fast data over short distances.	It is meant for transmitting slow data over long distances.

It is a parallel communication physical interface.	It is a serial communication physical interface which transmits one bit at a time.
A Parallel port is primarily used to connect printers to a computer.	Dial-up modems and serial mice use serial ports.
In parallel port communication more number of wires are used as compared to serial port.	In serial port communication less number of wires are used.

(e) What is an integrated circuit ? Is microprocessor an integrated circuit ? 2

Ans: Integrated circuits are semiconductor devices with several transistors built into one physical component. It is an electronic circuit which involves thousands or millions of interconnected components like transistors, diodes and resistors. They are usually called ICs.

The microprocessor is an integrated circuit that processes all information in the computer. It is a specific type of IC which functions as the CPU of a computer. It keeps track of what keys are pressed and if the mouse has been moved. It counts numbers and runs programs, games and the operating system. It executes instructions and performs arithmetic and logic operations. A microprocessor is an IC since it consists of numerous electronic components integrated onto a single chip.

(f) Explain the concept of memory hierarchy with the help of a diagram. 4

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. A storage devices (or units) may vary according to the access time, storage capacity, and cost-per-bit of storage . Based on these criteria, a memory system consists of three groups of memories.

1. Processor's internal (CPU) memories: consisting of the small set of high speed registers which are internal to a processor and are used as temporary locations where actual processing is done.

2. Primary (main) memory: It is a fast and large memory but slower than processor memory. Primary memory has faster access time, smaller storage capacity and higher cost per bit storage. This memory is accessed directly by the processor. It stores programs and data which are currently needed by the CPU. The size of the main memory is kept small because of its high cost.

3. Secondary (or auxiliary) memory: The secondary memory is mainly used for bulk storage (mass storage) of programs, data and other information. It has much larger capacity than main memory but slower than main memory. It basically stores system software, compiler, assembler and useful packages, large data files etc.

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.
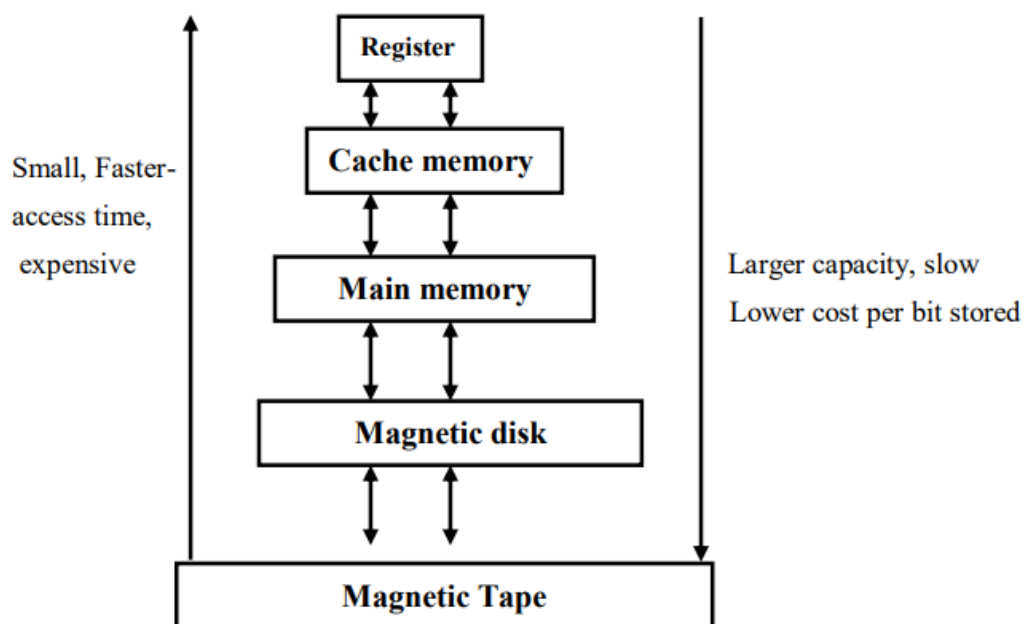
Memory hierarchy

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.

(g) Draw a flowchart to find if the given number is odd. 5

Ans:

Start
→ Read n
→ is n%2==0
Yes → Print number is even
No → Print number is odd.
→ Stop
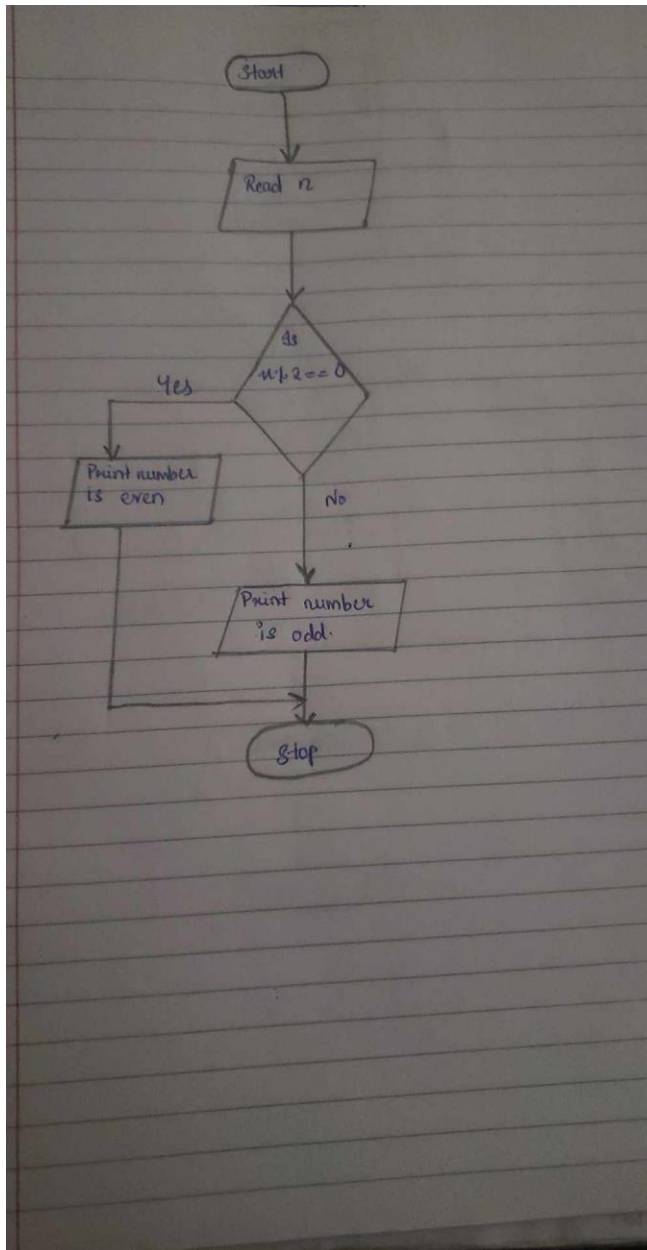
(h) What is the file management in the context to operating system ? How does file management system keeps track of a file ? Explain. 5

Ans: A file management system is designed to efficiently store, organize and track files on a computer or network. A file management system is used for file maintenance operations. It is a type of software that manages data files in a computer system. A file management system is also known as a file manager. File management systems are used by businesses to store, organize, locate, track and manage files.

How does file management keep track of a file:

Files are organized in a hierarchical directory or folder structure. It allows users to categorize the files and makes it easier to find them. Each file is assigned a unique name and often an extension (.docx,.jpg). This helps in identifying the file type and its contents. The system tracks information about each file known as metadata. This includes size, type etc.. Metadata enables quick searching and filtering of files based on various criteria.

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.

(i) What is the role of compiler in a computer system ? 3

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..

(j) Which of the following are valid IPv4 address ? Give justification : 3

(i) 256.0.0.0

(ii) 192.168.1.27

 (iii) 10.0.5.7.5

Ans: To determine whether the given IP address "192.168.5.512" is valid, we need to check the format and range of the values in each of its segments. An IP address in IPV4 format consists of four numerical segments known as octets, separated by periods. Each octet must be a number from 0 to 255, inclusive.

(i) 256.0.0.0

Let's break down the IP address and verify each octet:

The first octet 256, is not within the range of 0 to 255.

The second octet 0, is within the range of 0 to 255.

The third octet 0, is within the range of 0 to 255.

The fourth octet 0, is within the range of 0 to 255.

Since the first octet is not within the valid range, the IP address 256.0.0.0 is not a valid IP address.

(ii) 192.168.1.27

Let's break down the IP address and verify each octet:

The first octet 192, is within the range of 0 to 255.

The second octet 168, is within the range of 0 to 255.

The third octet 1, is within the range of 0 to 255.

The fourth octet 27, is within the range of 0 to 255.

Since all the octets are within the valid range, the IP address 192.168.1.27 is a valid IP address.

(iii) 10.0.5.7.5

This is not a valid IP address. There are five segments in total, which is more than the required four segments for an IP address. An IPv4 address consists of four numerical segments, separated by dots (.).

(k) What is meant by the term 'Network Topology' ? Explain the bus topology with the help of a diagram. List the advantages and disadvantages of bus topology. 6

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.
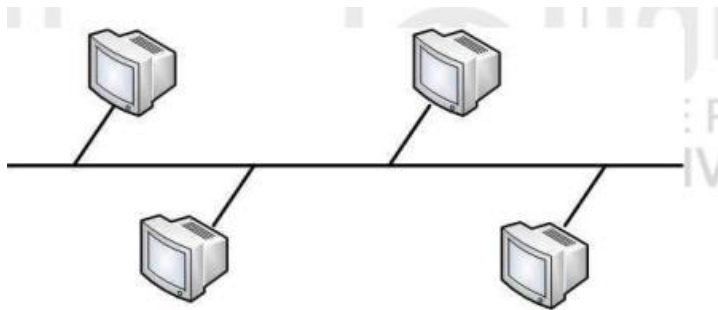
Bus topology

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.

(l) What is e-Learning ? What are its advantages and disadvantages ? 4

Ans:

E-learning is electronic based learning that uses latest technologies to support the delivery of training or education. E-learning as far as reach and access is concerned provides better opportunities for the learner. In addition, if e-learning uses Content and Learner Management System then can provide useful tips for teachers about the learners and usefulness of content. E-learning can also support interactivity.

Some of the key requirements for a good e-learning system are:

- A successful e-learning system depends on good student interaction, self motivation of individuals.
- A student has to study in an effective manner. This is essential as there is no teacher to motivate or drive the student.

Some of the key features of e-learning include:

- Flexibility: E-learning allows students to access course materials and participate in learning activities at their own pace and convenience. This feature is beneficial for individuals with busy schedules or those who prefer to learn at their own speed.
- Accessibility: E-learning makes education more accessible to a wider range of learners, including those with physical disabilities or those living in remote areas.
- Interactivity: Many e-learning platforms incorporate interactive elements such as quizzes, simulations and multimedia content to engage learners and enhance understanding. These features can make the learning process more engaging and effective.

Advantages of E-learning:

- Affordability: The cost of e-learning is one of its main advantages.
- It improves the IT skills of individuals and may improve their time management skills.

- Flexibility: Users are able to access educational content from anywhere with an internet connection. This means that students can continue their learning even if they are traveling or living in remote locations. The level of participation of student in learning may improve as it provides anytime, anywhere learning.
- Self-placed learning: E-learning gives students and workers the freedom to learn at their own pace, which can be useful for those who have varied learning preferences or have difficulty with a specific subject. Students can access educational materials and complete assignments via eLearning at their convenience and on their own timetable. Students can tailor their learning around their work and other responsibilities.
- It promotes active and independent learning.
- Through discussion boards and chats, one can interact with everyone online and also clear your doubts if any.
- The video instructions that are provided for audio and video learning can be rewound and seen and heard again and again if we do not happen to understand the topic.

Disadvantages of e-learning:

* The authenticity of a particular student's work is also a problem as online just about anyone can do a project rather than the actual student itself.

* The face-to-face learning experience is missing in e-learning. This can be a problem for those who learn better when they can work together with other students on the same subject.

* The interactive support that requires teacher at the other end may still be available in slotted time only. In traditional method, trainees can ask their trainers lots of questions and get immediate answers. On the other hand, in case of e-learning, the trainers usually work within their working hours and those trainees who learn out of these working hours may not be able to get an immediate response to their questions.

* E-learning requires reliable internet access and electronic devices which can be a challenge for some learners.

When in a traditional training center, trainees can ask their trainers lots of questions and get immediate answers. However, in the case of e-learning, the trainers usually work within their working hours, and those trainees who learn out of these working hours may not be able to get an immediate response to their questions, and this may de-motivate them.

* It allows possibilities of course material but that require constant support of a course team.

* While e-learning is flexible in place, it does require a level of motivation to complete and managers may need to monitor this.

2.

(a) Explain the three modes of data transmission. 5

Ans: Data communication is the process of transferring data from one place to another or between two locations. There are 3 modes of data communication:

- Simplex communication
- Half duplex communication
- Full duplex communication

Simplex data communication: In simplex mode of data communication, data flow is uni-directional. It is a one-way communication in which one device only receives and another device only sends data. The receiver cannot respond back to the sender. Example for simplex communication is speaker.

Simplex – only from A to B
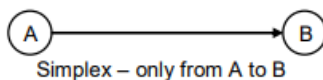
Half duplex communication: It is an extension of simplex communication. It is a bi-directional communication, although in only one direction at a time. It is a two-way communication in which both the devices can send and receive data but not at the same time. When one device is sending data then another device is only receiving and vice-versa. An example for half duplex communication is walkie-talkie. In such systems sender and receiver both transmit on the same frequency.

Half duplex-only one at a time
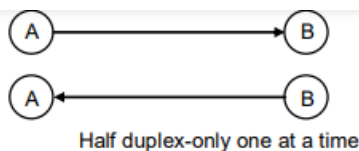
Full duplex communication: It is a bi-directional communication. It is a two-way communication in which both the devices can send and receive data at the same time. This means that both the devices in a network can send and receive the data at the same time. In this mode signals going in either direction share the capacity. Half of the bandwidth is used for sending data in one direction, while the other half is used for receiving data from other direction. An example is a telephone conversation.

Full duplex – both ways simultaneously
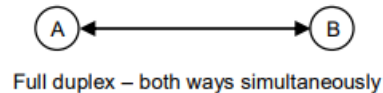
(b) What is URL ? Why is it needed ? Explain various parts of a URL with the help of an example. How URL is translated to physical address of the resource ? Explain with the help of an example. 8

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.

Translation of URL to physical address :

Steps to translate URL to physical address are:

1) As a first step you may put a URL like http://www.abc.com/index.html or equivalent Domain name www.abc.com as the address of the website that you want to access through your web browser.

2) The Web browser tries to resolve the IP address of the website www.abc.com by the information available in its own cache memory. If web server does not have the information about IP address stored in its cache, it requests the IP address from Domain Name System (DNS) servers. The DNS server tells the browser about the IP address of the website.

3) Once the web browser knows the IP address of the website, it then requests the web page (index.html page which is the home page in the present example) from the web server.

4) The web server responds by sending back the requested web page. If the requested page does not exist, then it will send back the appropriate error message.

5) Your web browser receives the page from the web server and displays it as per the display requirements of the web page.

(c) Explain the following terms in the context of a search engine : (i) Spidering or Web Crawling (ii) Indexing (iii) Searching 2+3+2-=7

(i) 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.

(ii) Indexing: Once, the spiders have completed the task of finding information about Web pages, the search engine must store the information in such a 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.

(iii) 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.

3.

(a) What is Computer Virus ? How is it different from Trojan Horse in the context of a computer ? List the ways to counter the perverse software. 7

Ans:

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.

Computer virus	Trojan horse
Computer virus 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 trojan horse is a type of malware that disguises itself as legitimate code or software.
The main objective of virus is to modify the information.	The main objective of trojan horse is to steal the information.
Computer viruses replicate.	Trojan horses do not reproduce by infecting other files nor do they self-replicate.
A virus is a program that spreads by attaching itself to other software.	It spreads by pretending to be a useful software or content.

4 ways to counter perverse software are :

* Ensure that the operating system and any program one uses are up to date with updates.

* Block unwanted email viruses by installing a spam filter and spam blocker.

* When browsing the internet, always watch what one clicks and installs. Do not simply click OK to dismiss pop-up windows.

* Install anti-virus software; scan and update regularly. It can, in most cases, remove and prevent viruses, worms, trojans, and (depending on the software) some spyware.

* Install anti-spyware/anti-adware; scan and update regularly. It will remove and (depending on the software) prevent future adware and spyware.

(b) Explain the following features of an application software : 8

 (i) Mail merge in word processing

Ans: Mail merge is a software function describing the production of multiple documents from a single template form and a structured data source. This helps to create personalized letters and pre-addressed envelopes or mailing labels for mass mailings from a word processing document which contains fixed text, which will be the same in each output document, and variables, which act as placeholders that are replaced by text from the data source. The data source is typically a spreadsheet or a database which has a field or column matching each variable in the template. When the mail merge is run, the word processing system creates an output document for each row in the database, using the fixed text exactly as it appears in the template, but substituting the data variables in the template with the values from the matching columns.

The mail merge process entails the following overall steps:

1. Set up the main document. The main document contains the text and graphics that are the same for each version of the merged document. For example, the return address or salutation in a form letter.

2. Connect the document to a data source. A data source is a file that contains the information to be merged into a document. For example, the names and addresses of the recipients of a letter.
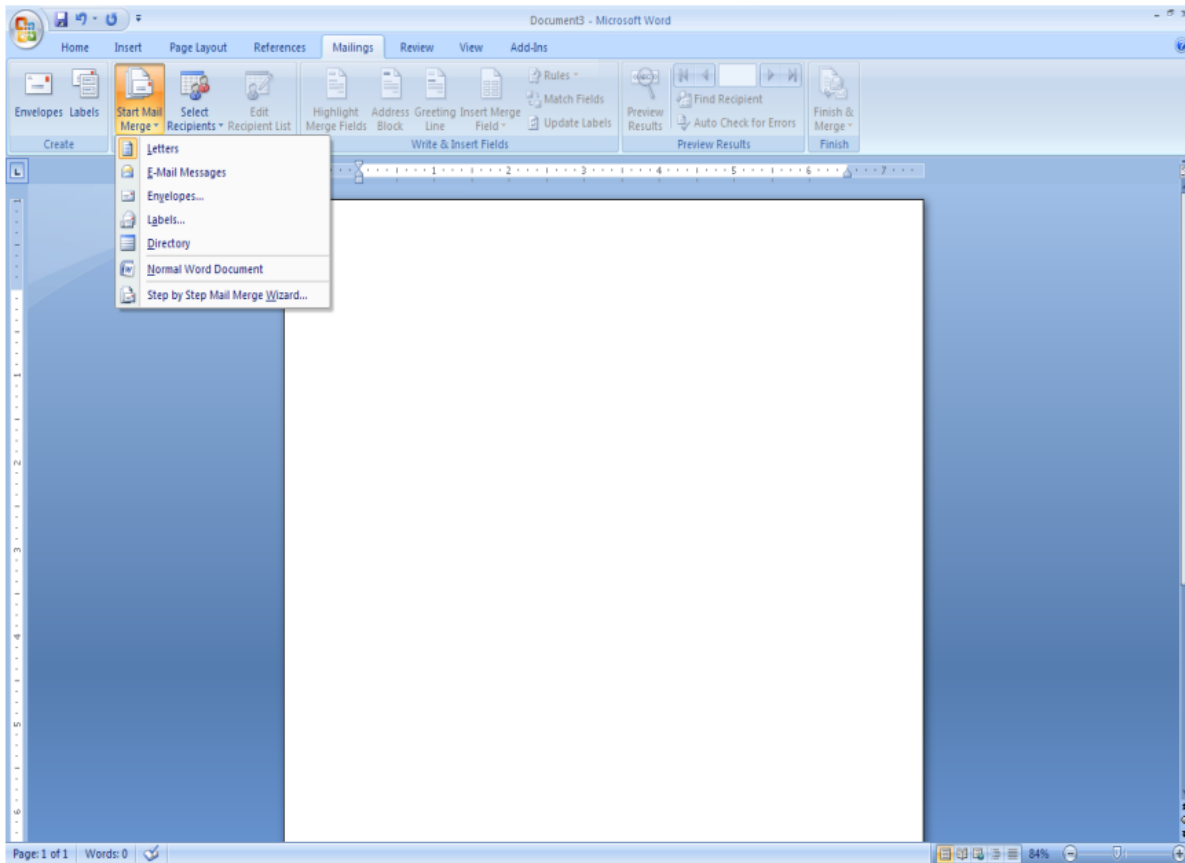
3. Refine the list of recipients or items. Microsoft Office Word generates a copy of the main document for each item, or record, in your data file. If your data file is a mailing list, these items are probably recipients of your mailing. If you want to generate copies for only certain items in your data file, you can choose which items (records) to include.

4. Add placeholders, called mail merge fields, to the document. When you perform the mail merge, the mail merge fields are filled with information from your data file.

5. Preview and complete the merge. You can preview each copy of the document before you print the whole set.

Thus, Mail Merge is used to create documents that are essentially the same but have a few unique data elements that vary for each document.

(ii) Macros in spreadsheet

Ans: Macros in spreadsheets are sets of instructions or commands that automate tasks within the spreadsheet software. 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.

When a macro is executed, it carries out the specified actions in the order they were recorded or programmed.

Macros can save time by automating repetitive tasks, reduce errors by ensuring consistency in operations and improves productivity.

(iii) Defining relationship in Database Management System

Ans: In a database management system, defining relationship refers to the connection between two entities in a database that establishes a specific link or dependency between them.

When you create a relationship between tables, the common fields are not required to have the same names, although it is often the case that they do. But, the common fields must have the same data type. If the primary key field is an AutoNumber field, however, the foreign key field can also be a Number field if the FieldSize property of both fields is the same. For example, you can match an AutoNumber field and a Number field if the

FieldSize property of both fields is Long Integer. When both common fields are Number fields, they must have the same FieldSize property setting.

To create relationships between two tables,

1. Choose Relationships under the Database Tools menu.

2. Then Choose the Table option and add the tables between which relationship has to be created.
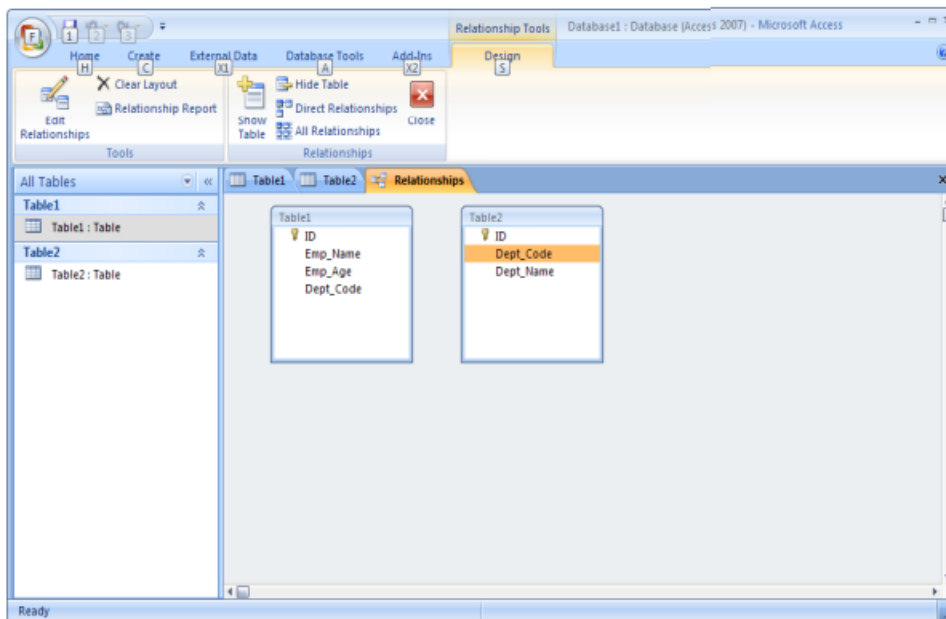
3. Drag a field (typically the primary key) from one table to the common field (the foreign key) in the other table. To drag multiple fields, press the CTRL key, click each field, and then drag them.

4. The Edit Relationships dialog box appears as below:
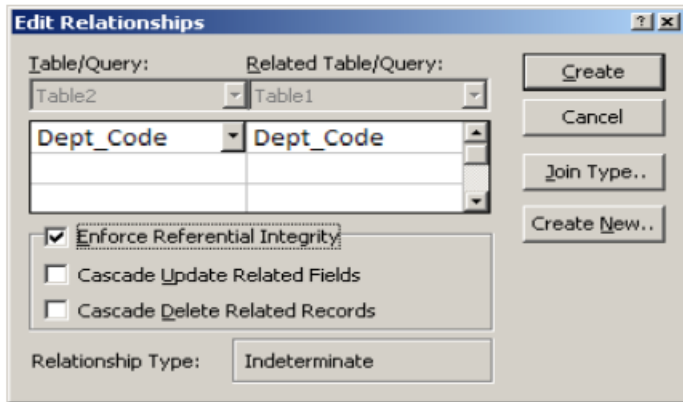
5. To enforce referential integrity for this relationship, select the Enforce Referential Integrity check box.

6. Click Create.

Access draws a relationship line between the two tables. If the Enforce Referential Integrity check box is selected, the line appears thicker at each end. In addition, the number 1 appears over the thick portion on one side of the relationship line, and the infinity symbol (∞) appears over the thick portion on the on the other side of the line, as shown in the following screen.
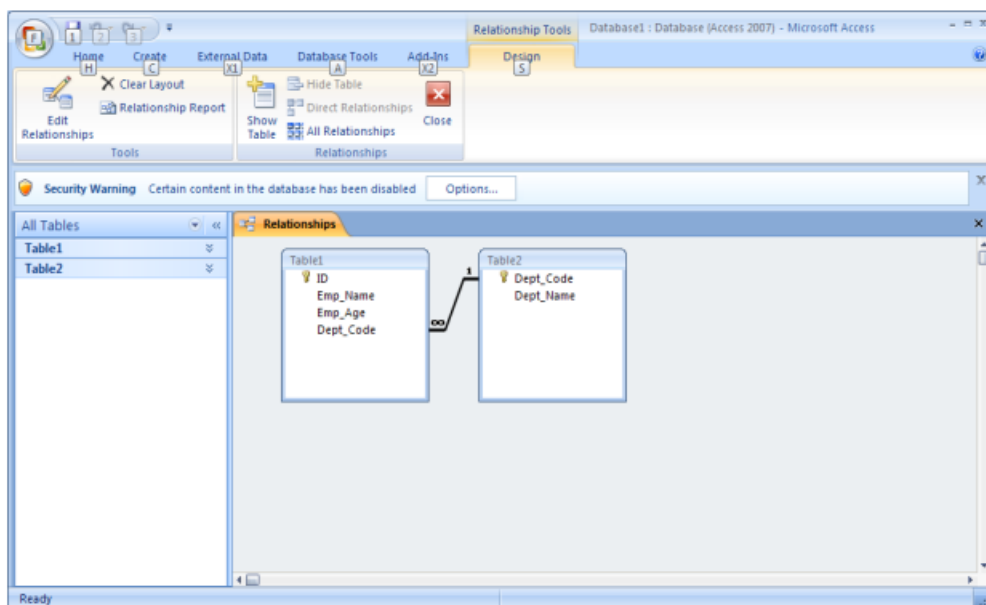
The purpose of referential integrity is to prevent orphan records and to keep references synchronized. Once referential integrity is enforced, Access rejects any operation that would violate referential integrity for that table relationship.

(iv) Scheduling in Project Management Software

Ans: 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.

(c) Differentiate between the open source software and proprietary software. 5

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 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

4.

(a) Explain the role of various components of a computer system with the help of a diagram. 5

Ans: Structure of a computer

 A computer is made up of several different components. All these components work together in order to produce the desired result. The physical components of a computer which can be seen and touched are known as hardware of a computer system. Each of these parts are designed for a specific purpose. Central Processing Unit (CPU), Memory, Input / Output devices like mouse, keyboard, Monitor, CPU, Memory etc. are different hardware components of a computer system. These hardware components are the building block of a computer.

Computer system consists of three basic sections:

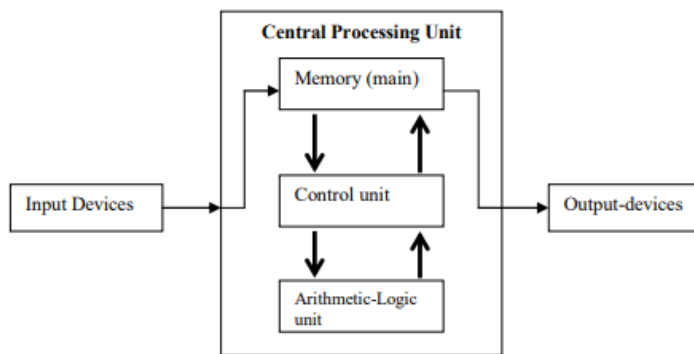1. Input device (i.e. Keyboard, mouse or scanner etc.)

2. Processor (or CPU):

* Control unit (CU)

* Arithmetic and Logic Unit (ALU)

*Memory unit

3. Output device (Visual Display Unit (Monitor/screen) or printer etc.)

Central Processing Unit

Input devices: Input devices are the components or devices of the computer by which we can enter any data into the computer. These devices take input and convert it into binary language that the computer understands. Some common input devices are keyboard, mouse, joystick, scanner etc. Input devices such as a keyboard, mouse or scanner are used to enter input (data and/or instructions), directly into the computer.

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

The Memory unit is an important component of a computer where all the data and information are stored in the form of binary digits (combination of 0"s and 1"s) and retrieved whenever necessary. 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. If our computer's CPU had to constantly access the hard drive to retrieve every piece of data it requires, the operation will be very slow. On the other hand, when the data or information is kept in memory the CPU can access it much more quickly. From the time the computer is turned on until the time it is shut down, the CPU is constantly using the memory system. The act of entering data into a storage location is called a memory write operation, and the act of retrieving data from a storage location is called a memory read operation. Data and instructions are moved, to and from memory, in bunches of word length. These memory devices are categorised according to access time, storage capacity and cost-per-bit of storage. Memory is broadly categorised into two types: ▯ Primary or main memory (also called semiconductor memory). ▯ Secondary or auxiliary memory (magnetic memory/Optical memory).

Based on access time, storage capacity and cost/bit storage, the memory devices (such as RAM, ROM, Hard-disk, Floppy disk, Magnetic disk, Magnetic Tape, CD-ROM, and DVD etc.) can be categorized into three kinds of memory systems:

* Semiconductor memory such as RAM, ROM etc

* Magnetic memory such as Hard-disk, Floppy disk, and Magnetic tapes

* Optical memory such as CD-ROM, DVD etc

(b) Differentiate between the following 10

(i) Serial Access and Random Access

Ans:

Serial access	Random access
Serial access is also known as Sequential access.	Random access is also known as direct access.
A Sequential-access memory device reads data in sequence.	In random access memory device reads data in random.
In case of a sequential access device the information is available in a sequential manner.	In case of a random access device the information is available at random.
In order to get to a specific piece of information, all previous data must be read first.	In order to get to a specific piece of information , all previous data need not be read.
Memory access time depends on where the store is located.	The amount of time needed to access memory is not dependent on the storage location.
Memory access time is more.	Memory access time is less.

Sequential access is efficient when processing large volumes of data in a linear order.	Random access is more suitable for situations where data access order is not predictable.
Examples of serial access storage devices include magnetic tapes and CDs.	Examples of random-access storage devices include hard drives and RAM.

(ii) RAM and ROM

Ans:

RAM	ROM
RAM stands for Random Access Memory.	ROM stands for Read Only Memory.
RAM is a temporary memory.	ROM is a permanent memory.
RAM is the memory that stores the data that you're currently working with.	It is typically used to store firmware or microcode, which is used to initialize and control hardware components of the computer.
RAM is a volatile memory that could store the data as lang as the power is supplied.	ROM is a non-volatile memory that the memory could retain the data even when the power is turned off.
Read and Write operations are supported.	Only read operations are supported.
It is a high-speed memory.	It is much slower than RAM.
CPU can easily access data stored in RAM.	CPU cannot easily access data stored in ROM.
RAM is costlier than ROM.	ROM is cheaper than RAM.
RAM has a higher capacity when compared to ROM.	ROM has a lower capacity compared to RAM.
Data in RAM can be modified, erased or read.	Data in ROM can only be read, it cannot be modified or erased.

(iii) SRAM and DRAM

Ans: Static RAM vs Dynamic RAM:

Static RAM	Dynamic RAM
Static RAMs retain stored information only as long as the power supply is on.	It stores information as long as the power is supplied or a few milliseconds when the power is switched off.
Six (6) transistors are needed per memory cell in a static RAM.	Dynamic RAMs required fewer transistors per memory cell.
These are expensive.	These are cheaper.
Consumes less power.	Consumes more power.

SRAM is faster compared to DRAM.	DRAM is slower when compared to SRAM.
These are used in cache memory.	These are used in main memory.
SRAM does not need to be refreshed.	DRAM requires the data to be refreshed periodically in order to retain the data.

(iv) ROM and PROM

Ans:

ROM	PROM
ROM stands for Read Only Memory.	PROM stands for Programmable Read Only Memory.
ROM is programmed during the manufacturing process.	PROM is manufactured as blank memory. PROM is programmed into them after manufacture .
ROM cannot be programmed by the user.	PROM can be programmed by the user.
It is a type of computer memory that can only be read from, not written to.	PROM allows you to write data to it a single time.

(v) Inkjet Printer and Laser Printer

Ans:

Laser printer	Ink-jet printer
It is expensive than ink-jet printers.	It is cheap in price.
They do not have nozzle.	They have nozzle from which ink is sprayed on to paper and it gets printed.
Ink is in the form of toner powder, it does not dries up even if you don't use it for a long time.	Ink in the cartridges is in liquid form, which dries if not used for a long time.
A printer that uses laser and dry ink to print the information onto paper is called laser printer.	A printer that uses wet ink and nozzle assembly to produce the output onto paper is called the inkjet printer.
Laser printers can handle high-volume printing.	Ink-jet printers cannot handle high-volume printing.
The efficiency of laser printer is relatively high.	Ink-jet printers are less efficient than laser printers.
Laser printers are generally larger in size.	The size of inkjet printers is relatively smaller.

(c) What are utility software ? Explain the use of disk checker and disk defragmenter utility software. 5

Ans: Utility programs are also known as utilities. Utilities help out a user for system maintenance and performing routine tasks. It basically deals to optimize, manage, configure and analyze the computer system. Generally utilities are included with the operating systems.

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

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.

Once CHKDSK finishes the checking, it returns exit codes whose description is as My Personal Computer below:

Exit Code	Description
0	No errors found
1	Errors found and corrected
2	Disk cleanup was performed or disk cleanup was not performed because /f was not specified
3	Could not check the disk, errors could not be corrected or errors were not corrected because /f was not specified.

Running CHKDSK from My Computer :

* Double-click my computer and then right-click the disk drive you want to check.

* Click properties there and then click Tools.

* Under Error-checking, click Check Now button. It will open a dialog-box which shows Check disk options.

Running CHKDSK from Command Prompt:

- Click Start and then click Run.
- In Open type cmd and then press enter key, then use one of the following options:

    * If you want to run CHKDSK in read-only mode, type CHKDSK at command prompt and press enter.

    *If you want to repairs the error without scanning the volumes for bad sectors, type CHKDSK volume:/f at command prompt and press enter.

    *If you want to repair errors, locate bad sectors, and recover readable information, type chkdsk volume:/r at command prompt and then press ENTER.

Disk defragmenter:

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.

The main benefits of defragmentation are that 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.

Running Defragmenter

 * Click Start button, select All Programs, click on Accessories click System Tools, and then click Disk Defragmenter.

* In the Disk Defragmenter dialog box, click the drives that you want to defragment and then click the Analyze button. After the disk is analyzed, a dialog box appears, letting you know whether you should defragment the analyzed drives.

*To defragment the selected drive or drives, click the Defragment button.

*After the defragmentation is complete, Disk Defragmenter displays the results.

* If you want to view the detailed report about the defragmented disk, click on View Report.

5.

 Explain any five of the following with the help of an example/diagram, if needed : 5x 4=20

(a) Web Browser

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.

(b) Optical Memories

Ans: Optical memories or Optical disks are alternate mass storage devices with huge capacity (up to 20 GB). Information is written to or read from an optical disk using a laser beam. Only one surface of an optical disk is used to stored data. An optical disk is relatively inexpensive, and has a long life of at least 15 years. Since the read/write head does not touch the disk surface, there is no problem of disk wear or head crash. The main draw back of the optical disk system is its slow average access time.

Ans: Different types of optical disks are:

1. CD-ROM (Compact-Disk Read Only Memory)

2. WORM (Write Once Read many) or CD-R (CD-Recordable).

3. Erasable Optical Disk

4. DVD-ROM, DVD-R and DVD-RAM

CD-ROM: CD-ROM technology uses 12-centimeter (4.7-inch) compact disks (CDs) similar to those used in stereo music systems. Each disk can store more than 600 MB. That is approximately equivalent to 400 1.44 MB floppy disks or 300,000 double-spaced pages of text.

First of all a master disk is prepared. On a master disk, a laser records data by burning permanent microscopic pits in a spiral track to represent 1. From a master disk, CDROMs are produced on mass scale. Then CD-ROM disk drives use a laser device to read the binary codes formed by those pits.

For reading the data a laser beam of lower intensity is employed. A laser system needs 25mW for writing whereas only 5mW are needed for reading.

CD-ROMs use long spiral tracks to store data serially, as shown in Figure 3.15. The track is divided into blocks of same size as shown in the figure. A CD-ROM disk rotates at a variable speed so that the pits are read by the laser at a constant linear speed. The speed of the disk is adjusted in such a way that the track passes under the read/write head at a constant linear velocity.

Advantages of CD-ROM:

* High storage capacity.

* Cost per bit of storage is cheaper than the other types of memory devices.

* Removable from the computer, so suitable for archival storage. 5.25 inch disks store 650 MB data.

WORM or CD-R:

CD-R (compact-disk recordable) is another optical disk technology. The user can record (write) their own data once on a CD with a CD-R disk drive unit. After this recording user can read the data as many times as desired.

CD-R is suitable for data and files which are not to be changed. The user can store permanent data, information, and files for maintaining records.

Advantages of WORM or CD-R:

*High storage capacity.

*Better reliability and long life.

Erasable Optical disk or CD-RW (CD-rewritable):

CD-RW (CD-rewritable) optical disk systems have now become available which record and erase data by using a laser to heat a microscopic point on the disk's surface.

Advantages of CD-RW:

* Very high storage capacity. A 5.25 inch optical disk can store about 650 MB data

* Optical disk can store about 650 MB data

* It can be erased and reused.

DVD-ROM, DVD-R and DVD-RAM:

DVD stands for Digital Video Disks or Digital Versatile Disks. A DVD stores much more data than a CD-ROM. Its capacities are 4.7GB, 8.5GB, and 20GB etc. The capacity depends on whether it is a single layer, double layer; single sided or double sided disk. DVD uses laser beam of shorter wavelength than CD-ROM uses and therefore more tracks are available. Working principles of DVD disks are same as those of a CD-ROM, CD-R or CD-RW.

DVD-R: It is a recordable DVD, same as a CD-R disk. The user can write data once on a DVD-R, then read the data as many times as required.

DVD-RAM: It is a rewritable DVD, same as a CD-RW disk. DVD-RAM uses a phase change technology to write, read and erase data.

Advantages of DVD-ROM, DVD-R and DVD-RAM:

- Large storage capacity
- Can be used in certain models of DVD players.
- Some types can be reused or rewritable.

(c) ASCII and Unicode

Ans:

ASCII:

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 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. ASCII consumes less memory as compared to Unicode.

Unicode: Unicode is a computing industry standard for the consistent encoding, representation and handling of text expressed in most of the world's writing systems. Unicode provides a unique way to define every character in every spoken language of the world by assigning it a unique number. The Unicode standard is maintained by the Unicode consortium and defines more than 107,000 characters from more than 90 scripts.

Unicode can be implemented by different character encodings like UTF-8, UTF-16, UTF-32 etc. The most used encoding is UTF-8. UTF-8 is a 8-bit encoding scheme, UTF-16 is a 16-bit encoding scheme and UTF-32 is a 32-bit encoding scheme. Unicode represents a wide range of characters, formulae, texts, mathematical symbols, emojis, Greek letters, etc. Therefore, Unicode is the one of the most popular encoding scheme to encode many of the globally used characters.

The main objective of the use of Unicode is localization and internationalization of computer applications and software. Unicode is also used for programming operating systems, java applications, XML etc.

One advantage of Unicode is it allows developers to create user-friendly interfaces that can be used by people speaking different languages and it helps to simplify tasks related to data processing and information management.

(d) Looping Statement

Ans: Loops in programming are used to repeat a block of code until the specified condition is satisfied. A loop statement allows programmers to execute a statement or group of statements multiple times without repetition of code. Several variations of a loop structure are available in each programming language to handle different situations.

A program loop consists of two segments, one is the body of the loop and the other is the control statement. The control statement tests certain conditions and then directs the repeated execution of the statements contained in the body of the loop. The test may be either to determine whether the loop has repeated the specified number of times or to determine whether the condition has been met.

A loop consists of :

i) Initial condition
ii) Execution of set of statements inside the loop
iii) Test the condition
iv) Again, execute the statements if the condition is met else go to the next statement in the sequence

The three types of loops typically encountered in programming are:

- For loop
- While loop
- Do while loop

Example for for loop:

```
for(i=0;i<20;i++)
 {
printf("%d =",i+1);
 scanf("%d",&s[i]);
 }
```

Example for while loop:

```
i=0;
while(i<20)
 { sum=sum+s[i];
i++; /* increment counter */
 }
```

Example for do while loop:

```
int i=0;
do
{
printf("Hello");
i++;
}
```

while(i<3);

Return 0;

(e) Kernel of an Operating System

Ans: It is an important part of an operating system. The memory resident components of an operating system are commonly known as the kernel of the operating system. Kernal is central component of an operating system that manages operations of computer and hardware. It manages the operations of memory and CPU time. It is core component of an operating system. Kernel acts as a bridge between applications and data processing performed at hardware level using inter-process communication and system calls. It acts as a bridge between the hardware and software. Kernel loads first into the memory when an operating system is loaded and remains into memory until operating system is shut down again. It is responsible for various tasks such as disk management, task management and memory management. It manages system resources such as memory, CPU and input/output devices and provides a layer of abstraction between the hardware and higher-level software components.

(f) Linker and Text Editors

Linkers: A linker is a program that takes one or more Object file codes generated by a compiler and combine them into a single executable program. Linker is a program in a system which helps to link object modules of a program into a single object file. Linkers are also called as link editors.

When large software, involving many programmers is to be developed, then the modular approach is adapted. The software is divided into functional modules and separate source programs are written for each module. Each of these source files can then be compiled independent of each other to create a corresponding object file. Eventually, linker is used to combine all the object files and convert them into a final executable program.
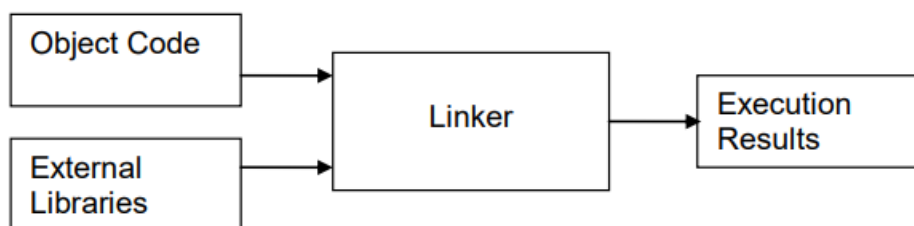

Editors: Editors are also known as text editors. Editors are software programs that enable the user to create and edit text files. To write a program in any of the programming languages requires an editor. While saving the program, filename and extension as per programming language is required to be given e.g in C programming language f1.c, in C++ f1.cpp or f1.C, in Java f1.java etc. The extension may also depend on the conventions of the operating system used, for instance, in unix the extension for a C++ program is .C while for Windows it would be .cpp. There are different types

of editors. Some of the programming languages have some specific built in editors. Some types of editors are : line editor, stream editors, screen editors.

(g) Hub and Switches (Networking devices)

Ans: Ans: 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.
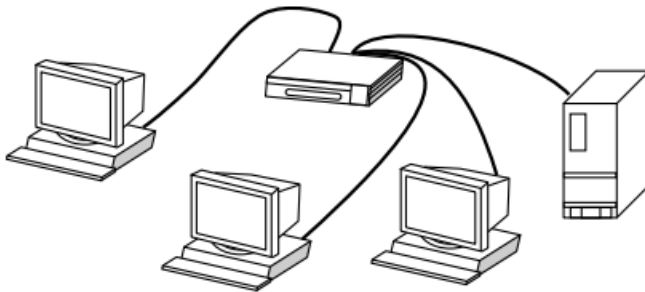
Advantages:

* It is less expensive.

* The use of a hub does not impact the network performance.

* It provides support for different types of network media.

Disadvantage:

* It cannot reduce the network traffic as it has no mechanism.

* It does not include mechanisms such as collision detection.

* It has no ability to choose the best path of the network.

Switches:

Ans: 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.

A switch has many ports, to which computers are plugged in. When a data frame arrives at any port of a network switch, it examines the destination address, performs necessary checks and sends the frame to the corresponding device(s).
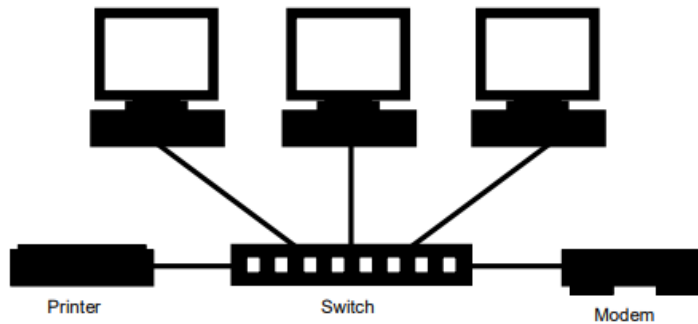
Advantages:

* Prevents traffic overloading in a network by segmenting the network into smaller subnets.

* It increases the available bandwidth of the network.

* It enhances the performance of the network.

Disadvantage:

- They are pretty expensive.
- Proper design and configuration are needed.
- Network connectivity issues are difficult to be traced through network switch.

(h) WIKI

Ans: Wiki stands for "What I Know Is". Wiki's are a powerful tool for creating collaborative knowledge resources created by the community. A wiki is a page or collection of Web pages designed to create and edit contents. Wiki supports hyperlinks and has simple text syntax for creating new pages. Wiki's are also used to create websites, to enhance the features of community websites and for knowledge management. The collaborative encyclopedia, Wikipedia is one of the best-known wiki's. It contains very large number of articles – all created and moderated by the community. Ward Cunningham developed the first wiki software - WikiWikiWeb in 1995.

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.

Documents can be written using a markup language. We can see a wiki page using web browser. Wiki pages are connected through hyperlinks. Therefore, a wiki is database for creating, editing, browsing, and searching through information.