BCS-011 : COMPUTER BASICS AND PC SOFTWARE

December 2018

1.

(a) A hypothetical simple computer has the following opcodes in its instruction set, each of which takes two operands that are given in the next 2 bytes :

00 Add (op1 + op2)

01 Subtract (opt — op2)

10 Multiply (op 1 x op2)

11 Divide (opl op2)

Write, in binary, the instruction that will carry out the calculation 46 x 75. 6

Ans: To write the binary instruction that will carry out the calculation 46 * 75:

Convert 46 and 75 to binary :

46: 101110

75: 1001011

To perform the multiplication operation using the binary representation of 46 and 75:

Opcode for multiplication is 10

46*75 : 101110*1001011

Result: 101110*1001011=4684 (1001001001100)

Therefore, the binary instruction that will carry out the calculation 46*75 using the given opcode is:

10 101110 1001011

This instruction represents the opcode for multiplication (10) followed by the binary representations of 46 and 75 as operands (101110 and 1001011).

(b) Explain Internet Protocol addressing with the help of an example. 3

Ans: Internet Protocol (IP) addressing is a system that uniquely identifies every device connected to the internet using a numerical code. For example, an IP address might look like 192.168.10.1. IP address is a 32 bits number, can be represented in decimal e.g., 192.168.32.10. is a series of four numbers separated by dots (.). The four numbers ranges between 0 and 255. So IPv4 address takes only 4-bytes (or 32-bits) of computer memory.

An IP address definition is a numeric label assigned to devices that use the internet to communicate. Computers that communicate over the internet or via local networks share information to a specific location using IP addresses.

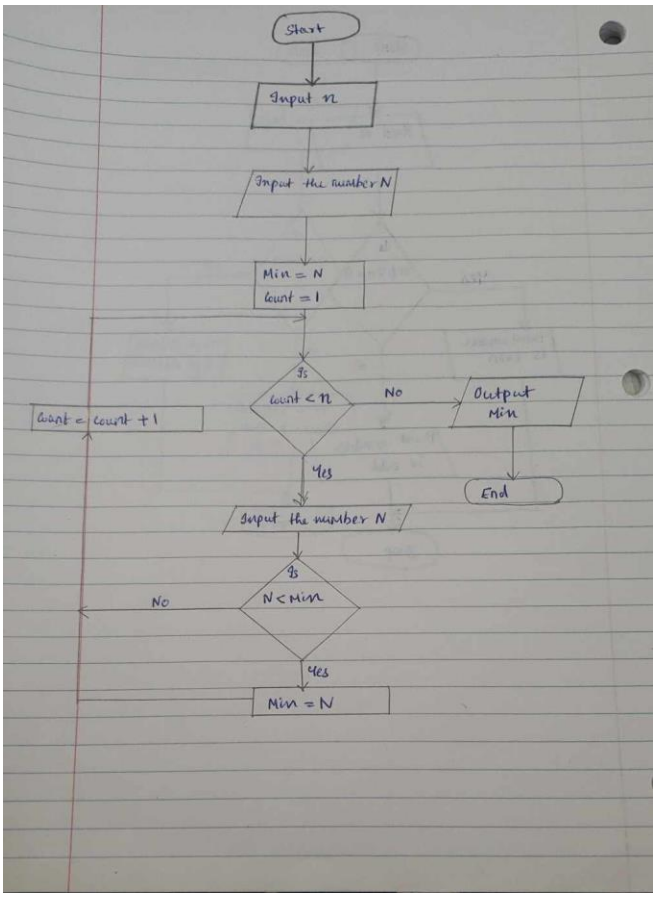
There are two versions of IP addresses that are commonly used on the internet : IPv4 and IPv6.

Every device, computer, printer or peripheral connected to a TCP/IP network must have its own IP address. Each 32 bit IP address consists of two components:

* Network Identifier (Net ID) – which identifies one of the Networks that is a part of Internet. A Net ID may be of 8 to 24 bits long.

* Device Identifier (Device ID) – which identifies a specific device within the identified Net-ID.

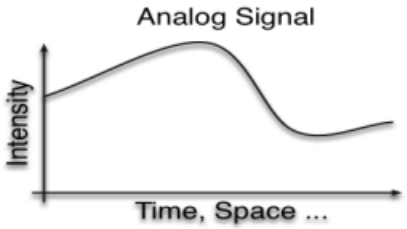
(c) Draw a flowchart that takes "n" numbers as input and produces the smallest of those numbers as output. 5



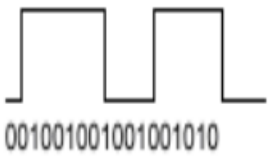
(d) Draw the graph for the following : (i) Analog signal (ii) Digital signal

Ans:

(i) Analog signal



(ii) Digital signal



(e) List any three features of cloud computing and describe each of them briefly. 6

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.

(f) 5

(i) What are the advantages and disadvantages of using CD as secondary storage ?

Ans:

Advantages of CD :

* Portability: CDs are compact and lightweight, making them easy to transport and store. This portability allows for convenient access to data on the go.

* Durability: CDs are relatively durable and resistant to scratches and dust compared to other storage options like floppy disks. This durability ensures the safety of data stored on CDs.

* Low cost: CDs are cost-effective storage solutions, especially when bought in bulk. They provide a budget-friendly option for storing large amounts of data. Cost per bit of storage is cheaper than the other types of memory devices.

Disadvantages of CD:

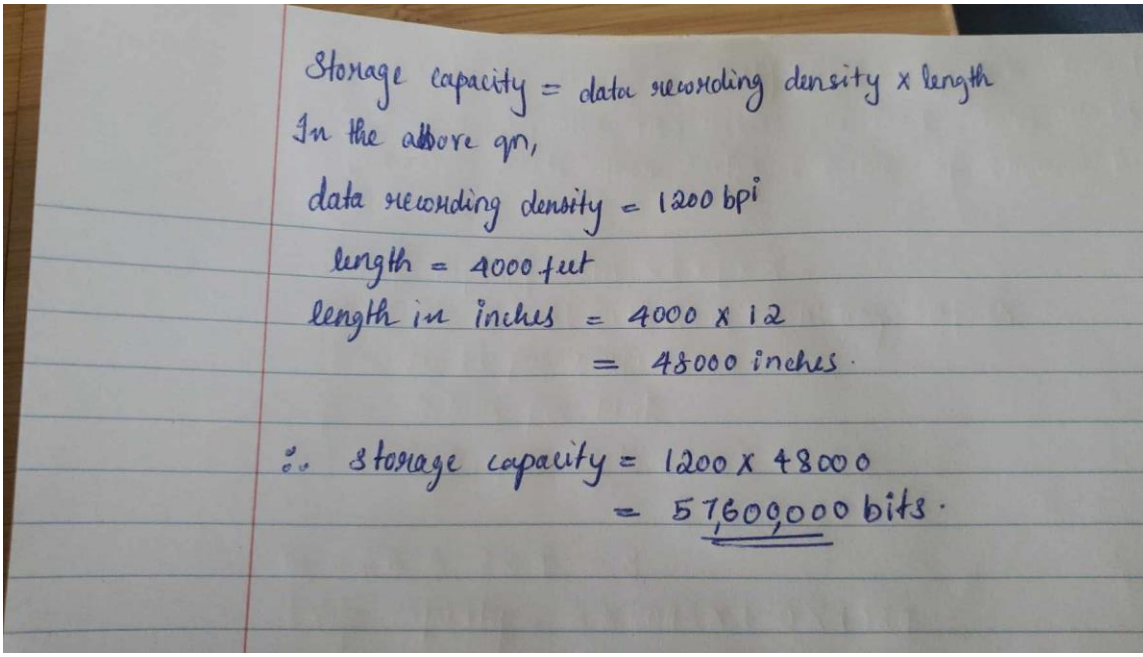
* Limited storage capacity: CDs have limited storage capacity compared to other storage devices like external hard drives or USB flash drives. This limitation can be a drawback when dealing with large files or collections of data.

* Compatibility issues: Some older computers may not have CD drives , making it challenging to access data stored on CDs. Additionally, not all devices can read or write to CDs, leading to compatibility issues.

* Longer access time as compared to that of magnetic hard disk (because locating a desired address involves first moving the head to the specific area then adjusting the rotating speed and then reading the address, and then to find and anness the specific sector).

(ii) A tape is 4000 feet long and has a recording density of 1200 bpi. What is its storage capacity ?

Ans:



g) List five security measures one should take while browsing. 5

Ans:

- Do not click all the links without considering the risks of your actions.

Some web page addresses may be disguised and may be very close to address of a site you want to visit but they may take you to an unexpected site.

- Do not download or install plug-in from the unknown party.

Cybercriminals can trick you into downloading malware-programs or apps that carry malware or try to steal information.

- Do not visit unsolicited websites, those add to your computer vulnerabilities.
- Do not login to a critical application if it does not have https://.

If someone is inputting sensitive data such as payment information or even just their name and address into an unprotected web page, then there's a possibility this data could be accessed by someone else and misused.

- Do not visit unsolicited websites, those add to your computer vulnerabilities.

When visiting unsafe sites, a user may inadvertently be redirected to other, even more malicious sites that may automatically attempt to install malware on the device.

- Use a separate user account for accessing internet on your computer. Restrict the rights of this user account.

(h) What is an open source software ? Give examples. What are the advantages and disadvantages of using open source software ?

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

Examples of open source software are: OpenOffice, Filezilla, Mozilla Firefox,

Advantages of Open Source Software:

* Transparency: 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.

* Low cost : Open-source software is very often free or cheaper than proprietary software. Therefor, we can save on licensing and maintenance costs.

* Flexibility and Customization: The availability of source code allows developers to modify and tailor the software to suit their specific needs. This level of customization empowers businesses to create unique solutions that align perfectly with their requirements, workflows and objectives. It also enables developers to fix bugs, optimize performance, and add new features, ensuring long-term viability and adaptability.

* Community support: Open-source software has a large community of users who contribute to documentation, bug fixes, and improvements.

* Security: With open-source software, the community can detect and fix security vulnerabilities quickly.

Disadvantages of Open Source Software:

Lack of Professional Support: While there is a large community of users who can help troubleshoot issues, there is no guarantee of professional technical support. It may lack dedicated support compared to proprietary software. Businesses relying on open-source solutions may need to rely on forums, documentation, or community-driven support channels for assistance.

Compatibility issues: When using open source software you may run into compatibility issues. This is because many computers will need specialist drivers to be able to run open source programmes.

These drivers may only be available from the manufacturer of the equipment and the costs can quickly add up.

Complexity: Open-source software can be more difficult to set up and configure than closed-source software, especially for users who are not experienced in software development.

Lack of features: Open-source software may not have all the features that are available in closed-source software, especially for niche or specialized industries.

2.

(a) What is perverse software and what are its effects ? Describe briefly any three types of perverse software. 6

Ans: Perverse software is a program which causes hindrances in other programs execution in such a way resulting in modification or complete destruction of data without the user's intention or even sabotaging the operational system. It is a type of software that is designed to secretly access a computer system, without the owner‘s consent, and damage the system. The impact can be as damaging as shutting down a business, pulling down computer network or significantly impacting regular use of individual computer systems etc. The damage done can vary from something as little as changing the author's name in a document to full control of one‘s machine without the ability to easily find out.

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

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

Early infectious programs, such as Internet Worm and MS DOS viruses, were written as experiments and were largely harmless or at most annoying. With the spread of broadband Internet access, malicious software has been designed for a profit, for forced advertising. Here the malware keeps track of user‘s web browsing, and pushes related advertisements.

Effects of perverse software are:

- Data theft: Malwares can steal sensitive information such as personal data, financial details, login credentials and more from infected devices. Such stolen information can be used for identity theft, financial fraud or malicious other malicious activities.

- Slow performance: Malwares can use up system resources which results in slow performance, slowly start up times and overall degradation of the devices speed and efficiency.
- Damage the system: Malware can corrupt files, damage the OS, and cause system crashes. It can also modify or delete important data, leading to loss of valuable information.
- Financial loss: Malware can lead to financial losses for individuals and organizations due to stolen funds, unauthorized transactions, system downtime and data recovery costs.

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

Computer Virus: It is a small software program that is designed to enter a computer without users permission or knowledge, to interfere with computer operation and to spread from one computer to another. A computer virus needs to attach itself to a document or program to infect other computers or programs. There are various types of computer virus that can be classified by their origins, techniques of attack, modes of spreading, forms of infections, hiding locations and the kind of damage caused. Examples of computer viruses are: Randex, Melissa.A and Trj.Reboot.

Computer Worm: Computer Worm is a program that is very similar to a virus. It has ability to self replicate. It actively spreads itself over the network, copies itself from one disk drive to another or copies using email. It does not need user action to start it unlike virus. Examples of worms include: PSWBugbear.B, Lovgate.F, Trile.C, Sobig.D, Mapson.

Data-stealing This is a web threat that results in stealing of personal and proprietary information to be used for commercial gains either directly or via underground distribution. Some popular examples of recent data-stealing cases are – steal and sell large number of credit card numbers from businesses such as TJX, OfficeMax, Sports Authority etc.

(b) What is an unguided media channel ? Explain the characteristics of the different kinds of unguided media channels. 9

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. It can be categorized as follows: a) Radio waves b) Micro waves c) Infrared

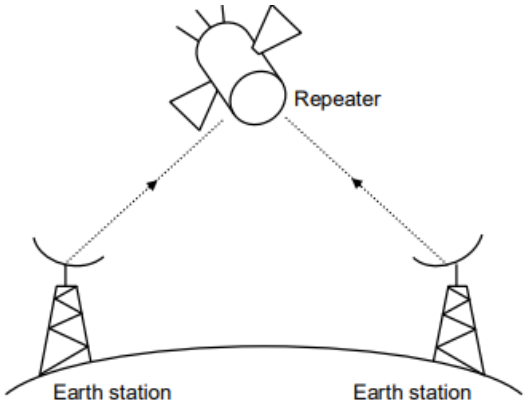
a) Radio waves: Radio waves are electromagnetic waves ranging in frequencies between 3 Kilo-Hertz and 1 Giga-Hertz. Radio waves are easy to generate and can travel long distances and can penetrate buildings easily, therefore widely used for communication. These are omni-directional which implies that these travel in all directions from the source, so the transmitter and receiver do not have to be carefully aligned physically. A sending antenna sends waves that can be received by any receiving antenna. These 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. Radio waves are used for various wireless communication technologies like Wi-fi, Bluetooth etc.

The omnidirectional property has a disadvantage , the radio waves transmitted by one antenna are susceptible to interference by another antenna that may send signals using the same band.

b) Micro waves: 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. The unidirectional property has an advantage, a pair of antennas can be alligned without interfering with another pair of aligned antennas. Microwave is by far the most widely used form of radio transmission. 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. 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.



c) 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.

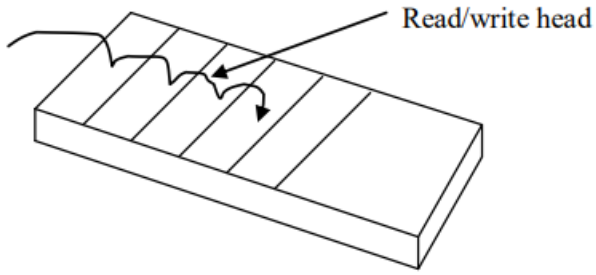
(c) What is a sequential access memory device ? Describe its features. 5

Ans:

Sequential access is also known as serial access. A Sequential-access memory device reads data in sequence. Information on a serial access device can only be retrieved in the same sequence in which it is stored. Data is recorded one after another in a predetermined sequence on a storage medium. A Sequential-access memory device reads data in sequence. In order to get to a specific piece of information, all previous data must be read first.

Memory access time depends on where the store is located. information is stored at the last address, then data stored at the last address cannot be accessed until all preceding locations in the sequence have been traversed. That is locating an individual item of data requires searching the recorded data on the tape until the desired item is located.

Memory access time is more in a serial access. Sequential access is efficient when processing large volumes of data in a linear order. A sequential-access memory such as magnetic tape is organized by arranging memory cells in a linear sequence. These do not have unique storage address that can be directly addressed. Instead, data is presented serially for writing and is retrieved serially during a read.



Sequential access is efficient when processing large volumes of data in a linear order. Examples of serial access storage devices include magnetic tapes and CDs.

Some of the features of Sequential access memory device are:

* Data is accessed in a sequential order. Information is retrieved or stored in a linear manner.

* Sequential Access Memory devices are designed for sequential reading and writing operations. This is suitable for tasks where data needs to be processed in a specific order.

* Sequential Access Memory devices may have slower access times due to the sequential nature of data retrieval.

* Sequential Access Memory devices are used in applications where data needs to be processed sequentially. Sequential access is efficient when processing large volumes of data in a linear order. Examples of serial access storage devices include magnetic tapes and CDs.

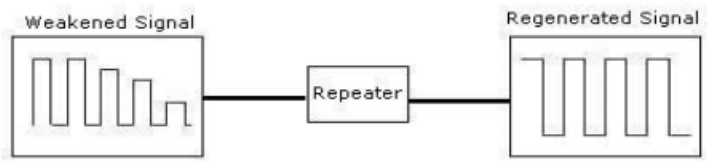
3.

a) Discuss the following in brief : 8

(i) Repeater

Ans: When a signal travels a network cable (or any other medium of transmission), they lose strength, degrade and become distorted in a process that is called attenuation. Repeater is a device that electrically amplifies the signal it receives and re-broadcasts it. They are used when the total length of your network cable exceeds the standards set for the type of cable being used. Repeaters work at the physical layer of the OSI model.

A repeater's main function is to increase signal strength and quality over vast distances. A good example of the use of repeaters would be in a local area network using a star topology with unshielded twisted-pair cabling. If a cable is long enough, the attenuation will finally make a signal unrecognizable by the receiver.



Repeaters are frequently used in LANs and WANs to increase the network's performance and dependability. They can aid in preventing data loss, minimizing mistakes and ensuring that the signal is strong and of high enough quality when it reaches its intended location.

The main benefit of repeaters is their capacity for signal amplification. They increase signal power, enabling data to travel farther distances without experiencing substantial signal deterioration. Repeaters renew signals in addition to amplifying them. It prevents boosted signals from weaking before reaching their destination.

The primary purpose of a repeater is to extend the distance of a network by increasing the strength and quality of signals over long distances or through dense blocks. Repeaters are frequently used in LANs and WANs to increase the network's performance and dependability.

Advantages:

- Repeaters are simple to install and can easily extend the length or the coverage area of networks.
- They are cost effective.

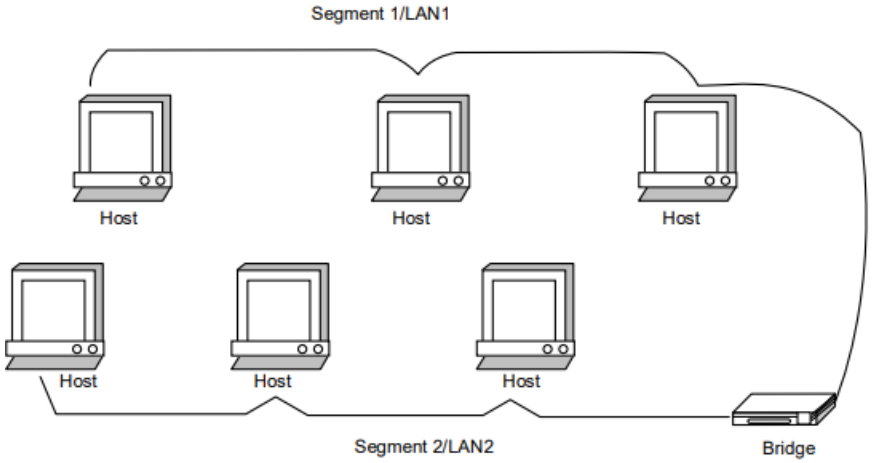
Disadvantages:

- They cannot reduce network traffic or congestion.

- Most networks have limitations upon the number of repeaters that can be deployed.

(ii) Bridge:

Ans: A bridge in a computer network is a device used to connect multiple LANs together with a larger Local Area Network. A bridge can also divide a network to isolate traffic problems. s. For example, if the volume of traffic from one or two computers or a single department is flooding the network with data and slowing down entire operation, a bridge can isolate those computers or that department. A bridge is used to connect two segment i.e., segment 1 (LAN 1) and segment 2 (LAN 2). Each segment can have several computer attached to it.



A bridge is operated at the data link layer.

The primary responsibility of a bridge is to examine the incoming traffic and filter content by reading the MAC addresses of the source and destination.

Bridges are used to divide large busy networks into multiple smaller and interconnected networks to improve performance.

Advantages:

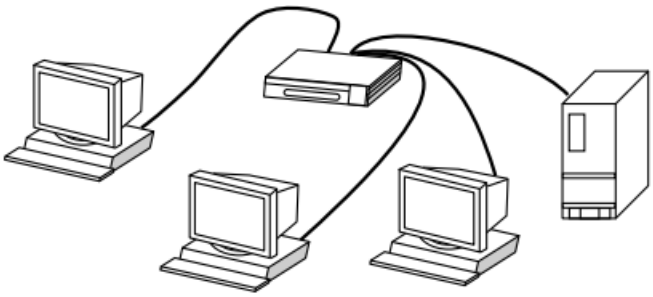
- Collisions can be reduced to a minimum.
- It reduces bandwidth wastage.
- Bridges are highly reliable and maintainable.
- Installation of bridge is easy and requires no extra hardware or software except the bridge itself.

Disadvantages:

- When compared to repeater and hubs, these are more expensive.
- Poor performances as as additional processing is required to view MAC address of the device on the network.
- Slow in speed

(iii) Hub :

Ans: A hub sends any data packet coming from one port to all other ports. It is up to the receiving computer to decide if the packet is for it. Typically used to connect segments of a local area network (LAN), a hub contains multiple ports. The biggest problem with hubs is their simplicity. Since every packet is sent out to every computer on the network, there is a lot of wasted transmission. This means that the network can easily become bogged down. Hubs are typically used on small networks where the amount of data going across the network is never very high. A hub is typically the least expensive, least intelligent, and least complicated of the hub, router and switches.



Advantages:

* It is less expensive.

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

* It provides support for different types of network media.

Disadvantage:

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

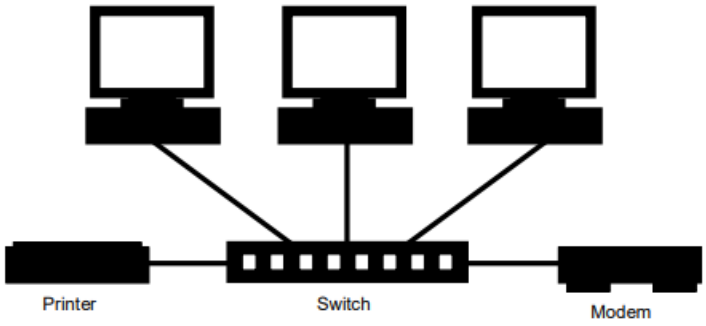
* It does not include mechanisms such as collision detection.

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

(iv) Switch

Ans: A switch is also known as switching hub. It is a device that can segment a larger local area network to reduce the traffic load. A network switch connects devices in a network to each other, enabling them to exchange data packets. One should implement a switch when you have a network with 20 or more users that have bogged down the network by excess traffic. It splits the network into two or more segments with devices that normally talk with each other. Conceptually – switching takes data from one interface and delivers it to another interface. A switch operates on the data-link layer of the OSI model.

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



Advantages:

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

* It increases the available bandwidth of the network.

* It enhances the performance of the network.

Disadvantage:

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

(b) IGNOU needs to send a letter to each student of the BCS-011 course, informing them of the location of their examination center. The major portion of the text is the same for each student, but the roll number, name of the student and examination center location are different. These details are available in a data file for each student (one file with all the data). What are the steps you would follow to make a personalized letter in Microsoft Word for each student so that each one feels the letter has been drafted for him or her alone ? 8

Ans:

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.

Dear [Student Name]

This letter is to inform that examination center for the BCS-011 course is located at [Examination Center] for Roll Number [Roll Number].

ALL THE BEST!!

Sincerely,

IGNOU

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 Examination Center Roll Number

Rohit AMC High School,Delhi 1087691

Joseph HS College, Kochi 1087791

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]

This letter is to inform that examination center for the BCS-011 course is located at [Examination Center] for Roll Number [Roll Number].

ALL THE BEST!!

Sincerely,

IGNOU

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

(c) Explain the four different types of computer monitors. 4

Ans: 4 types of computer monitors are:

1.Cathode Ray Tube Monitors (CRT): are those monitors that were used in earlier versions of computer. They are heavier, require lot of space for installation and consume more energy.

The main components of a CRT monitors are the electron gun, the electron beam controlled by an electromagnetic field and phosphor coated display screen. These monitors produce images through manipulation of electronic beams. To precisely direct the electron beams, copper steering coils are used to create a magnetic field inside the tube. By applying varying voltages to the copper coils a beam can be positioned at any point on the screen.

2. Liquid Crystal Displays (LCD): These monitors are thinner as compared to Cathode Ray Tubes. It was first used in clocks and watches and later on used in laptops. Active matrix structure is used

by most of the modern LCD monitors and television sets. In this technology, a matrix of thin-film transistors (TFT) is added to the polarizing and color filters. It enhances the display to make it look brighter and sharper. It can also produce much better images and have quicker response times.

They have higher resolution, consume energy ,take up less space and portable. Images produced by these monitors are of better quality than that of old CRT monitors. The LCD monitors have very high resolution and emit less radiation than CRT monitors. The screen is also flicker free.

3. Thin Film Transistor Liquid Crystal Display (TFT LCD)

It is type of monitor which used thin film transistor technology to enhance the image quality of LCD Monitors. These are used as monitor in television set, desktop computer, laptop computer and mobile phones etc.

4. Light Emitting Diodes Monitors (LED)

Light Emitting Diodes (LED) is the latest technology which is being used now a days for making high definition TV screens and monitors. It is a semi-conductor light source. In this technology diodes are used to light up the screen instead of liquid crystal Diodes. LED is known as light emitting diode. It is an electronic device that lights up when electricity is passed through it. LEDs are usually red. They are good for displaying images because they can be relatively small, and they do not burn out. However, they require more power than LCD monitors. LED is light weight monitors and is used in laptop computers and in TV. The Life of LED monitors is three times than that of LCD monitors and they have less warm up time than that of CRT or LCD monitors. These monitors require less space on the desk, less power consumption and have flicker free screen.

4.

(a) What is e-mail ? Describe its advantages and the facilities it provides. Explain how one can create an e-mail account on the e-mail system of one's choice.

Ans: Electronic mail is commonly known as email. It is a communication method that uses electronic devices to deliver messages across computer networks. It is one of the most popular methods of digital communication. It is mostly used in business, education, technical communication, and document interactions. It allows communication with people all over the world without bothering them. It is a communication that happens in real time and can get important data across to people in various geographies. An email is a record of the communications that have happened and is stored on the server of the organization. Internet based E-mail system was designed by a computer engineer - Ray Tomlinson in late 1971 while working with ARPANET.

The advantages of e-mail are:

- E-mail is faster than postal mail.

- E-mail cannot be lost like letters and can be stored for life long.
- It can be edited and forwarded to other users.
- Emails are not affected by distances.
- It can be sent anywhere in world in seconds unlike postal mails.
- You can add video and audio with the e-mail.
- Email allows for easy referencing. Messages that have been sent and received can be stored and searched through safely and easily.
- It is a lot easier to go through old email messages rather than old notes written on paper.
- Email is accessible from anywhere-as long as you have an internet connection.
- It is paperless and therefore, beneficial for the planet. It reduces the cost of paper and even reduces the damage paper usage does to the environment.

Email provides many facilities, which includes :

- Mail
- Chat
- Orkut
- Calendar
- Documents
- Photos
- web

Chat: Chat is a synchronous communication. It is a casual conversation. Some of the common chat services are yahoo messenger (yahoo), Gtalk (Google), RediffBol. Most chat services also provide different forums, communities, discussion groups.

Photos: Google photos is a photo sharing and storage service developed by Google.

Documents: Google Docs is an online word processor included as a part of the free, web-based Google Docs Editors suite offered by Google, which also includes Google Sheets, Google Slides, Google Drawings, Google Forms, Google Sites and Google Keep.

Steps to create an email account:

For sending or receiving email, you need to have to an email account. The email account may be provided by the organization for which you are working or else you can create an account with web-based email providers. If you are working on mail services provided by your organization ‘s mail server, you must install and use email client software such as Microsoft Outlook Express, Pegasus Mail, Apple Mail client, Mozilla Thunderbird etc. On the other hand, if you are using web-based mail services then you may use the mail services offered by any of the web-based mail service providers. Some of these web-based mail providers are – Windows Live mail, Yahoo mail, Gmail, Rediffmail, and many more.

Following are the steps to create an email account:

Step 1: Start the browser and open the Gmail Homepage www.gmail.com.

Step 2: Select the —Create an Accountll button on the right.

Step 3: Fill all the fields and click —I accept. Create my account.

If there are no mistakes then an account will be created, otherwise the error will be displayed. Correct the errors and try again. Your email account is created.

Next time we visit the Gmail website, we can access the account as: Enter the username and password and click —Sign in button.

(b) Describe the mainframe software architecture. Contrast it with the following, bringing out any underlying similarities : 8

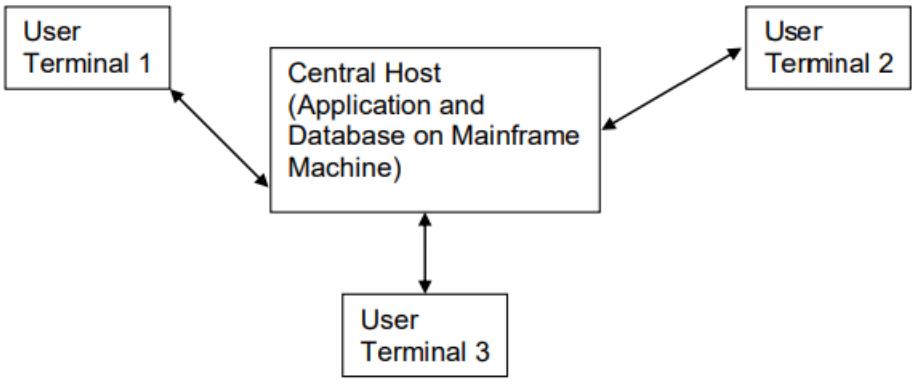
(i) Two-tiered architecture

(ii) Three-tiered architecture

(iii) n-tiered architecture

Ans : Mainframe software architecture:

Till a few decades back, all computing was controlled through the central mainframes server. Multiple users could connect to the central host through unintelligent terminals which captured the keystrokes, sent the information to the host and displayed the text output. All the processing was done by the applications residing on the main central server. Only large transaction-oriented applications were developed during that time. Business tasks such as accounts receivable, accounts payable, general ledger, credit account management and payroll that were repetitive and could be run as batch jobs were automated. In these centralized computing models, the host provided both the data storage and processing power for the client systems. There was no support for graphical user interface or access to multiple databases from geographically dispersed sites.



Contrast between mainframe and two-tier architecture:

Mainframe software architecture supports centralized computing: It typically involves a large, powerful central computer that serves multiple users or clients. There was no support for graphical user interface or access to multiple databases from geographically dispersed sites. Mainframes are highly scalable and can handle a large number of users and transactions.

Two-tier architecture supports distributed computing. Client server architecture distributes computing tasks between clients and servers. The emergence of relational database management systems and graphical user interface applications led to database server which could be accessed through the GUI based client applications. Since, Centralized File Server Shared Resource 1 (Database) Workstation 1 (Application Logic) Workstation 2 (Application Logic) Workstation 3 (Application Logic) Shared Resource 2 (Printer) 10 Basics of Computer Software clients and server interact over the network, increases in the number of users often lead to network congestion. Also, maintenance of the application becomes difficult with more users.

Similarities between mainframe and two-tier architecture:

Both mainframe and two-tier architecture involves a centralized control mechanism. In mainframe architecture, the processing power is concentrated in a single mainframe system, while in two-tier architecture, there is a clear separation between the client and server components, with the server managing the centralized data storage and processing.

Both architectures are known for their efficiency in handling large volumes of data and transactions. Mainframes are designed for high-speed processing and reliability, making them ideal for critical business applications. Similarly, two-tier architecture has a simplified structure making the communication between the client and server components efficient.

(ii) Contrast between mainframe and Three-tiered architecture

Ans: Mainframe architecture is centralized with all processing power and data storage concentrated in a single mainframe system. This centralization simplifies management and control but can lead to bottlenecks and failures. On the other hand, three-tier architecture distributes the system across three separate layers: client, application and server. This distribution allows for better scalability, flexibility and fault tolerance.

In mainframe architecture applications are tightly coupled to the mainframe environment. This lack of modularity can make it challenging to update or replace components without impacting the entire system. In contrast, three-tier architecture promotes modularity and flexibility by separating the user interface, application logic and data into different layers. This enables easier maintenance and upgrades.

Similarities between mainframe and Three-tiered architecture :

Mainframe and three-tier architectures are designed to be scalable to accommodate changing workloads and business needs.

Both Mainframe and three-tier architectures prioritize security considerations in their design.

Mainframes are renowned for their high-performance computing capabilities, enabling rapid data processing and transaction handling. Similarly, three-tier architecture aims to optimize performance by distributing tasks efficiently across the client, application and server layers to enhance overall system performance.

(iii) Contrast between mainframe and n-tiered architecture

Ans: Mainframe architecture is centralized with all computing resources and data stored within a single mainframe system. This centralized approach simplifies management but may lead to few bottlenecks and failures. On the other hand, in n-tiered architecture the 3-tier architecture can be extended to N-tiers when the middle tier provides connections to various types of services, integrating and coupling them to the client, and to each other. Partitioning the application logic among various hosts can also create an N-tiered system.

In mainframe architecture, application is tightly coupled to the mainframe environment. This lack of modularity can make maintenance and updates challenging as changes to one component may impact the entire system. On the other hand, N-tiered architecture promotes modularity and separation of concerns, with each tier handling a specific aspect of the application. This enhances maintainability and ease of updates by allowing changes to be made to individual tiers without affecting the entire system.

Similarities between mainframe and n-tiered architecture :

Both mainframe and n-tiered architectures are designed to be scalable to accommodate varying workloads and business needs. Mainframes can be scaled up vertically by adding more resources, while n-tiered architectures offer horizontal scalability by adding more instances of specific tiers. Mainframes are known for their high reliability and availability, ensuring continuous operations of critical applications. Similarly, n-tiered architectures focus on fault tolerance and redundancy across tiers to minimize downtime and ensure system availability.

(c) What is Unicode ? Where and how is it used ? 4

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

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

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

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

How is it used: Unicode uses a set of code points, which are numerical values assigned to each character. These code points can be represented in various formats, such as Unicode transformation format (UTF-8) or UTF-16, depending on the number of bits used. The code points map to specific characters, allowing computers to display and interpret text correctly.

Where is it used?

Unicode has been adopted by all modern software providers, allowing the transportation of data through devices, applications and platforms without corruption. It is now used in all major operating systems, browsers, search engines, laptops, smartphones and across the internet. Unicode is also used for programming operating systems, java applications, XML etc.

5.

(a) Laptop computer

Ans: Laptop is also a personal computer but intended of using it at a single place, it is small size, portable and can be used anywhere. Portability is one of the main advantages of a laptop over a table PC. Another advantage of a laptop is that it contains batteries which are used for power supply. It makes a laptop usable even if power is not available. In a laptop almost all the components are attached as a single unit. Although some devices like mouse, can be attached externally through ports. They usually have a built-in webcam, microphone and speakers, making video calls much easier. The basic components of a laptop are similar in function to the desktop computers. Most modern desktop computers have separate screens and keyboards. Generally, in majority of the PCs, Microsoft Windows, LINUX and Mac OS x are used as operating system.

Laptops are much more power efficient than desktops. The major disadvantage of Laptop is that its upgradeability is limited as compared to desktops. There are many brands of Laptop are available in Indian market and abroad including HP, HCL, Wipro, Compaq, Dell, Lenovo, Toshiba, Sony etc.

A Configuration of Laptop is given below:

Hard Disk- 320 GB SATA HDD

Processor – Intel Pentium processor P6200 (2.13 GHz, 3 MB) RAM-3 GB

Memory: 1 GB DDR3 RAM (DDR3 RAM can transfer data twice the rate, hence it has higher bandwidth than DDR2 RAM)

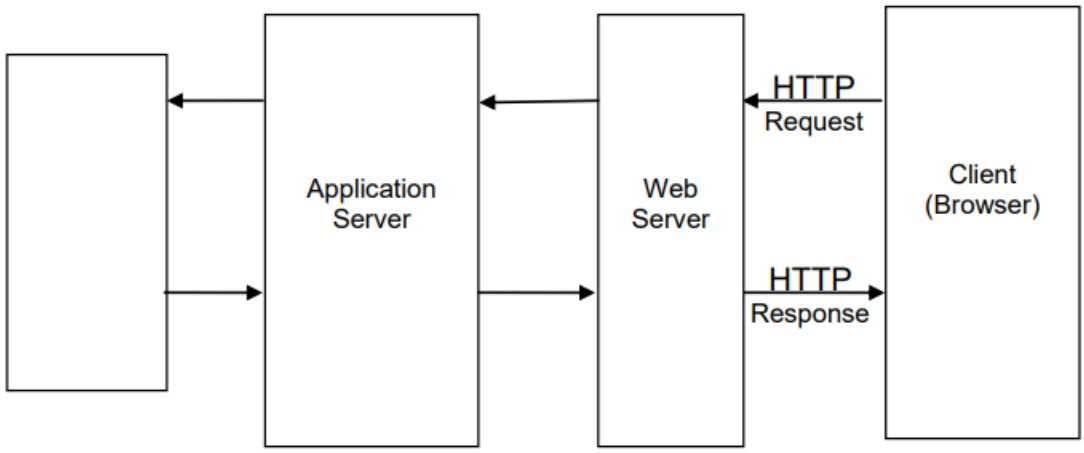
Portable computers have several negative points like:

- Price is higher
- They are often slower than desktop computers with heavy tasks like gaming, video editing or graphic design.
- They break more easily than desktop computers.

(b) Internet based software architecture

Ans: In the late 1990‘s, the client/server trend was augmented by the internet. The users access the web servers through the web browsers on the client machines and over the internet. This led to very thin client based applications, which reside on corporate web servers.

The advantage of web based applications is that they do not have to be tailored to run on specific platforms. But since the web applications cannot perform client side processing, they limit the user experience by turning the client computers into —dumb terminals. Web mails, online transactions are examples of web applications.



Internet based architecture

(c) Social networking

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

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

Features provided by these services are:

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

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

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

Some basic security policies for such sites are:

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

Advantages of Social networking:

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

Disadvantages of Social networking:

- Social networking sometimes can be potentially unsafe. You are advised not to put any confidential information about you on such sites.
- They reduce or eliminate face-to-face socialization.

- It can become addictive if you are constantly glancing at your posts to see who commented or shared your content.
- It can distract users from real-life activities, and negatively impact mental health.

(d) Dot matrix printer

Ans: Dot-Matrix Printer : This is one of the most popular printers used for personal computing systems. These printers are relatively cheaper compared to other technologies and use impact technology. Characters in this printer are formed by the combination of dots.

A Dot-Matrix printer creates characters by striking pins against an ink soaked ribbon. Each pin makes a dot and combinations of dots form characters and illustrations. The moving portion of the printer is called the print head.

Advantages:

* Dot matrix printers, like any impact printer, can print on multi-part stationery or make carbon copies.

* Impact printers have one of the lowest printing costs per page. As the ink is running out, the printout gradually fades rather than suddenly stopping part of the way through a job.

* They are able to use continuous paper rather than requiring individual sheets, making them useful for data logging. They are good, reliable and ideal for use in situations where printed content is more important than print quality.

Disadvantages:

* Impact printers are usually noisy.

* They can only print low resolution graphics, with limited color performance, and limited quality.

* These printers are slow. Speed can be 225 cps to 250 cps. Speed may vary from one printer to another.

(e) Looping statements in programming languages

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

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

A loop consists of :

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

The three types of loops typically encountered in programming are:

- For loop
- While loop
- Do while loop

Example for for loop:

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

Example for while loop:

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

Example for do while loop:

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

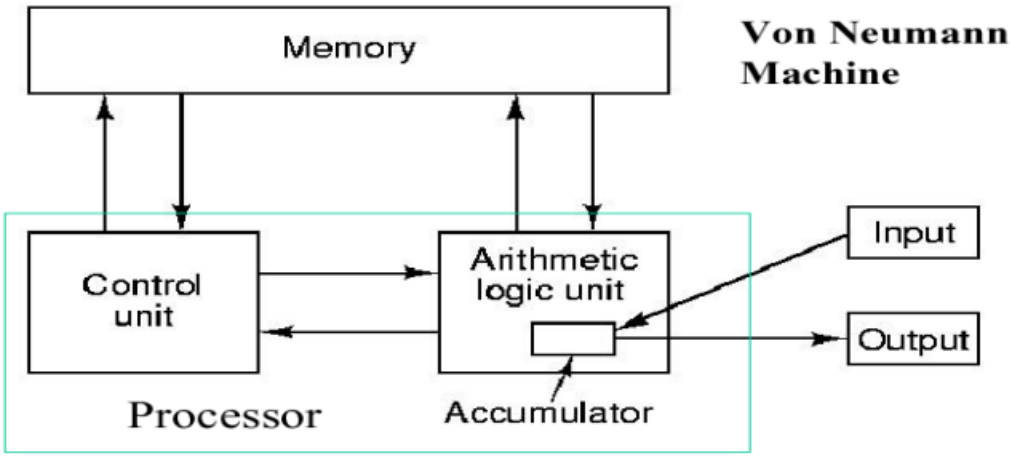
while(i<3);

Return 0;

(f) Von Neumann architecture

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

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



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

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

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

Arithmetic Logic Unit (ALU): The ALU is an important component which carry the actual extension of the instructions. The processing of the data and instruction are performed by the ALU. The Arithmetic and Logic Unit performs the required micro-operations for executing the instructions.

ALU allows arithmetic (add, subtract, divide, multiply) and logical operations (AND, OR, NOT etc.) operations to be carried out.

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

(g) Routers

Ans:

Router: A router is a networking device that forwards data packets between computer networks. A router translates information from one network to another. Router selects the best path to route a message, based on the destination address and origin. The router can direct traffic to prevent head-on collisions, and is smart enough to know when to direct traffic along shortcuts. Routers can even —listen to the entire network to determine which sections are busiest—they can then redirect data around those sections until they are removed.

If you have a LAN that you want to connect to the internet, you will need to purchase a router. the router serves as the translator between the information on your LAN and the internet. It also determines the best route to send the data over the internet. Routers maintain a map of the physical networks on a Internet (network) and forward data received from one physical network to other physical networks. The router is mainly a Network Layer device.

A router operates on the Network layer of the OSI model. It allows the users to connect several LAN and WAN. A router is more capable as compared to other network devices such as hub, switch etc. , as the router has the capability to analyze and modify the data while transferring it over a network, and it can send it to another network.

Advantages:

- Router provides the security, as LANs work in broadcast mode. The information is transmitted over the network and traverses the entire cable system. Although the data is available to each station, but the station which is specifically addressed reads the data.
- Routers provide reliability. If one network gets down when the server has stooped, or there is a defect in the cable, then the router services and other networks will not be affected.
- Routers are relatively easy to set up and manage.

Disadvantages:

- One of the main disadvantages of routers is that they may have limited bandwidth. This means that the amount of data that can be transmitted over a network is limited, which can cause delays and slowdowns.
- Routers can be expensive.

- Routers also have a limited range, which means that the signal strength decreases as the distance from the router increases. This can cause connectivity issues.