BCS-011 : COMPUTER BASICS AND PC SOFTWARE

June 2019

1.

(a) Your computer has an IP address of 202.41.15.57. You are planning to communicate with a computer on the same network that has an IP address of 202.41.15.116. What is the subnet mask ? 4

Ans: To identify what the subnet mask is in a network communication between two computers, first we need to know Net ID of both the devices.

Convert the IP addresses to binary:

202.41.15.57 : 11001010.00101001.00001111.00111001

202.41.15.116 : 11001010.00101001.00001111.01110100

Identifying the common net ID:

The common network ID in binary is 11001010.00101001.00001111 - the first 24 bits

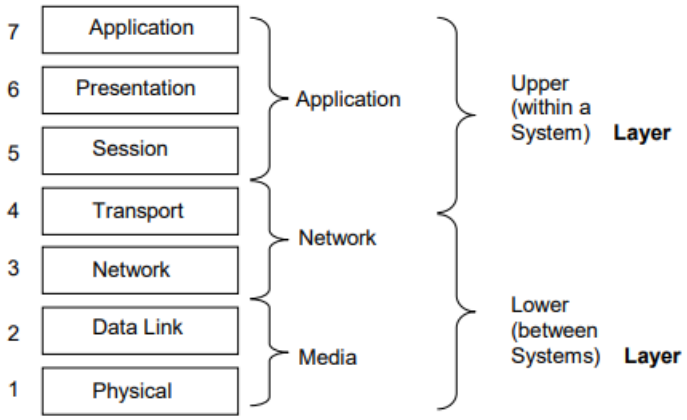
The subnet mask for a common network portion of 24 bits is 255.255.255.0

(b) What is the OSI model ? List the layers of the model from the lowest layer upwards. 4

Ans: OSI stands for Open Systems Interconnection. It was developed by ISO (International Organization for Standardization) in 1984. The OSI model is an abstract description for layered communications and computer network protocol design open system means that it can communicate with any other system that follows the specified standards, formats and semantics. Protocols specify how the different parties may communicate. It is a seven-layer architecture with each layer having specific functionality to perform. All these 7 layers work together to transmit data from one person to another across the globe. It is also referred to as the OSI Seven Layer Model.

A layer is a collection of conceptually similar functions that provide services to the layer above it and receives service from the layer below it. On each layer an instance provides services to the instances at the layer above and requests service from the layer below

The following are the layers of OSI model:



The OSI model is divided into two layers: upper layers and lower layers.

The upper layer of the OSI model mainly deals with the application related issues, and they are implemented only in the software. The application layer is closest to the end user. Both the end user and the application layer interact with the software applications.

The lower layer of the OSI model deals with the data transport issues. The data link layer and the physical layer are implemented in hardware and software. The physical layer is the lowest layer of the OSI model and is closest to the physical medium. The physical layer is mainly responsible for placing the information on the physical medium.

In its most basic form, it divides network architecture into seven layers which from top to bottom are the Application, Presentation, Session, Transport, Network, Data Link, and Physical Layers. In transmission side data flows from layer 7 to layer 1, then to cabling or suitable medium. When data reaches the reception side, it flows from layer 1 to layer 7.

Application Layer:It is the top-most layer of the OSI reference model. This layer is the layer for user interaction. We must have application software for dealing with the data.

Presentation Layer: It converts the data into suitable format. It does tasks like compression, decompression, encryption and decryption.

Session Layer: This layer manages connections between different application layers. This layer is responsible for the establishment of connection, maintenance of sessions, and authentication and ensures security.

Transport Layer: The transport layer provides services to the application layer and takes services from the network layer. This layer converts data into segments and reassembles the data stream. TCP and UDP are the protocols used in this layer. In this layer, data is converted into so called segments. It is responsible for the end-to-end delivery of the complete message. The transport layer also provides the acknowledgement of the successful data transmission and re-transmits the data if an error is found.

Network Layer: This layer translates logical address into physical address. This layer also fixes the route for data path. Router works in this layer. In this layer data is called a packet.

Data-Link Layer: This layer provides physical identification of a device using Media Access Control Address. The data link layer is responsible for the node-to-node delivery of the message. The main function of this layer is to make sure data transfer is error-free from one node to another, over the physical layer. It adds source and destination address to packets and convert them into frames. This is the layer that provides error free transmission.

Physical Layer: The lowest layer of the OSI reference model is the physical layer. This layer provides the functional requirements for activating a physical link. In this layer, data is carried from one device to another.

(c) Write down the 9 logical and relational operators in C, giving the function of each. 5

Ans: 9 logical and relational operators in C are:

== (equal to) : Returns true if both the operands are equal.

!=(Not equal to) : Returns true if both the operands are not equal.

<(less than): Returns true if the left operand is less than the right operand. Else false

<=(less than equal to): Returns true if the left operand is less than or equal to the right operand. Else false.

>(greater than): Returns true if the left operand is greater than the right operand. Else false.

>=(greater than equal to): Returns true if the left operand is greater than or equal to right operand. Else false.

&& (logical AND): Returns true if both the operands are true.

|| (logical OR): Returns true if both or any of the operands are true.

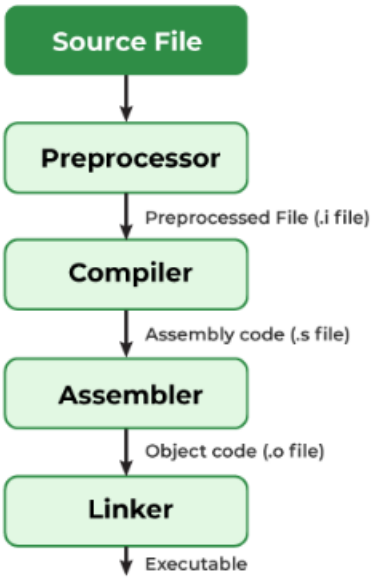
! (logical NOT): Returns true if the operand is false.

(d) What is a compiler ? Draw a diagram showing the different stages of the program compilation process. 6

Ans: Compilers: 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..

Different stages of program compilation:



Preprocessor : To write a program in any of the programming languages requires an editor. This is a program that is used to create text files. 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.

This source code is first passed to the preprocessor, and then the preprocessor expands this code. After expanding the code, the expanded code is passed to the compiler.

Compiler : Assembly language is a low level programming language similar to machine language, but far easier to write and understand because machine language binary instructions and operands are replaced by mnemonics that are comprehensible to humans. A Programming Language is different from machine language, which is understood by a computer in the sense that it can be directly executed. Hence a program in any higher level programming language like C requires a translation process that can translate the source program into machine code so that it can be executed by the computer.

An additional program called a compiler translates a program written in a programming language; into a new file that does not require any other program to execute itself, such a file is called an executable. The output is a mnemonic version of machine code.

Assembler: It converts assembly level language code into machine language code. It inputs assembly level code. The output is binary code.

Linker: All the programs written in C use library functions. These library functions are pre-compiled, and the object code of these library files is stored with '.lib' extension. The main working of the linker is to combine the object code of library files with the object code of our program.

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.

(e) Let x = 6 and y = 5. What are the values of (i) x! = y (ii) x < y (iii) x % y (iv) (x > 6) I I (y ! = 5) 5

(i) x! = y

Ans: 6!=5

True

(ii) x < y

Ans: 6<5

False

(iii) x % y

Ans:6%5

1

(iv) (x > 6) I I (y ! = 5)

Ans: (x>6)-false

(5!=5)-false

False||false

False

(f) What is meant by the configuration of a Personal Computer ? Write down the configuration of a typical workstation used for software development work. 6

Ans: Configuration of a PC usually mean the technical details of the System. Many software's require that computer must have some minimum requirements so that the software can run properly on that system, hence we need to check the configuration of the system.

The specification details generally include speed of the processor, RAM, Hard-Disk Drive, Video card, etc. The configuration of one computer may vary from others. Generally configuration of a computer depends on the user requirement for example, a user who mostly works on multimedia software, graphics software, scientific computation etc., needs more powerful computer rather than a normal PC user.

Before purchasing a PC one should be aware about the different components of a PC and its typical configuration so that one can make a suitable choice. When one visits a PC shop for purchasing a PC, one clearly need to state what will be the storage capacity of your hard-disk, processor speed and its type, the amount of RAM you want to have in your PC, different ports and connector etc.

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Processor plays major role in a computer. One should carefully decide about the type of processor and its speed before making a choice.

Typical Configuration of a Workstation:

Processor: Intel Core Processor (3.20 GHz)

Memory: 4GB 1333MHz

Hard Disk: 500GB,

RAM – 2GB

Here GHz is known as gigahertz. The speed of the processor is generally measured in gigahertz. 1 GHZ equals to 1 billion cycles per second. Similarly MHz is called as megahertz. 1 MHZ is equal to 1 million cycles per second. GB or Gigabyte is the measurements of the digital data in a computer. 1 GB is equal to 1024 Megabytes (MB).

(g) What is the desktop in a Personal Computer ? What are the items typically found in it ? 4

Ans: Desktop which is a part of Graphical User Interface (GUI). A desktop is a place which holds icons, files, folders etc. Desktop is a visible image which covers the entire screen. The desktop environment provides GUI to the Personal Computer users. On the desktop you can find several small images called as icons. These Icons may also be found on the toolbars and in the menus of computer application software such as Microsoft Word, Microsoft Excel etc . Icons are more user-friendly compare to text-based commands.

Desktop is the background area on our computer screen. We can customize our desktop in several ways. We can add background picture, background color etc. on a desktop. Icons on a desktop are small graphical images which represents various items found on a desktop such as my computer, recycle bin, my documents etc. We can also rename an icon by right-clicking on it.

Some of the commonly used items found on a Desktop are:

* My Computer

* My Documents

* Recycle Bin

* Task Bar

My Computer: This icon displays the main components of your computer. You can open any of the items in this window to further examine the components of your computer by clicking on my computer icon. It displays different drives/disks attached with the computer.

My Documents: It is the default space where all the files are stored unless we specifically instruct the computer to save at a specified location. It is a special folder where the system stores user's files, pictures, music, download etc.

Recycle Bin: In Windows Operating System, Recycle Bin is a temporary folder which holds files and folders before it is permanently deleted from the storage devices. The Recycle Bin only stores, files deleted from hard drives, not from removable media, such as memory cards and pen drive/ flash drives. It also doesn't store files deleted from network drives. We can also restore the files from the recycle bin to its original location.

Taskbar: The taskbar is the long horizontal bar at the bottom of your screen. It is used to launch and monitor running applications.

(h) List the five parts of a communication system and mention the role of each. 6

Ans: Five parts of a communication system are:

1. Source
2. Encoder
3. Channel

4. Decoder
5. Destination

Source: Source produces a message or sequence of messages to be communicated to the receiver. The source output may be in many different forms such as a waveform, a sequence of binary digits, and a set of output from sensors in a space probe, or many other similar forms. The node can be a computer, mobile device, telephone, laptop, video camera, workstation, etc..

An Encoder: Encoder represents any processing of the source messages/ signals prior to transmission. The processing might include, for example, any combination of modulation, data reduction and insertion of redundancy to combat the channel noise.

Channel: Channel is the medium for transmitting signals from transmitter to receiver.It acts as a bridge between sender and receiver. The transmission is the physical path from the sender to the recipient where the information or message passes. It may be a telephone line, a high frequency radio link, a space communication link or a storage medium. A channel is usually subject to various types of noise disturbances, which on telephone line, for example, might take the form of a time-varying frequency response, crosstalk from other lines, thermal noise, and impulsive switching noise. A channel subject to noise is called noisy channel. An error-correcting code corrects errors due to noise. The examples of transmission medium are twisted pair cable, fibre optic cable, radio waves, microwaves, etc. The transmission medium could be guided (with wires) or unguided (without wires).

The Decoder: A decoder represents the processing of a channel output received from the channel to produce an accepted replica of the input at the destination.

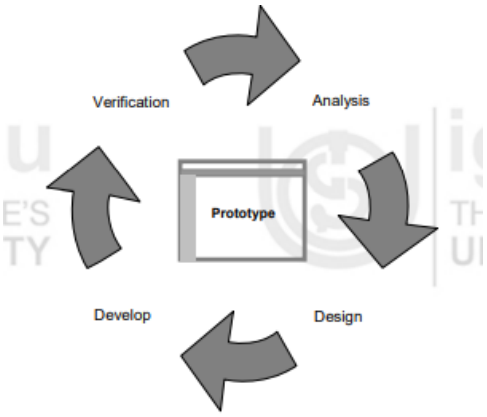
The Destination: Destination is the receiver. It may be the person or object for whom the message is intended. The receiver is in the form of a computer, cell phone, workstation, etc., identical to the sender.

2.

(a) Explain, with the help of a diagram, the process of developing content for an e-learning course. 8

Ans: 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.

(b) List the features of second and third generation computers. 6

Ans:

Second Generation computers:

The second generation computers were used during 1956-1963. These computers replaced vacuum tubes with transistors. Solid-State components (transistors and diodes) and magnetic core storage formed the basis for the second generation of computers. They are also known as

transistor computers. Transistor is a device composed of semiconductor material that amplifies a signal or opens or closes a circuit.

Transistors perform the same functions as a vacuum tube, except that electrons move through solid materials instead of through a vacuum. Transistors were made of a semiconducting material and controlled the flow of electricity through the circuit. They also allowed computers to become smaller and more powerful and faster at the same time. They are also less expensive, required less electricity and emitted less heat than vacuum tubes. Manufacturing cost was also very low.

It is in the second generation that the concept of Central Processing Unit (CPU), memory, programming language and input and output units were developed. Second-generation computers moved from cryptic binary machine language to symbolic, or assembly, languages, which allowed programmers to specify instructions in words.

These were also the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology.

In this generation, assembly language and high-level programming languages like FORTRAN, COBOL were used. Examples: PDP-8, IBM1400 series, IBM 1620, IBM 7090, CDC 3600

Features:

- Smaller in size: The second generation of computers are much more smaller in size than the first generation computers. Transistors allowed computers to become smaller and more powerful and faster at the same time.
- Power/Energy requirement: The second generation of computers requires less amount of energy (i.e. electricity) compared to the first generation of computers and produces less heat than the first-generation computer.
- Speed: The speed of the second generation is faster as compared to the first generation. Calculation of data could be done in microseconds.
- Accuracy: They have improved accuracy.
- Portability: They offer better portability because of smaller size.
- These computers used batch processing and multiprogramming operating system.
- They used high-level languages such as FORTRAN, COBOL.

Third Generation computers:

The third generation computers were introduced in 1964. The computers of third generation used Integrated Circuits (ICs) in place of transistors. The integrated circuit is a semiconductor material, that contains thousands of transistors miniaturized in it. These ICs are popularly known as chips. With the help of IC, the computer becomes more reliable, fast, required less maintenance, small in size, generates less heat, and is less expensive.

The third generation computers reduce the computational time. In the previous generation, the computational time was microsecond which was decreased to the nanosecond.

The high level programming languages such as BASIC, PASCAL, ALGOL-68, COBOL, FORTRAN-II was used in third generation computers.

During the third generation, the computer has a large storage capacity than the previous generations.

Examples: NCR 395, B6500, IBM 360,370

Features:

* Instead of using individual transistors, the computers made in the third generaiton used integrated circuits technology.

* Compared to second generation computers, 3rd generation computers were cheaper in price, smaller in size, less heavy in weight, faster in speed and more efficient.

* The computers have high storage capacity (magnetic storage).

* The production of energy and heat was less as compared to the previous generation of computers.

* The high level programming languages such as BASIC, PASCAL, ALGOL-68, COBOL, FORTRAN-II was used in third generation computers.

* Multiprogramming operating systems, time-sharing, and remote processing were introduced in this generation.

(c) What is the function of the memory management system of a computer ? Explain the primary tasks it needs to perform. 6

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

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

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

3. When space is available, it allocates memory to the programs that are next to be loaded. It also de-allocates a program's memory space when it completes execution. The de-allocated space is made available for other programs.

3.

(a) Discuss the following briefly :

(i) Batch processing

Ans: Early machines were very expensive, and therefore it was important to maximize machine utilization. To improve utilization, the concept of batch operating system was developed. In the early 1950s, General Motors Research Laboratories announced the first batch operating system for use on IBM 701.

In batch operating system the jobs were performed in batches. This means jobs having similar requirements are grouped and executed as a group to speed up processing. The central idea behind the batch processing system was the use of a piece of software known as the monitor. With the use of this type of operating system, the user no longer had direct access to the machine. Rather, the user submitted the job on cards or tape to a computer operator, who batches the jobs together sequentially and places the entire batch on an input device, for use by the monitor. Many business tasks such as banking and insurance operations are performed much effectively in a batch.

(ii) Online processing

Ans: In online processing, the user the user is connected directly to the computer. When the system is interactive, the user interacts directly with the program to provide input data and guidance during program execution. This is called online processing. Interactive systems are sometimes known as conversational systems. An online processing system handles transactions in real time and provides the output instantly.

In online processing, data is processed immediately, allowing users to interact with and receive responses to their inputs without delay.

(iii) Diskless workstations

Ans: Diskless workstations are also known as thin clients. It is a personal computer that does not have its own disk. It relies completely on the network for its data and program storage and access. It employs network booting to load its operating system from a server.

Advantages of diskless nodes can include lower production cost, lower running costs and quieter operation.

One disadvantage of diskless workstations is that they are useless if the network fails.

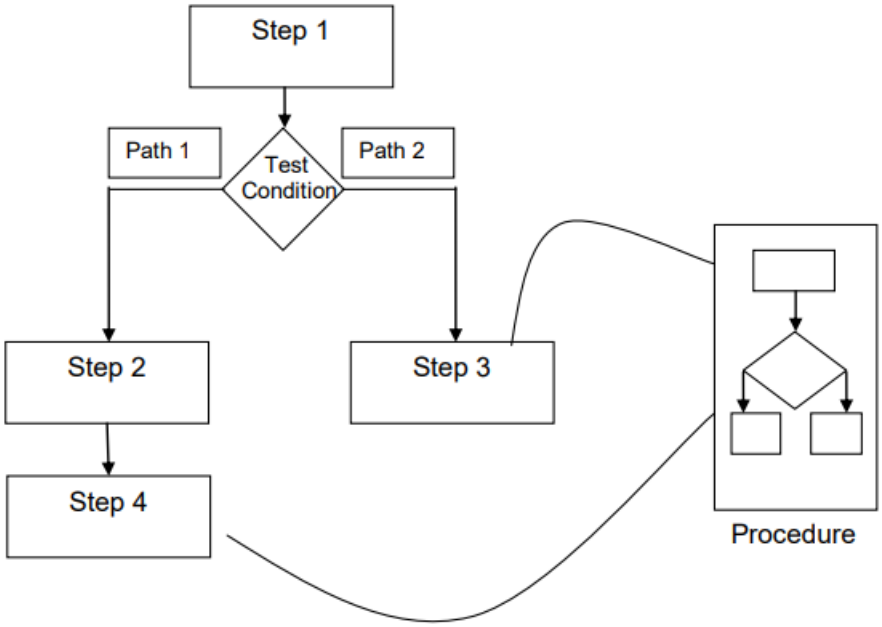
(iv) Operating system kernel

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.

(b) Describe the structured and modular design paradigm with the help of a diagram and pseudo code. 8

Ans: It follows top-down approach. It introduced the concept of selection and repetition of statements in code execution along with the line by line execution. Programs are divided into objects or entities. It emphasizes breaking down a system into smaller, more manageable components. Code must be more flexible and modular, making it suitable for more straightforward, linear tasks. It is less secure as there is no way of data hiding. It gives more importance on code. Its main aim is to improve and increase quality, clarity, and development time of computer program. It simply focuses on functions and processes that usually work on data.Structured design paradigm introduced the concept of selection and repetition of statements in code execution along with the line by line execution. It allowed writing of procedures and functions. These are the terms used for a block of code that is written to perform a single task. Procedures and functions were the beginning of compartmentalization and hence reusability of program code. Procedures and functions which were for similar purpose were grouped together to get a module. A big software application consisted of multiple modules, each performing a particular task.

Structural design allowed modules to be reused in the form of Software Evolution code libraries.



In the above diagram, the same procedure is invoked from step 3 and step 4. There is also a selection of paths to be followed. The two paths would be either steps 1,2,4 or steps 1,3.

The sample pseudo code for the above flow could be:

Accept user input in X

Accept user input in X

    Add 1 to X

    Call procedure PrintPrime(X)

Else

    Call procedure PrintPrime (X)

Procedure PrintPrime (Y)

    Accept Y and Check if Y is prime number

If Y is prime

    Display —"Y is prime number"

else

    Display —"Y is not prime number"

(c) What is volunteer computing ? Give an example of such computing. 4

Ans: Volunteer computing is a type of distributed computing in which computer owners can donate their spare computing resources (processing power, storage and Internet connection) to one or more research projects. It offers a cost-effective and scalable solution for computation resources. Volunteer computing can provide researchers with computing power that is not achievable any other way. A CPU generally uses more electricity when it is active compared to when it is idle. In order to participate by the PC may be left on overnight. If the computer cannot cool itself, the added load on the volunteer's CPU can cause it to overheat. If the volunteer computing application runs while the computer is in use, it may impact performance of the PC. This is due to increased usage of the CPU, CPU cache, local storage, and network connection.

One such project that is hosted by Space Science Laboratory at the University of California, Berkley is for Search of Extra-Terrestrial Intelligence called SETI@Home.

4.

(a) Draw the block diagram of a computer system and briefly explain the function of each of the main components. 8

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.)

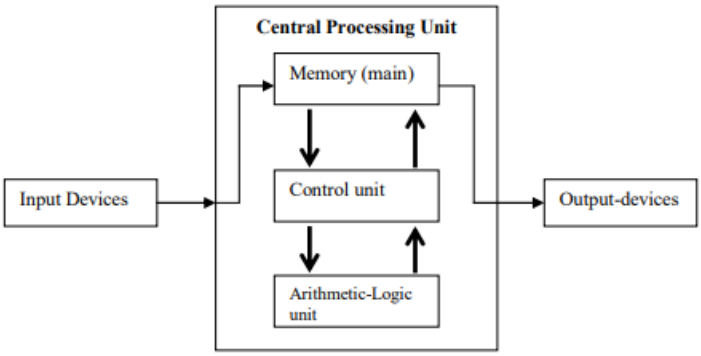
2. Processor (or CPU):

* Control unit (CU)

* Arithmetic and Logic Unit (ALU)

*Memory unit

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



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) What is a linker ? Explain its function with the help of a diagram. 4

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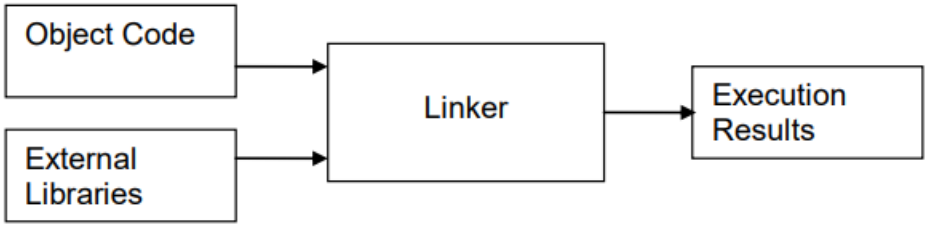
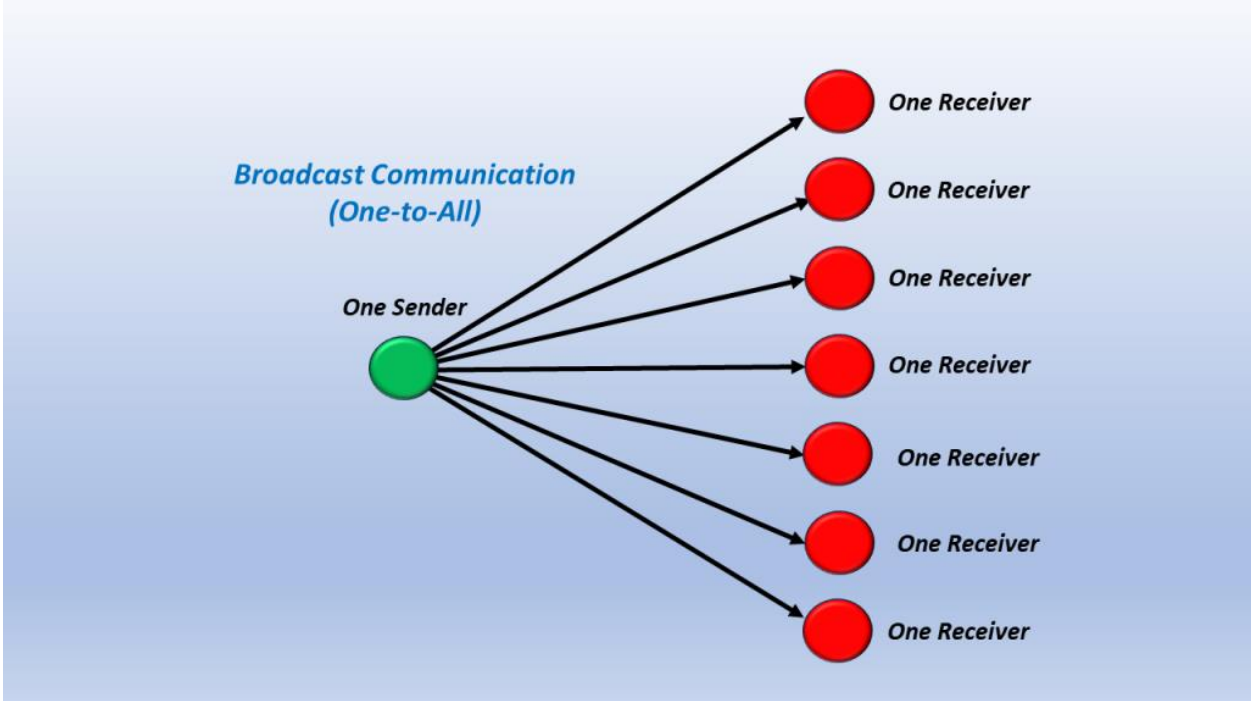


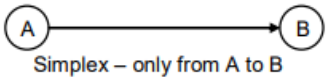
Linker

(c) Describe each of the following communication modes, bringing out the similarities and differences among them : 8 (i) Broadcast (ii) Simplex (iii) Half-duplex (iv) Duplex

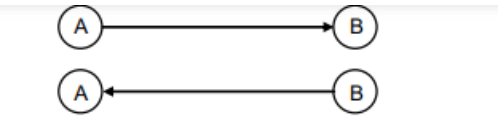
(i) Broadcast: If one source is transmitting signal and any destination that is in the range may be able to reach it then it is called broadcast. Broadcasting in computer networks is a type of communication mechanism that allows the message to be received by all the nodes of a network. It is a one-to-all communication method. The word broadcast is used for transmission of signals from radio or televisions.



(ii) 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.

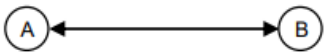


(iii) Half duplex communication: It is an extension of simplex communication. It is a bi-directional communication, although in only one direction at a time. It is a two-way communication in which both the devices can send and receive data but not at the same time. When one device is sending data then 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

(iv) 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

5. Explain any five of the following with the help of examples or diagrams wherever required: 5*4=20

(a) Hark disk defragmenter utility

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.

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

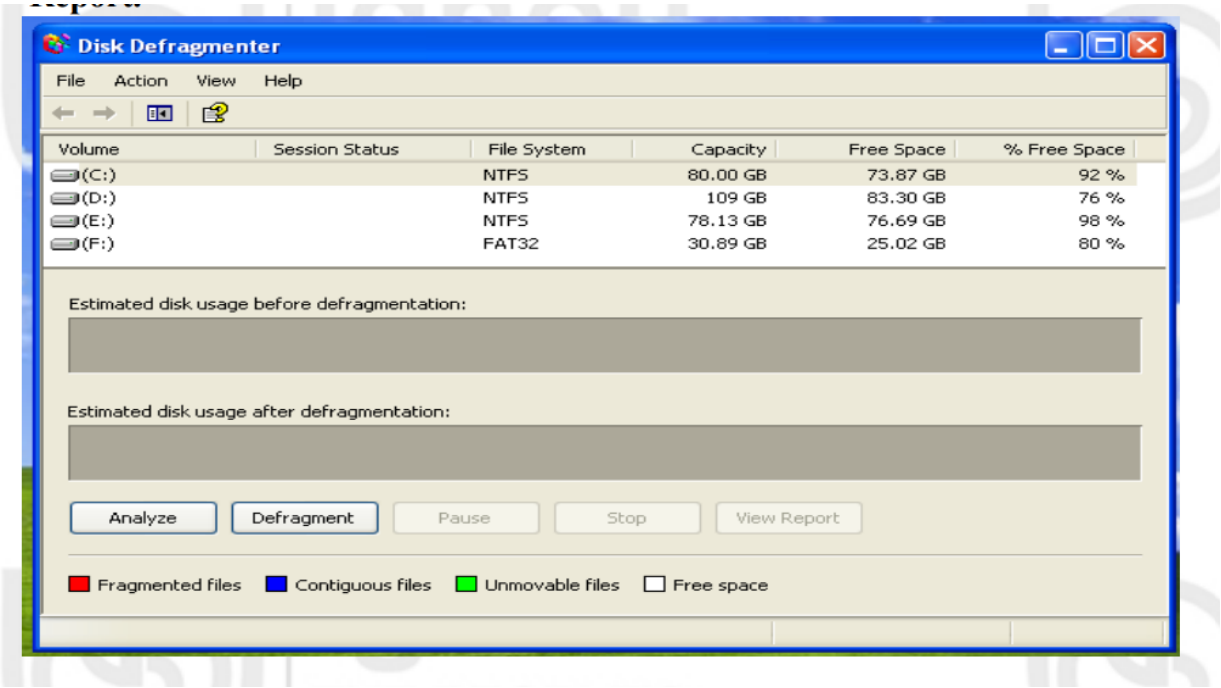
* Click Start button, select All Programs, click on Accessories click System Tools, and then click Disk Defragmenter.

* 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.



Disk defragmenter

(b) Video card of a Personal Computer

Ans: A video card is an expansion card , which is used to produce output images to a display in a monitor. Its main purpose is to generate graphical information. It is responsible for rendering the image on the monitor of a PC . It is also known as video adapter, display adapter or graphics card. A video card should be capable of displaying the best resolution supported by the monitor of the system. These days high performance video cards are available for gaming purposes which requires very high resolution. Video card consists of a circuit board which holds several components such as graphics processing unit (GPU), video memory, video BIOS etc. Video graphics array (VGA), Digital visual interface, high definition multimedia port etc are some of the common connection points used between video card and display.

High performance video cards are available, which has higher visual capability. With increasingly popularity of computer games video cards became one of the most important parts of a computer. One disadvantage of this high performance video card is that consume high power.

The amount of video memory in video card is one of the main considerations while opting for a video card. Advanced graphics port (AGP) and PCI-Express are the two commonly slots available which is used to connect a video card.

Video card

(c) Timesheet Management System

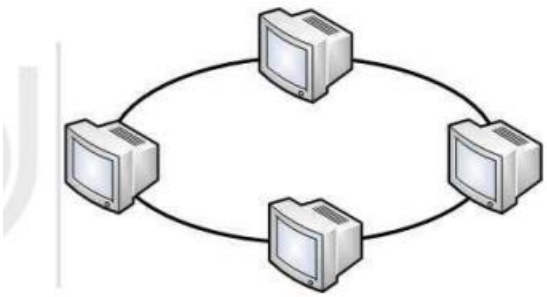
Ans: A good timesheet management system is essential both for the customer projects as well as internal activities within the organization. Timesheets not only help the Project Manager in managing the project in a better manner but is also useful for maintaining employee records for payroll calculations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

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

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

(d) Ring network topology

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



Ring topology

In this topology, each node is connected to two and only two neighboring nodes. The ring does not have an end. It is made of short segments that connect one PC to the next PC and so on Data is accepted from one of the neighboring nodes and is transmitted onwards to another node. Therefore, data travels in only direction from node to node around the rings. Since each computer retransmits what it receives, a ring is an active network and is not subject to signal loss problems. There is no termination because there is no end to the ring.

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

Advantages of ring topology:

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

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

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

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

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

Disadvantages of ring topology:

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

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

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

d) It is difficult to troubleshoot.

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

(e) Device drivers

Ans: Device drivers are shared computer programs that provide an interface between the hardware devices and operating system or other higher level programs.

Device drivers are essential for a computer system to work properly because without a device driver the hardware fails to work accordingly, which means it fails in doing the function/action it was created to do. Instead of writing the same code for a device in multiple applications you share the code between applications. To ensure that the shared code is not compromised, you protect it from users and programs. Such a piece of code is called the device driver.

Device drivers are hardware dependent and operating system specific. They allow you to add and remove devices conveniently from your computer system without changing any of the applications using that device.

Devices which require device drivers:

* Keyboards

* Mouse

* Printers

* Graphics cards

Functions of a device driver:

- The primary purpose of a device driver is to control or drive a device that is attached to your computer.
- It is a piece of software that enables communication between an operating system or application and hardware or peripheral devices.
- It serves as a bridge between the different components of a computer, allowing them to interact with each other.

- It is essential for the proper functioning of hardware components within a computer system. Without the appropriate drivers, the operating system may not be able to recognize or utilize the features of connected devices.
- The device driver also optimizes the performance of the device, such a adjusting the speed, resolution, or quality, depending on the system requirements and user preferences.

(f) Infra-red communication

Ans: 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.

Advantages :

- It is a very high speed transmission.
- It has a large bandwidth and can be used to transmit digital data with a very high data rate.
- Infrared systems represent a cheap alternative to most other methods, because there is no cabling involved and the necessary equipment is relatively cheap.

Disadvantages:

- It cannot be used for long range transmission.
- It cannot be used outside building as rays of sun contain infrared which leads to interference in communication.
- It can’t penetrate through obstructions like walls.

(g) Magnetic ink character recognition

Ans: Magnetic Ink Character Recognition is a character recognition system that uses special ink and characters. When a document that contains this ink needs to be read, it passes through a machine, which magnetizes the ink and then translates the magnetic information into characters.

MICR technology is used by banks for faster processing of large volumes of cheques. Numbers and characters found on the bottom of checks (usually containing the check number, sort number, and account number) are printed using Magnetic Ink. To print Magnetic Ink codes, we need a laser printer that accepts MICR toner.

MICR provides a secure, high-speed method of scanning and processing information. This technology is used for processing large volume of data. It speeds up data input for the bank because cheques can be directly fed into the input device as it also ensures accuracy of data entry. The most commonly used character set by MICR devices are known as E13B font which consists of the numerals 0 to 9, and four special characters.

Advantages:

- Since data does not need to be entered manually, there is less risk of the data being entered incorrectly
- They can be read even if someone writes over them

Disadvantages:

- Only certain characters can be written that the device will be able to interpret
- Its more expensive than most direct data entry method