## BCS-011 : COMPUTER BASICS AND PC SOFTWARE

## December 2022

1.

1. (a) Do the following conversions : 8
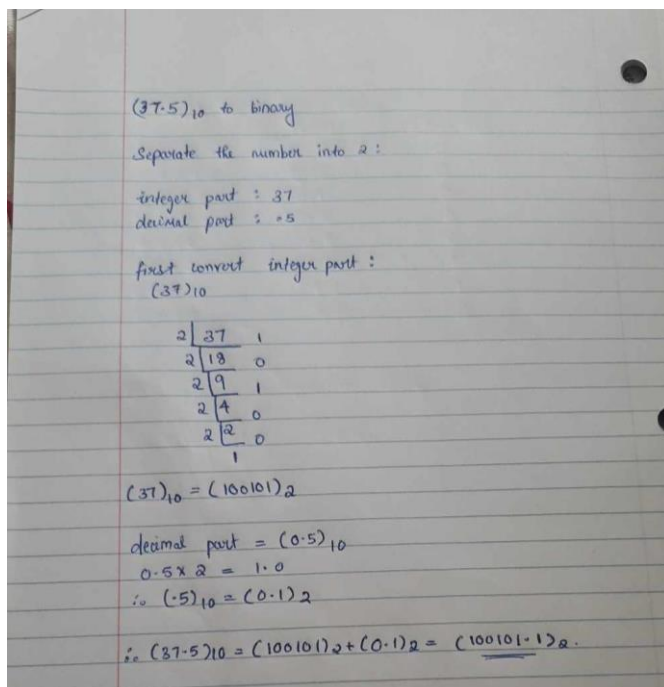
(i) $(37.5)_{10}$ to Binary

(ii) $(100100101101)_2$ to Hexadecimal

(iii) $(ABE)_{16}$ to Binary

(iv) $(574)_8$ to Decimal

(i) $(37.5)_{10}$ to Binary

Ans:



ii) $(100100101101)_2$ to Hexadecimal

$(100100101101)_2 = $ 1001 0010 1101

 9     2     D

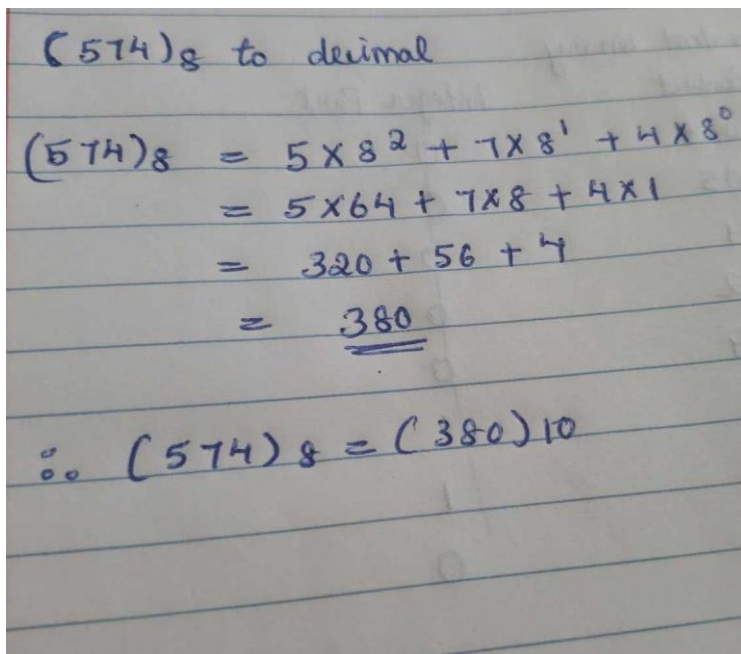$(100100101101)_2 = (92D)_{16}$

(iii) (ABE) $_{16}$ to Binary

Ans: (ABE) $_{16}$ =      A              B              E

    1010          1011          1110

(ABE) $_{16}$ = (101010111110) $_2$

(iv) (574) $_8$ to Decimal

Ans:



(b) What is main memory of the computer and why is it needed ? Explain briefly the various types of main memory. 5

Ans: Main memory:

Main memory is also known as primary memory, semiconductor memory or random access memory. It is a crucial component of a computer system. It stores programs and data which are currently needed by the CPU. The main memory stores the programs and data required by the CPU for carrying out its operations. The primary (main) storage is a semiconductor device that is built using integrated circuits. The data is stored in binary form in main memory.

Another part of main memory is Read Only Memory (ROM). ROMs are those memories on which it is not possible to write the data. They can only be read. Thus, RAM and ROM memories are used as the main memory of the computer.

Need for main memory:

All modern computers use semiconductor memory as its main memory(primary memory). It is also known as Random Access Memory (RAM) because any part of the memory can be accessed for reading and writing. Any memory location can be accessed in a random manner for reading and writing. The access time is the same for each memory location. It usually refers to "temporary" memory, which means that when the system is shut down, the memory is lost.

It is really the main store and is the place where the program and software we load gets stored. When the CPU runs a program, it fetches the program instructions from the RAM and carries them out. Similarly, if the CPU needs to store the final results of calculations, it stores them in RAM. Thus, the CPU can both READ data from RAM and WRITE data into the RAM.

Main memory refers to physical memory that is internal to the computer. It is a computer's short-term storage. Main memory's job is to hold data that the CPU needs to access frequently, such as instructions and data currently being processed. Data can be accessed much more quickly than data stored on disk drives or other secondary storage devices. This in turn allows the CPU to quickly access and process the necessary information and improves the performance and speed of the computer. Primary memory is much faster and more expensive and has less storage capacity.

The computer can manipulate only data that is in the main memory. Hence, every program to execute and every file to be accessed must be copied from a storage device into the main memory. The amount of this space on a computer is crucial because it determines how many programs can be executed at one time and how much data can be readily available to a program.

Types of Main memory :

Main Memory can be of various types like Random Access Memory (RAM) and Read-Only Memory (ROM). The below diagram shows different types of main memory.
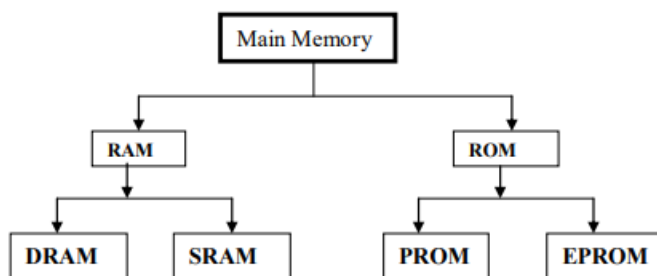


RAM(Random Access Memory): The Read and write memory (R/W memory) of a computer is called a RAM. The user can write information into RAM and read information from it. It is called random access since any memory location can be accessed in a random manner for reading and writing. The access time is the same for each memory location. Random

Access Memory (RAM) is really the main store and is the place where the program and software we load gets stored.

It usually refers to "temporary" memory, which means that when the system is shut down, the memory is lost.

RAM is further divided into static RAM and Dynamic RAM.

Read Only Memory: A Read-Only memory (ROM) is a non-volatile memory, i.e., the information stored in it is not lost even if the power supply goes off. Thus a Read Only Memory (ROM) is one in which information is stored permanently. , the information from ROM can only be READ and it is not possible to WRITE fresh information to it. It is much cheaper compared to RAMs when produced in large volumes. ROM is used for storing a special set of instruction, which the computer needs when it starts up (boots up). The contents of ROMs are decided by the manufacturers. The contents are permanently stored in a ROM at the time of manufacture.

ROM is further divided into Programmable ROM (PROM) and Erasable PROM.

(c) Why are the arrays used in programming ? Explain with the help of an example of one-dimensional array. 3

Ans: An array is a linear data structure where all are arranged sequentially. It is a collection of elements of same data type stored at contiguous memory locations. Each element can be individually referenced by an index.

In programming, when large amount of related data needs to be processed and each data element is stored with different a variable name, it becomes very difficult to manage and manipulate. Arrays provide a way to store and manage multiple values or data items under a single variable name, making it easier to work with a large set of related data. This means data can be accessed quicker than if stored across multiple variables, improving program efficiency significantly. Arrays offer immediate random access to elements, efficient memory utilization and faster manipulation.

The two types of array used are:

* One dimensional array

* two dimensional array

One dimensional are: A one-dimensional array is a structured collection of elements that can be accessed individually by specifying the position of a component with index/ subscript value. The index would let us refer to the corresponding value. It is the simplest form of an array. t is an array in which elements are stored one after the other.

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

type name [elements];

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

int marks[5];

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

It allows random access and all the elements can be accessed with the help of their index.

(d) Differentiate between the following : 6

(i) Subroutine and Function

Ans:

| Subroutine | Function |
|------------|----------|
| A subroutine is a sequence of program instructions that performs a specific task within a larger program. | A function is a named block of code that performs a specific task and returns a value. |
| A subroutine is used when a desired task is needed but no value is returned. | A function is used when a value is returned to the calling routine. |
| A subroutine could change the actual arguments. | A function should not change the values of actual arguments. |
| Subroutines are designed to be reusable. | Functions are not reusable. |
| Subroutines can be called multiple times from different parts of the program. | Functions are designed to be modular and can be called from different parts of the program to achieve a specific purpose. |

(ii) Modem and Router

Ans:

| Modem | Router |
|---|---|
| The modem is defined as a networking device that is used to connect devices connected in the network to the internet. | A router is a networking device that forwards data packets between computer networks. |
| It modulates and demodulates the electrical signal. Modem stands for Modulator/Demodulator. | A router translates information from one network to another. |
| It works on the data link layer of the OSI reference model. | A router operates on the Network layer of the OSI model. |
| Modem is not secure. | Router is highly secure. |
| Modem provides internet access to only one device at a time. | It allows multiple devices to connect to the internet simultaneously. |

(iii) URL and IP address

Ans:

| IP address | URL |
|---|---|
| IP address is a unique numerical identifier that is given to each device linked to the internet. | URL is the unique address of the web page. It is also known as web address. |
| IP address identifies a typical device attached to the internet. | URL allows you to navigate to a specific web page on the internet. |
| It is made up of two parts: the network component and the host part. | It is made up of three parts: the protocol, the domain name of the server where the page is found and the path to access that specific page. |
| Example: 188.112.0.1 | Example: www.google.com |
| IP addresses from the IPv4 address pool are rapidly exhausting, while internet users are rapidly rising. As a result, IPv6 was designed to solve the scarcity of IP addresses. | There is no scarcity in web addresses, since web address names have no bounds. |

(e) What are communication ports and why are they needed ? Explain parallel ports and serial ports. 5

Ans: Port is a connecting socket, outside the system into which different types of cables are plugged. It is a specific place from which other devices can be physically connected. In other words, a port is an interface between the motherboard and an external device of the

computer. Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speaker etc.

Need for communication ports:

A computer port is a piece of hardware that allows a computer to connect to other devices including accessories, peripheral devices and other computers. They are essential in enabling interoperability and connectivity among electronic systems and devices.

Serial port: Serial port transmits one bit of a byte, one at a time as a single stream of bits. It is meant for transmitting slow data over long distances. Communication over a phone is an example of serial communication. It is a serial communication physical interface which transmits one bit at a time. Serial ports are cheaper and they are easier to shield from interference. Serial port is used to transmit one bit of a byte, one at a time as a single stream of bits. It is used for transmitting slow data over long distances. Communication over a phone is an example of serial communication. It is a serial communication physical interface which transmits one bit at a time. They are used for connection of external devices like a modem, mouse, or keyboard.



Parallel port: Parallel port can send several bits at the same time as it uses parallel communication. They are generally used for connecting scanners and printers. A parallel port transmits 8 bits of a byte of data in parallel. It is used for transmitting fast data over short distances. Since a parallel port transmits an entire byte at a time, it operates I/O ports are the interfaces through which computers communicate with external devices such as printers, modems, joysticks and terminals at a relatively high speed. A Parallel port is primarily used to connect printers to a computer and hence it is often called a printer port.

(f) Why do computer systems need Antivirus Softwares ? Which technique do antivirus programs use to identify viruses ? 5

Ans: Anti-virus software is designed to combat viruses. Anti-virus software plays a crucial role in controlling computer viruses and protecting your system from malicious threats. Antivirus software protects your device from viruses that can destroy your data, slow down or crash your device, or allow spammers to send email through your account. It scans your files and your incoming email for viruses, and then deletes anything malicious preventing it from spreading further.

Anti-virus software uses the below methods to detect and prevent malware from infecting your device:

- Signature based detection : This is oldest and most common form of anti-virus protection. It compares the contents of the infected file to a known pattern of data. Because viruses can embed themselves in existing files, the entire file is searched.
- Heuristic-based detection: This method is primarily used to identify unknown viruses by looking for malicious code or variations of such code.
- File emulation: This is another heuristic approach in which the infected program is run in a virtual environment and the actions it performs are recorded. The actions are analyzed to check for any malicious actions and carry out disinfection actions accordingly.

Many anti-virus solutions include safe browsing features that warn you about dangerous websites or downloads, helping you avoid potential infections before they happen. Some of them can monitor the overall performance of your system and alert you to any unusual activities.

(g) Write short notes on the following : 8

(i) E-learning

Ans:

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.

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.

Steps for creating E-learning content:

Different steps in content development process are:
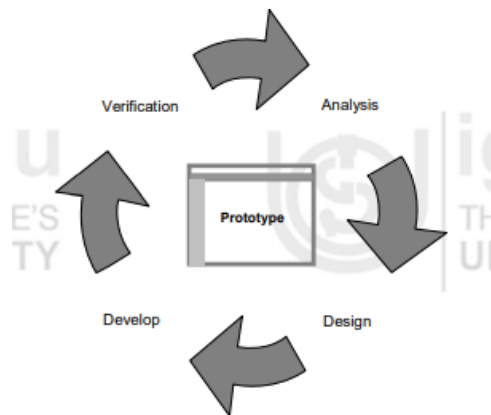


Analysis Phase: Analysis requires identifying the learning objectives for the development of content for the target audience. This phase also lists the financial, technological and time constraints for the e-learning project. It also enables identification of the gap between the expected knowledge of the target audience and what they should know after going through the course. This facilitates the design phase.

Design Phase: In most organizations the design phase involves the development of a storyboard that may include a concept flow, text, graphics, video, audio, animation if needed. In this phase you may also design the basic questions that must be answered by the learner after going through the learning content. This step may also design the interface and interactivity.

Implementation Phase: Implementation phase brings the design to live course material. You may take the help of various experts for this phase including content expert, graphic expert, interaction designer, web designer etc.

Verification Phase: during the Verification phase the contents so produced can be tested to determine if it is conveying what it is expected to convey. It may also be used to check the usability features of the product.

(ii) Security threats on Internet

Ans: Basic threats we face when using internet are:

• Confidentiality: Confidentiality is the protection of information in the system so that an unauthorized person cannot access it. No unauthorized person should be able to read or copy information that s/he is not supposed to read. Confidentiality must be well-defined,

and procedures for maintaining confidentiality must be carefully implemented. A breach of confidentiality may take place through different means, for instance hacking or trojan horses etc...

• Integrity: Data integrity refers to the certainty that the data is not tampered with or degraded during or after submission. It is the certainty that the data has not been subject to unauthorized modification, either intentional or unintentional. No unauthorized person should be able to modify information. The challenges of the security program are to ensure that data is maintained in the state that is expected by the users.

• Availability: This means that the information is available to authorised users when it is needed. No unauthorized person should be able to erase information or make it inaccessible.

The other threats posed on the Internet are due to:

• Computer Viruses : Computer viruses are the most common among internet security threats out there. Viruses are malicious programs that spread through computers and networks. Both exploit software vulnerabilities that allow an attacker to steal data from systems. They also install backdoors into systems that an attacker can use to gain unauthorized access, corrupt files, and damage.

• Identity information thefts: This process is known as phishing. Phishing scams are created by cybercriminals attempting to steal private or sensitive information. Phishing attacks involve attackers targeting users through email, text messages, or social media messaging sites. They pose as a sender the user trusts to trick them into giving up sensitive information like account numbers, credit card data, and login credentials.

2.

(a) What is CPU ? Describe the structure of the CPU and explain its components with the help of a diagram.

Ans: Central Processing Unit (CPU) is considered as one of the most important component of a computer system. It is also known as the brain of a computer. It contains all the circuitry needed to process input, store data, and other results. The main function of a CPU is to execute a series of instructions called as program in a specific sequence. Normally there are four steps that all CPU use in order to perform their operation these are: fetch, decode, execute and output. The CPU is constantly following instructions of computer programs that tell it which data to process and how to process it. Without a CPU, we could not run programs on a computer. The CPU performs arithmetic, logic, and other operations to transform data input into more usable information output.

Components of a CPU:

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

CPU has three major identifiable parts: Control Unit (CU), Arithmetic & logic Unit (ALU) and a set of Registers. The below figure presents the components of a computer:
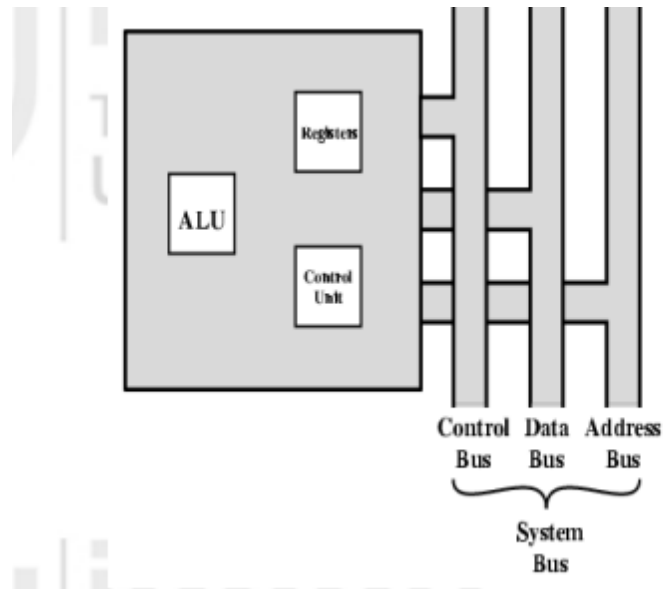


Arithmetic Logic Unit(ALU) : The Arithmetic and Logic Unit is that part of the CPU that actually performs arithmetic and logical operations on data. It performs the basic arithmetic, logical operations specified by the instructions. Arithmetic operations includes addition, subtraction, multiplication, and division. Logical operations includes comparison, selection and merging of data. The CU, CPU registers and memory help in bringing the data into the ALU and then taking the results back.
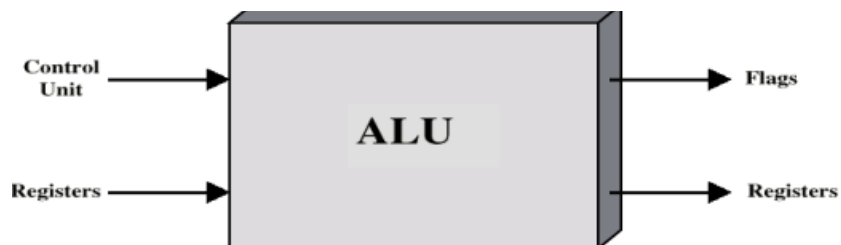


Control Unit: - The CU controls the execution of instructions by decoding the instruction and generating micro-operations to be performed for executing that instruction. It controls the operation of other parts of the computer. Control Unit (CU) is the unit which manages

and coordinates the entire operation of a computer system. It controls the operation of the other components of a computer system. The Control Unit of the processor is that unit which controls and coordinates the execution of instructions by the processor. It is responsible for defining and controlling the instruction cycle. In essence, it causes things to happen in the processor. It issues control signals external to the processor to cause data exchange with memory and I/O modules. It also issues control signals internal to the processor to move data between registers, to cause the ALU to perform a specified function, and to regulate other internal operations. It generates timing signals and initiates the Fetch cycle of instruction execution. When the instruction is fetched, it generates the sequence of micro-operations which need to be executed in order to execute the instruction. CU also generates timing signals for executing set of micro-operations. There are three different ways in which CU can generate these micro-operations: through a hardwired logic, by reading a programmable Array (PLA) table or by reading a Programmable Read Only Memory (PROM).

 Functions of CU:

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

* It does not store or process data.

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

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

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

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

(b) What is Operating System ? What kind of services does operating system provide to users and programs ? 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.

Facilities operating system provides to the users and programs:

• The operating system provides interfaces for the user (keyboard, mouse, clicks, and pen drive) and also for the user's programs.

• It provides file system support to manage huge volume of data in to secondary storage device.

• It provides I/O services that can be used by every program.

• It provides networking services.

• It provides boot-strapping or Initial Program Load (IPL) to start a computer

• It manages all kinds of errors and also supports error recovery mechanisms.

(c) How does data get transmitted via unguided transmission media ? Explain the radio, microwave and infrared modes of wireless transmission. 6

Ans: Unguided media is used for transmitting the signal without any physical media. It transports electromagnetic waves and is often called wireless communication. Signals are broadcast through air and received by all who have devices to receive them. The signal energy propagates through the air in unguided media.

Radio waves: Radio waves are electromagnetic waves ranging in frequencies between 3 Kilo-Hertz and 1 Giga-Hertz. Radio waves are easy to generate and can travel long distances and can penetrate buildings easily, therefore widely used for communication. These are omni-directional

which implies that these travel in all directions from the source, so the transmitter and receiver do not have to be carefully aligned physically.

Radio signals have been used for a long time to transmit analog information. They are particularly attractive for long distance communication over difficult terrain or across the oceans.

An increasingly-popular form of radio is cellular radio, which is currently being used by carriers for providing mobile telephone networks. These operate in the VHF (Very High Frequency) band and subdivide their coverage area into conceptual cells, where each cell represents a limited area which is served by a low-power transmitter and receiver station. As the mobile user moves from one cell area to another, its communication is handed over from one station to another. Radio waves transmitted by one antenna are susceptible to interference by another antenna due to its Omni-directional property. Radio waves can be received both inside and outside the building.

Radio waves are very useful in multicasting (source transmits a signal for some specific group of destinations which may be more than one) and hence used in AM and FM radios, cordless phones and paging. Bluetooth is a very popular application of radio wave.

Micro wave: Electromagnetic waves ranging from 1 to 300 Gigahertz are called microwaves. Microwaves are unidirectional that is the sending and receiving antennas need to be aligned. Microwave is by far the most widely used form of radio transmission. It operates in the GHz range with data rates in order of hundreds of Mbps per channel. Telecommunication carriers and TV stations are the primary users of microwave transmission. Repeaters placed at several points are used to boost the power of the signal.

Unidirectional property of microwave helps in avoiding interference by a pair of aligned antenna to another. It travels in straight lines, and so the transmitter and receiver stations should be accurately aligned to each other. High frequency micro waves cannot be received inside the building. It cannot penetrate through obstacles such as hills, buildings and trees due to its high frequency.

Applications of micro waves are: long distance telephone communication, cellular phones, television networks and satellites.
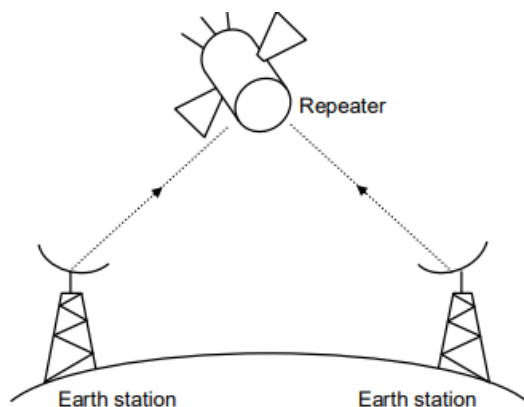


Infrared waves: Infrared signals range between 300 Giga-Hertz to 400 Tera-Hertz. These can be used for short range communication. High range infrared rays cannot be used for long range

communication as it cannot penetrate walls. This also helps in avoiding interference. Infrared signals are generated and received using optical transceivers.

Infrared systems represent a cheap alternative to most other methods, because there is no cabling involved and the necessary equipment is relatively cheap. A short range communication system in one room cannot be affected by another system in the next room. For example, use of infrared remotes in one room do not interfere with the use of remote by neighbors. Infrared signals are useless for long-range communication. We cannot use infrared waves outside a building because rays of sun contain infrared which leads to interference in communication. Infrared signals supports high bandwidth and can be used to transmit digital data with a very high data rate.

3.

(a) What are Optical Memories ? Explain briefly any four types of optical disks. 8

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.

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.

(b) What is cloud computing ? Explain the various cloud services and how they benefit organizations. Describe key features and benefits of cloud based solutions. 7

Ans: Cloud computing is the broader concept of using the internet to allow people to access the technology enabled services .Cloud computing refers to the delivery of computing services over the internet, including storage, databases, software and analytics.

Some of the cloud services are :

IaaS- IaaS stands for Infrastructure as a Service. It delivers on-demand infrastructure resources such as computer, storage and networking. Cost savings is an important advantage of IaaS.  IaaS is a cloud computing service where customers only pay for the resources they use.

PaaS-PaaS stands for Platform as a Service. It delivers and manages hardware and software resources for developing, testing, delivering and managing cloud applications.

SaaS-SaaS stands for Software as a Service. It provides a full application stack as a service that customers can access and use. Software-as-a-Service (SaaS) is basically a software delivery model where customers can use the software application as a service on demand and pay for it per usage. It is based on the concept of renting application functionality from a service provider rather than buying, installing and running the software yourself.

Key features of cloud based solutions :

Ans: Key features of cloud computing are:

- Infrastructure sharing

- Scalability
- Self service
- Pay-per-use

Scalability: To handle ever increasing workload demands and support the entire enterprise, cloud computing must have the flexibility to significantly scale IT resources.

Self service: Cloud computing provides customers with access to IT resources through service-based offerings. The details of IT resources and their setup are transparent to the users.

Pay-per-use: Because cloud resources can be added and removed according to workload demand, users pay for only what they use and are not charged when their service demands decrease.

Infrastructure sharing: Cloud computing enables dynamic sharing of resources so that demands can be met cost effectively.

Benefits of cloud based solutions:

* Lower upfront cost to get started, lower time-to-market (as it takes less time to get a customer going on a cloud solution), allows the company to focus on the core business and not worry about hiring and constantly training its staff on the new technology etc.

* On the flip side for a Cloud-based solution, certain segment of customers such as large Banks and Financial institutions, Insurance companies may have security constraints in letting their data reside outside its premises (in their own data centers).

(c) What are open source software and why are they in demand ? List the key criterion of OSD compliance. 5

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

Some of the reasons why OSS are in demand are:

* Transparency of code : Since the code is publicly available, users can see the code.

* Flexibility: It allows developers to see how the code works and make changes to it. Flexibility is one of the biggest open-source software advantages.

* Cost: OSS is often free or cheaper than proprietary software.

* Security: OSS is more secure than its proprietary software.

* Availability of customer support : In OSS companies offer dedicated customer support services to assist users. This includes helpdesk, hotline where users can reach out for assistance, online forms, discussion boards etc.

Some key criterion for OSD compliance are:

- Free Redistribution : The license should allow any party to sell or give away the software as a component of a larger software distribution containing programs from multiple sources.
- Source Code : The program must include source code, and must allow distribution in source code as well as in executable form.
- Derived Works : The license must allow changes to the existing source code and must allow them to be distributed under the same terms as the license of the original software.
- No Discrimination against specific applications : The license must not restrict anyone from making use of the program in a specific scenario.
- License must Not Be Specific to a Product: The rights attached to the program must not depend on the program being part of a particular software distribution.
- 

4.

(a) Discuss the key characteristics of printers on the basis of quality of print. 4

Classification of printers on the basis of quality:

1. Ink-jet Printer: The Inkjet printer works on inkjet technology and produces better quality printouts than dot matrix printers. These print by spraying a controlled stream of tiny ink droplets accurately on the paper forming either dot matrix or solid characters. The printing quality of these printers is very good with a speed of 700 or more characters per second. These are non-impact and hence are relatively silent during the printing process. These printers are easy to use and can be used to print color pages.

2. Laser Printer : This is a high quality, high speed and high volume technology printer. In laser printers, a laser beam is used to produce an image on a drum. The light of the laser alters the electrical charge on the drum wherever it hits it. The drum is then rolled through a reservoir of toner, which is picked up by the charged portions of the drum. Finally, the toner is transferred to the paper through a combination of heat and pressure. Laser printers produce very high quality text and graphics but are expensive. The technology used by them is the same as that of photocopying machines. The speed of laser printers varies from 10 pages per minute to 200 pages per minute. Laser printers are also called page printers; because they print a whole page at one go.

Standard laser printers can be classified into two categories in terms of color:

* Monochrome laser printer, and

* Color laser printer

Monochrome laser printers use a single toner. Color laser printers use four toners to print in full color. These printers are about five to ten times as expensive as their monochrome siblings. Color laser printers are popular and are being widely used, in spite of their cost. To print documents with graphics and photographs a color laser printer is a good option. Print speed, quality, printer resolution, reliability and the costs of toner are the major deciding factors for choosing a printer.

(b) What are utility softwares ? Explain the following utility softwares : 10

(i) Disk Defragmenter (ii) CHKDSK (iii) Data compression (iv) Disk management

Ans:

Utility software: The utility software is system software that helps to maintain the proper and smooth functioning of a computer system. Utility programs help manage, maintain and control computer resources. Utility software performs specific tasks to improve the performance, security and functionality of a computer system.

Some of the examples of utility programs are :

Anti-virus software, backup utilities, diagnostic programs.

(i) Disk Defragmenter :

Ans: 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.

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. The following are the main benefits of defragmenting a hard drive:

* 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.

* Files stay organised: Over time, adding and deleting files from a hard drive can make the data scattered, especially if it's running low on storage space. Defragmentation organises the individual files, resulting in improved hard drive speed.

 * Unused space is freed. Any unused space on a hard drive can be maximized by fragmentation. Sometimes, it can also create more usable space if bits of data are left over from deleted files.

* HDD life is extended: With regular defragmentation, the files on a hard drive stay organised. This means the mechanical and spinning components of a h hard drive aren't used as extensively, which in turn extends the life span of a hard drive.

(ii) CHKDSK

Ans: 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.

(iii) Data compression

Ans: Data compression 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.

Text files are generally reduced more than the graphics file after compression. Similarly after zipping a file you need to unzip it, in order to view its contents or get it into its originalD form.

Steps to zip a file:

1. Right- click on any file you want to zip
2. Click WinZip from the shortcut menu
3. Click add to zip file
4. It will create .zip file

Steps to unzip file:

1. Right- click on any .zip file you want to unzip

2. Click Extract from the shortcut menu.

(iv) Disk management

Ans: 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.

How to open Disk Management:

1. Click My Computer, and then open Control Panel. Click Administrative Tools, and then double-click Computer Management.
2. In the console tree, click Storage and then click Disk Management.

You can also open Disk Management in following way :

1. Click Start, then click Run, type compmgmt.msc, and then click OK.

2. In the console tree, click Disk Management. The Disk Management window appears.
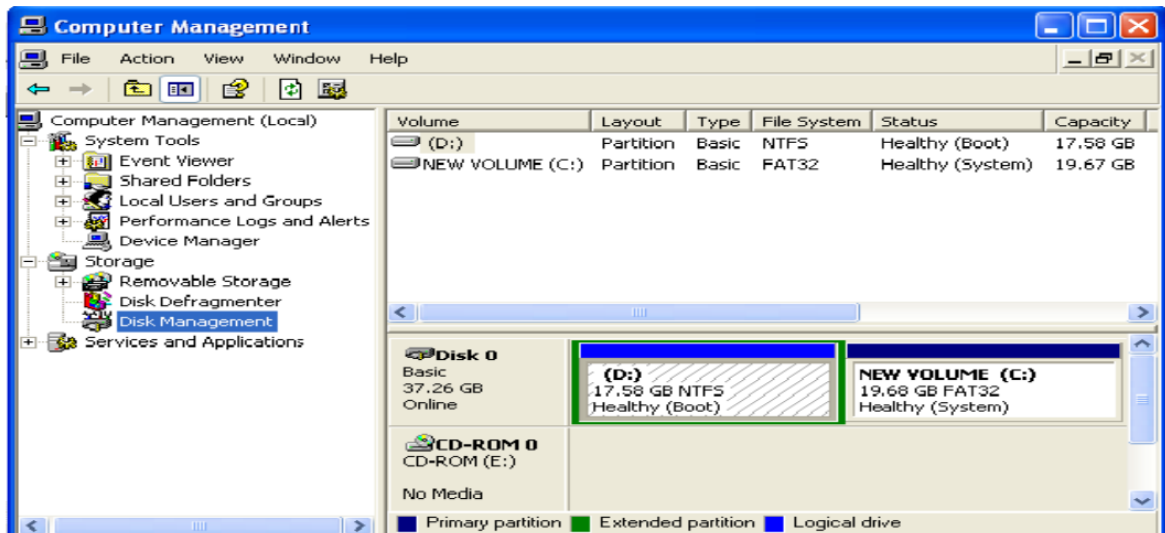
In Disk Management window, the upper section displays lists of all the partitions in the disk, and the bottom section contains the graphical representation of the drives in the computer.

(c) Describe the TCP/IP model with the help of a diagram. 6

Ans: 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. Currently two standard versions of IP are available viz. Internet Protocol Version 4 (IPv4) which is currently being used on most of the Internet. An IPv4 address is a 32 bit address.

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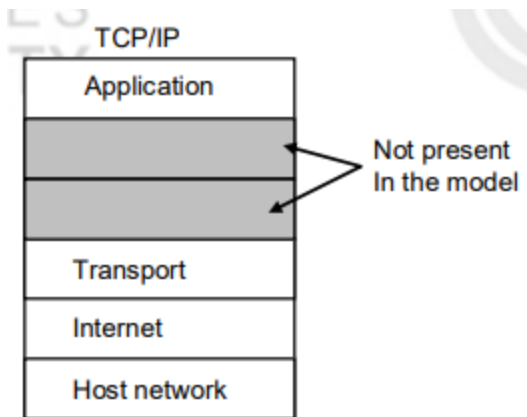
TCP/IP was originally designed for the UNIX operating system; however, TCP/IP software is now available for every major operating system. In order to be compatible to the Internet, the computer must have TCP/IP compatible software. The major advantage of Internet is information sharing. Since in computers,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

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

For sending large block of text/data to another machine, TCP divides the data into little data packets. It also adds special information e.g., the packet position, error correction code etc. to make sure that packets at the destination can be reassembled correctly and without any damage to data. The role of IP here is to put destination addressing information on such packets. On Internet, it is not necessary that all the packets will follow the same path from source to destination. A router tries to load balance various paths that exist on networks. Other gateways allow different electronic networks to talk to Internet that uses TCP/IP.

The Internet layer is an important layer in the protocol suite. At this layer, TCP/IP supports Internet Protocol (IP). This layer is responsible for the format of datagram or a packet as defined by IP and routing and forwarding a datagram or packet to the next hop (hop is a term that can be used to represent any computing device on Internet like; router, gateway, computer etc. A hop is the trip from one device to the next.) The primary goal of the Internet is to provide an abstract view of the complexities involved in it. Internet must appear as single network of computers. At the same time network administrators or users must be free to choose hardware or various internetworking technologies like Ethernet, Token ring etc. Different networking technologies have different physical addressing mechanisms. Therefore, identifying a computer on Internet is a challenge. To have uniform addressing for computers over the Internet, IP defines an IP address, which is a logical address. IP address is a 32 bits number, can be represented in decimal e.g., 192.168.32.10. Now, when a computer wants to communicate with another computer on the Internet, it can use logical address and is not bothered with the physical address of the destination and hence the format and size of data packet. IP address is a basic address used by the lower architecture of Internet. It is important for you to know that, any address you type as web address or email address actually gets converted into the equivalent IP address of a machine or computer where the server or resource is available. Web address or email addresses are used for ease and convenience of human beings otherwise; it is just a burden for network.

The TCP/IP model has many layers which are described below:

**TCP/IP**
- Application
- *Not present In the model* (grey bands)
- Transport
- Internet
- Host network

Host to Host Network:

In fact TCP/IP model does not specify this layer. But it basically combines functionality of physical and data link layers. Starting at the bottom, the Physical layer is what deals with hardware (wires, cables, satellite links, NICs, etc.). Utilizing the existing Physical layer, TCP/IP does not define its own, thus letting the layer be compatible with all network suites. This layer also encodes and transmits data over network communications media in the form of bits which are received by the Physical layer of the destination device. Often combined with this layer is the Data link layer which is responsible for moving packets from the network layer onto different hosts. Depending on the connection type, IP packets are transmitted using various methods. Dial-up modems transmit IP packets using PPP(Pointto-Point Protocol)while broadband users transmit using PPoE.(Point-to-Point Protocol over Ethernet).

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

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

The top layer of the TCP/IP model is the Application layer which is used for network communication. Ports are used by programs to transfer data through this layer. For

example, the File Transfer Protocol uses port 21 by default while the Hypertext Transfer Protocol uses port 80.

TCP/IP has many benefits. TCP/IP enables cross-platform networking which is useful in this day-in-age. This suite also has superior failure recovery and the ability to add networks without interrupting existing services. The reliability of TCP/IP is also a huge benefit to using this protocol. The fact that if one part of the network goes down, other parts are still able to function is what has set TCP/IP above other networking protocols. TCP/IP is also easily expandable which allows for the unprecedented rate of growth which the Internet possesses.

5.

 (a) Draw a flowchart to find whether a given number is even or odd. 6

Ans:
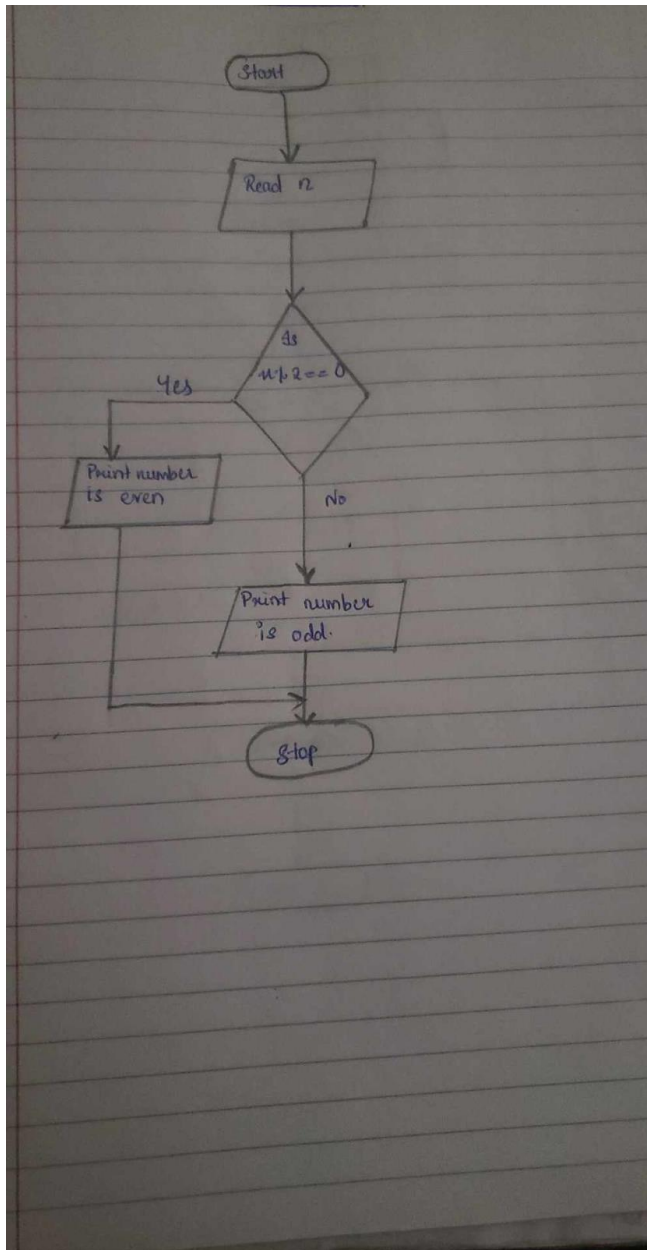
(b) What is software project management ? Explain various project management activities. 8

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.

The different project management activities which can be performed using the Project Management Software are:

* 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.

* Calculating critical path

In many complex schedules, there will be a critical path, or series of events which depend on each other, and whose durations directly determine the length of the whole project. Some software applications (for example, Dependency Structure Matrix solutions) can highlight these tasks, thus helping in optimization of effort.

* Providing information Project planning software provides information to various stakeholders of the project and can be used to measure and justify the level of effort required to complete the project. Typical information might include:

1. Tasks lists for team members

2. Allocation schedules for resources

3. Overview information on how long tasks will take to complete

4. Early warning of any risks to the project

5. Information on workload, for planning holidays

6. Historical information on how projects have progressed, and in particular, how actual and planned performance are related

7. Optimum utilization of available resources

* Timesheet Management

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.

(c) What is mail merge ? Explain various steps of mail merge with the help of an example. 6

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.
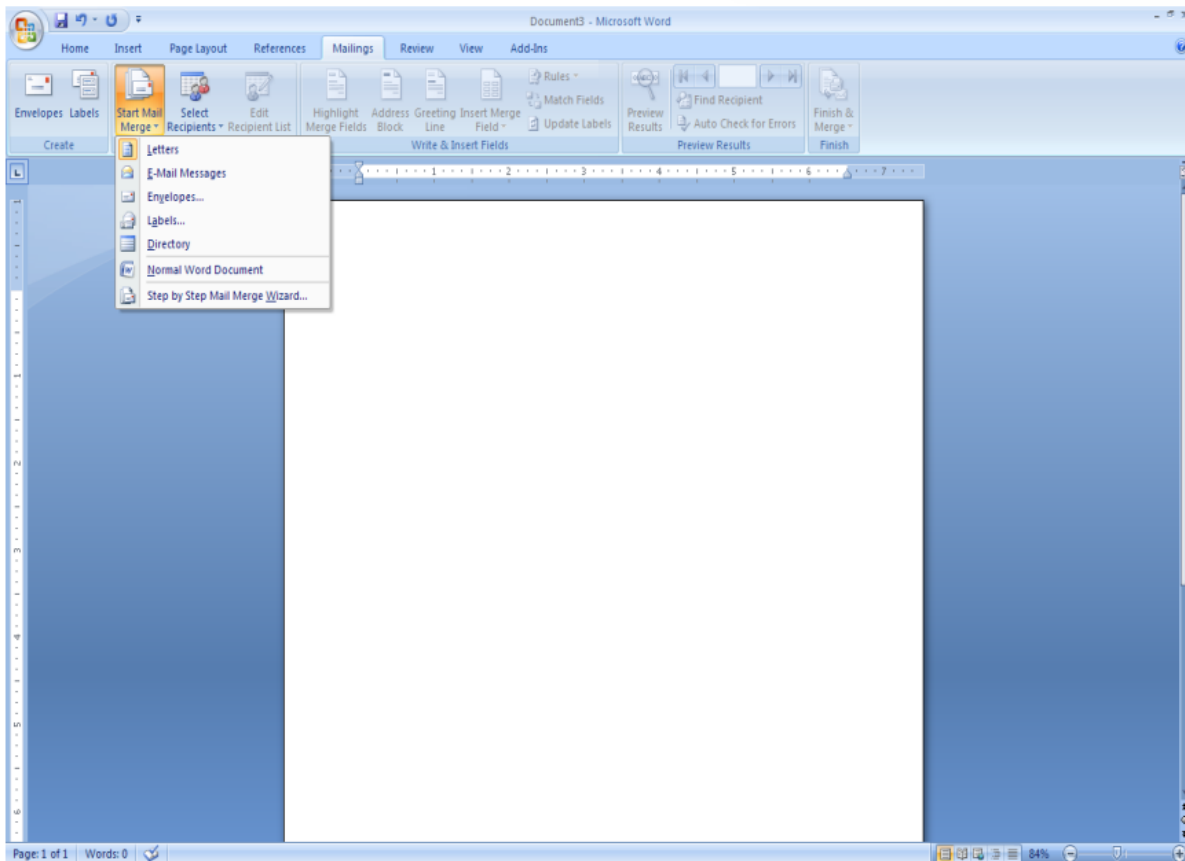


3. Refine the list of recipients or items. Microsoft Office Word generates a copy of the main document for each item, or record, in your data file. If your data file is a mailing list, these items are probably recipients of your mailing. If you want to generate copies for only certain items in your data 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.

For example, sending a letter to the students of a class giving their grades in different subjects using mail merge.

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.


In the above example,

Dear [Student Name],

Congratulations! Here are your grades for this semester : Mathematics [Math]  Social [Social ] English [English]   Hindi [Hindi]

2. Connect the document to a data source. A data source is a file that contains the information to be merged into a document. In the above example, data source will contain

| Student Name | Math | Social | English | Hindi |
|---|---|---|---|---|
| Jim | 89 | 90 | 95 | 80 |
| John | 98 | 85 | 90 | 95 |

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.

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.

In the template letter, replace the placeholders

Dear [Student Name],

Congratulations! Here are your grades for this semester : Mathematics [Math Mark]  Social [Social Mark] English [English Mark]   Hindi [Hindi Mark]

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