ICT NOTES

Commonly Used Computer Terms

S.No.	Term	Full-Form	Meaning
1	ACPI	Advanced Configuration and Power Interface	It is an industry determination for the productive treatment of intensity utilization in the work area and mobile computers.
2	ANSI	American National Standards Institute	It is a powerful industry association of the USA, promoting Programming language standards.
3	ASCII	American Standard Code for Information Interchange	This is a seven/eight-bit code widely used in computers for the transfer of data.
4	CD-ROM	Compact Disk-Read Only Memory	This is a permanent storage device used to store large quantities of information that need not be changed.
5	CGA	Color Graphics Adapter	Low-resolution screen (640 x 200 pixels) with colour capability.

6	CSS	Cascading Style Sheets	CSS stands for Cascading Style Sheet. It is a mechanism of adding style to a web document.
7	DNS	Domain Name System	Domain Name System (DNS) is a hierarchical and decentralized naming system for computers or any other services connected through the internet.
8	DOS	Disk Operating System	It is a single-user operating system.
9	DVD	Digital Versatile Disc/Digital Video Disc	-
10	EDP	Electronic Data Processing	-
11	EPROM	Erasable Programmable Read-Only Memory	A type of ROM that can be programmed or reprogrammed usually by exposing a normally covered sector to UV-Light.

12	HTML	HyperText Markup Language	A markup or structuring language used to describe Web and Intranet documents. It is used to define structure, appearance and placement of HTML elements including, fonts, graphics, text, hypertext links to other sites and many more details.
13	IDE	Integrated Development Environment	-
14	LAN	Local Area Network	A system of PCs that are located relatively near to each other and connected by wire so that individual users can cooperatively process information and share resources.
15	LED	Light Emitting Diode	An electronic device that lights up when electricity is passed through it.
16	MIPS	Million Instructions Per Seconds	A unit for measuring the speed of a computer.

17	MOOC	Massive Open Online Course	MOOC stands for Massive Open Online Course. It is an online course that aims at unlimited participation and access through the internet or the web.
18	SCSI	Small Computer System Interface	A standard for connecting a hard drive to a computer.
19	TCP/IP	Transmission Control Protocol/Internet Protocol	It is a set of communication protocols that encompass media access, packet transport, session communications, file transfer, e-mail, and terminal emulation. TCP/IP is supported by a large number of H/W and S/W vendors and is available on many computer systems, from PCs to mainframes.
20	UPS	Uninterruptible Power Supply	It is a power supply that includes a battery to maintain power in the event of a power cut for several minutes to some hours.

Input device

- It is a piece of hardware used to provide data to a computer used for interaction and control.
- It allows input of raw data to the computer for processing.
- List of some input devices:
- Keyboard- one of the primary input devices used to input data and commands. It has function keys, control keys, arrow keys, keypad and the keyboard itself with the letters, numbers and commands.
- Mouse – an input device used to control the cursor and coordinates. It can be wired or wireless.
- Microphone – an input device that allows users to input audio into their computers.
- Digital Camera – is an input device that takes pictures digitally.
- Scanner – is an input device that reads an image and converts it into a digital file.
- Barcode Reader – also known as a barcode scanner or point of sale (POS) scanner, is an input device capable of reading barcodes.
- Biometric devices – is an input device used to input biometric data into a computer. Here are the types of biometric devices: Face scanner, Hand scanner, Finger scanner, Voice scanner.
- Stylus – is a pen-shaped input device used to write or draw on the screen of a graphic tablet or device.

Instant messaging (IM)

- Instant messaging (IM) technology is a type of online chat that offers real-time text transmission over the Internet.
- Instant messaging (IM), a form of text-based communication in which two persons participate in a single conversation over their computers or mobile devices within an Internet-based chatroom.
- IM differs from “Chat,” in which the user participates in a more public real-time conversation within a chatroom where everyone on the channel sees everything being said by all other users.

Interface

- It is the interconnections that allow a device, a program, or a person to interact.
- Hardware interfaces are the cables that connect the device to its power source and to other devices.
- Software interfaces allow the program to communicate with other programs (such as the operating system), and user interfaces allow the user to communicate with the program (e.g., via mouse, menu commands, icons, voice commands, etc.).

Internet

- An international conglomeration of interconnected computer networks.
- It started in the late 1960s, it was developed in the 1970s to allow government and university researchers to share information.
- The Internet is not controlled by any single group or organization.
- Its original focus was on research and communications, but it continues to expand, offering a wide array of resources for business and home users.

IP (Internet Protocol) address

- An Internet Protocol address is a unique set of numbers used to locate another computer on a network.
- The format of an IP address is a 32-bit string of four numbers separated by periods.
- Each number can be from 0 to 255 (i.e., 1.154.10.255).
- Within a closed network, IP addresses may be assigned at random, however, IP addresses of web servers must be registered to avoid duplicates.

Java

- An object-oriented programming language designed specifically for programs (particularly multimedia) to be used over the Internet.
- Java allows programmers to create small programs or applications (applets) to enhance Web sites.

The history of the development of each generation of computer is characterized by a major technological development that fundamentally changed the way computers operate. It has resulted in increasingly smaller, cheaper, more powerful and efficient and reliable devices. Here the term generation refers to the time period during which a computer had been developed.

First Generation (1940-50)

- Entirely electronic.
- Used Vacuum tubes to store instructions.
- For memory Magnetic drums were used.
- They were often enormous, taking up entire rooms.
- Very expensive to operate.
- Very limited storage capacity.
- Used a lot of electricity and generated a lot of heat.
- Relied on lowest level-level programming language understood by computers to perform functions- machine language (1s and 0s).
- Slow input/output.
- Examples- UNIVAC 1, ENVIAC and MARK 1.

Second Generation (1950-60)

- Vacuum tubes were replaced by Transistors.
- This made computer to become smaller, faster, cheaper, more energy-efficient
- and more reliable.
- Magnetic disks and tape were used.
- Use of magnetic core as primary internal storage medium.
- Increased main storage capacity.
- Faster input / output.
- Example- IBM 400, IBM1600, IBM1401, HONEYWELL 200, CDC 1604, FORTRAN and COBOL.

Third Generation (1960-1970)

- Transistors were replaced by Integrated circuits (IC)
- Use of magnetic core as primary storage medium.
- This led to reduction in size, greater reliability, speed and lower costs.

- Small-scale integration (SSI) and medium-scale technology (MSI) was used.
- Use of magnetic core as primary storage medium.
- More flexible input / output.
- Increased speed and better performance.
- Extensive use of high-level programming languages- BASIC and PASCAL.
- Examples- PDP-8, ICL 2900, IBM-360, and IBM-370.

Fourth Generation (1970- present)

- Microprocessors bought the Fourth generation computers.
- Thousands of integrated circuits were built into single silicon chips.
- Large scale integration (LSI) and very large scale integration(VLSI) technology used.
- Microprocessors were produced using LSI technology.
- Development of portable computers.
- Micro computers became available.
- RAID (Redundant Array of Inexpensive Disks) technology was used for data storage.
- Greater versatility of Input / Output devices.
- Used in Virtual reality multimedia, and simulation.
- Examples- IBM-PC, Apple Macintosh

Fifth generation

- It is mainly aimed at reducing complex programming.
- These are used in parallel processing, speech recognition, intelligent robots, and artificial intelligence.
- For development of Natural language processing.
- For advancement in Parallel Processing.
- For advancement in Superconductor technology.
- More user-friendly interfaces with multimedia features.
- Availability of very powerful and compact computers at cheaper rates.

Types of computer

On the basis of operation

1. Digital computer

- In this binary is used like '0' and '1' or ‘ON’ and ‘OFF’.
- Used for business and scientific data processing.
- These can process numeric and non-numeric data.
- Digital computers are better suited for solving complex problems in science, engineering, and technology.

2. Analog Computer

- Data is represented as physical quantities.
- It processes the analog data; such data is always continuous and not discrete.
- Speed of this computer is slow.
- Example- voltmeter, thermometer and barometer.

3. Hybrid Computer

- These are a combination of analog and digital computers.
- In this input and output is in analog form and processing is in digital form.
- These have accuracy and memory of digital computers, and high speed of analog computers.
- These can process continuous as well as discrete data.

On the basis of size

1. Supercomputers

- It is used for stock analysis, weather forecasting, research, engineering,analysing geological data.
- These can process billions of instructions per second.
- Param is India’s first super computer.
- Other examples are CRAY, IBM, HP, etc.

2. Mainframe Computers

- These process data at very high speed.
- They are large, powerful, multi-user computers.
- These can be used for recording huge amounts of data.

- These can accommodate thousands of workstations simultaneously.

3. Minicomputers

- These are less powerful than supercomputers and mainframe computers.
- They are mid sized multiprocessing computers.
- It supports time sharing, batch processing, etc.
- Used in scientific research, industries, recording data, etc.
- They can perform several actions at the same time and can support 4 to 200 users simultaneously.

4. Microcomputers

- Also called personal computers.
- We generally use this at the office or at home.
- It is a small and relatively inexpensive computer.
- It consists of a display screen, keyboard, CPU, one or more disk drives.
- Examples- Desktop, laptop, tablets, smartphones.

5G

- It is the next generation mobile networks technology after 4G LTE networks.
- It is a wireless communication technology using radio waves or radiofrequency energy to transmit and receive data.
- It will provide faster data speed, ultra-low latency.
- Its application will be Augmented reality, Virtual reality, Artificial intelligence and Internet of things.
- Ericsson has installed the first public access 5G testbed at IIT DELHI.
- The 5G hackathon is organised by the Department of Telecommunication in association with government, academia & industry stakeholders.
- It was organised alongside India Mobile Congress, 2020 in New Delhi.
- Indian Mobile Congress is the largest technology forum in South Asia.

4G	5G
Ten milliseconds	less than one millisecond
Available spectrum- 3GHz	Available spectrum- 30GHz
Peak Data rate- 1 Gb/s	Peak Data rate- 20 Gb/s
Connectivity density – 100 thousand connections per kilometre square	Connectivity density – 1 Million connections per kilometre square

2G and 3G

- It is a wireless communication technology which relies on microwaves to connect sites with the nearest-switching centre.

National Digital Communication Policy 2018

- It envisages a digitally empowered economy and society.
- The need of citizens and enterprises will be met through affordable digital communications infrastructure and services.

BharatNet Programme

- The programme plans to link 2.5 lakh gram panchayats through an optical fibre network.

Artificial Intelligence

- It refers to machines ability to perform cognitive tasks like thinking, perceiving, learning, problem-solving and decision making in real-time situations.
- Machines do tasks that typically require human intelligence.
- Its application areas are healthcare, Agriculture, Education, smart cities and smart mobilities, etc.

- Government has signed a pact with IBM India to utilise Artificial Intelligence in agriculture.

Quantum Computing

- This information is encoded as quantum bits or qubits.
- Classical computers process information in binary format, called bits which can represent either 0 or 1.
- Quantum computers used quantum bits which can represent both 0 and 1 simultaneously.
- The government announced in the 2020 budget the largest ever science mission- National Mission on Quantum Technologies.
- The mission will be implemented by the Department of Science and Technology.
- Application areas are- aerospace engineering, numerical weather prediction, securing the communication, healthcare, agriculture, etc.

Dark net

- It is the part of the internet which cannot be accessed through traditional search engines like google.
- It requires a specific browser such as TOR (The Onion Ring) to access the pages that are encrypted.
- TOR was developed by the United States in the 1990s to protect US intelligence communication online.
- Darknet is mainly used for illegal activity.
- Surface Web is that part of the internet that is available to the general public and is searchable on standard search engines like google.

3-D Printing

- It is an additive process wherein an object is created by laying down successive layers of material until the object is created.
- It used materials like plastics, metals etc. to convert products designed on computers into three-dimensional items.
- Its application areas are aerospace, healthcare, etc.

Central Equipment Identity

- It is launched by the Department of Telecom to track and block stolen/lost mobile phones.
- It was first launched in Mumbai.
- It acts as a central system that connects to the IMEI database of all network operators to share blacklisted mobile devices.
- Through this, even if a sim card is changed in a stolen device, the device won't work.

Wifi calling

- It is India's First Voice over Wi-Fi service launched first by Airtel then followed by JIO.
- It allows users to make high definition calls using Wi-Fi even when there is no cellular connectivity.
- This is similar to calling using WhatsApp, but in Wi-Fi calling no app is required to be downloaded.

Input Devices

Input Devices: This unit makes the link between user and computer. The input devices translate the information into the form understandable by the computer.

- Keyboard: The most common and very popular input device which helps in inputting data to the computer.
- Mouse: Mouse is the most popular pointing device and cursor-control device having a small palm size box with a round ball at its base which senses the movement of a mouse and sends corresponding signals to the CPU when the mouse buttons are pressed.
- JoyStick: To move cursor position on a monitor screen. It is mainly used in Computer Aided Designing (CAD) and playing computer games.
- Light pen: It is used to select a displayed menu item or draw pictures on the monitor screen.

- Track Ball: Mostly used in notebook or laptop computers, instead of a mouse . This is a ball which is half inserted and by moving fingers on the ball, the pointer can be moved.
- Scanner: A scanner allows you to scan printed material and convert it into a file format that may be used within the Personal Computer.
- Digitizer: It converts analog information into digital form.
- Microphone: Microphone is an input device to input sound that is then stored in digital form.
- Magnetic Ink Character Recognition (MICR): MICR input device is generally used in banks because of a large number of checks to be processed every day.
- Optical character recognition (OCR): OCR converts a scanned image into text.

Output Devices

Output Devices: Output devices translate the computer's output into the form understandable by users.

(a). Monitors: Monitors, commonly called as Visual Display Unit (VDU) are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

- There are two kinds of viewing screens used for monitors.
- Cathode-Ray Tube (CRT): The CRT display is made up of small picture elements called pixels. The smaller the pixels, the better the image clarity, or resolution
- Flat- Panel Display: The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the CRT.

(b). Printers: Printer is an output device, which is used to print information on paper.

- Impact Printers: The impact printers print the characters by striking them on the ribbon which is then pressed on the paper.

- Non-Impact Printers: Non-impact printers print the characters without using ribbon. These printers print a complete page at a time so they are also called as Page Printers. Laser Printers, Inkjet Printers.

NEW MEDIA

- New media is a term used for various kinds of electronic communications that became available due to innovation in computer technology.
- New media could also be defined as any media that is delivered digitally like newspaper, blogs, music, email, streaming apps and podcasts.
- While “old” media includes newspapers, television, books, magazines, and other such non-interactive media, new media consists of websites, email, online social platforms, online communities, online forums, blogs, Internet telephony and online video/audio streams.
- Some types of old media have taken new forms like an online newspaper which is also “old media” when coming in the form of a printed newspaper.
- Podcast, smartphone apps are entirely new media.
- New media has allowed people to connect people all over the world. It has allowed people to express themselves through the internet by using social media.
- New media does not include analog broadcast television programs, feature films, magazines, or books – unless they are delivered digitally through the use of technology like watching Netflix on TV.

Some of the new media has been defined below:

Wikipedia

- It is an online encyclopaedia which is available digitally.
- It is created and edited by volunteers around the world.
- It begins with its first edit on 15 January 2001

Websites

- It is a site or location on the World Wide Web which contains information about a website.
- Each website contains a home page. The home page is the first document which users see when they enter the site.

- The site might also contain additional files, information and documents.
- Each site is owned and managed by an individual, company or organization.
- The first web page went live on August 6, 1991. It was dedicated to information on the World Wide Web project and was made by Tim Berners-Lee.

Blogs

- It is a Web page that is run by an individual and is like a personal journal.
- Author of a blog writes on this webpage about daily activity or any other thing. It typically reflects the personality of the author.

Streaming audio and video

- You must have heard about Amazon Prime, Netflix, Wynk music, Spotify music and many more.
- These are new media tools that are accessible to the public. Some free of cost and some paid.
- Users can watch a movie and listen to their favourite music any time using these media tools.

Chat rooms

- It is a virtual room where a chat session takes place among people.
- Technically, it is a channel, but the term room is used to promote the chat metaphor.
- In a chat room, people communicate using on-screen text, typed in real-time.

Email

- Short for electronic mail, it is defined as the transmission of messages over communications networks.
- Typically, the messages are notes entered from the keyboard or electronic files stored on computers or mobile phones.
- Engineer Ray Tomlinson sent the first network email in 1971

Social media

- It enables people to interact with each other as a community.
- A variety of platform applications are available today that enable people to socially interact with each other online.
- Some examples of social media sites and applications are Facebook, Twitter, Instagram, blogs and other sites that have content based on user participation and user-generated content.
- The first recognizable social media site, Six Degrees, was created in 1997. It enabled users to upload a profile and make friends with other users.

Mobile apps

- Apps are the buzz word used today. Every popular brand has come with their own app for business purposes. It is another example of new media.
- Apps make the user access the information about products easily.

DVD

- Short for digital versatile disc or digital video disc, a type of optical disk technology similar to the CD-ROM.
- A DVD holds a minimum of 4.7GBof data, enough for a full-length movie.
- DVDs are commonly used as a medium for digital representation of movies and other multimedia presentations that combine sound with graphics.

CD-ROM media

- Short for Compact Disc-Read-Only Memory, a type of optical disk capable of storing large amounts of data -- up to 1GB, although the most common size is 650MB (megabytes).
- A single CD-ROM has the storage capacity of 700 floppy disks, enough memory to store about 300,000 text pages.

Virtual reality environments

- It is an artificial environment created using computer software and hardware.
- Using VR feels that the surroundings around him/her are like a real environment.

- To "enter" a virtual reality, a user dons special gloves, earphones, and goggles, all of which receive their input from the computer system.
- In this way, at least three of the five senses are controlled by the computer.
- The device also monitors the user's action.
- The goggles, for example, track how the eyes move and respond accordingly by sending new video input.

Internet telephony

- In this, the user uses the internet as the transmission medium for making telephone calls.
- Internet telephony software provides free calls to a user all over the world.
- To date, however, Internet telephony does not offer the same quality of telephone service as direct telephone connections.

Differences between Traditional Media and New Media

Traditional media	New media
1. Non-technical in nature.	1. Technical in nature.
2. It is less expensive.	2. It is expensive because it needs investment.
3. Its reach is limited	3. It reaches a larger number of people.
4. Communication takes place directly in front of a live audience.	4. Message is broadcasted. It could be live or recorded.
5. It is culturally rigid.	5. It is flexible

TOPOLOGY

- Network topology is the way of arranging a network or how links and nodes are set up to relate with each other.
- It also refers to how various nodes, devices, and connections on ones' network are physically or logically arranged in relation to each other.
- There are plenty of ways in which a network can be arranged, all with different pros and cons, and some are more useful in certain circumstances than others.
- There are many different types of network topology and all are suitable for different purposes, depending on the overall network size and your objectives.

Star Topology

- Star topology is the most commonly networked topology.
- It is laid out in a way that every node is connected to one central hub in the network through a coaxial, twisted-pair or fibre-optic cable.
- The central node acts as a server and manages data transmission.
- All information from nodes has to pass through a central node to reach the destination.
- Central node functions as a repeater, which helps prevent data loss.
- From a single location, the entire network is managed thus, it's very convenient.
- If one node goes down others will continue to function because each of the nodes is independently connected to the central hub.
- This feature makes the star topology a stable and secure network layout.
- Further, devices can be added and removed or modified without the need of taking the entire network offline.
- It uses little cabling to fully connect the network.
- But one flipside of star topology is if the central hub goes down then the rest of the network can't function. Therefore, the central hub must be kept in good health for the smooth functioning of the entire network.
- Also, it is expensive to set up and operate because all technical specifications and bandwidth and performance of the network are also limited by the central node’s configurations.

Bus Topology

- In bus topology, all the devices on a network run along a single cable running in one direction from one end of the network to the other of the network.
- Bus topology is also called “line topology” because of the above feature.
- Date flows along the route of cable in only one direction.
- It is a good and cost-effective choice for smaller networks because all devices are connected in a simple layout through which all devices are connected via a single cable.
- More nodes can be added by joining additional cables in the network.
- But, this is vulnerable due to single cable use if sometimes cable experiences some sort of failure. It will lead to the whole system going down.
- If the cable experiences a failure, the whole network goes down, which can be time-consuming and expensive to restore, which can be less of an issue with smaller networks.

Ring Topology

- In this form of topology, nodes are arranged in a circle or like a ring.
- The date can travel either in one direction or in both directions with each device having exactly two neighbours.
- To reduce the risk of packed collusion, only one station is permitted to send data at a time. This makes the ring topology to work efficiently in transmitting data without any errors.
- Ring topology is prone to failure when the network is not managed properly.
- If the data is moving in one direction only and one node goes down it will take the entire network with it.
- All the devices on the network share bandwidth therefore the addition of more devices can contribute to overall communication delays.

Tree Topology

- In this, the central node functions like a trunk for the network with nodes going outward like branches of a tree.
- Two connected nodes share only one mutual connection because those connected to the central hub are connected linearly to other nodes.

- It is used for the wide-area network to support many spread out devices because the structure is both extremely flexible and scalable.
- Just like the star topology, the entire network's health depends on the root node in a tree topology structure. If the central hub fails, the various node branches will become disconnected, though connectivity within—but not between—branch systems will remain.

Mesh Topology

- A mesh topology is an intricate and elaborate structure of a network where each computer and network device is interconnected with one another
- This topology setup allows for most transmissions to be distributed even if one of the connections goes down.
- It is reliable and stable, and the interconnectivity of nodes makes the network resistant to failure. For Example: If one device goes down, it will not affect the entire network.
- But, it is time-consuming and labour-intensive because each interconnection between nodes requires a cable and configuration once deployed.

Hybrid Topology

- This form of topology combines two or more different topology structures.
- Example: tree topology- it integrates the bus and star layouts.
- It is most commonly found in larger companies where individual departments have personalized network topologies adapted to suit their needs and network usage.

Internet

The Internet is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to link several billion devices worldwide. It is also known as a “network of networks” that consists of millions of private, public, academic, business, and government networks.

1. Internet Work: In the Internet, most computers are not connected directly to the Internet. Rather they are connected to smaller networks, which in turn are connected through gateways to the Internet backbone.

- Gateway: A gateway is a device that connects dissimilar networks.
- Backbone: A backbone is a central interconnecting structure that connects one or more networks just like the trunk of a tree or the spine of a human being.

2. Who governs the Internet?

The Internet is not governed by any particular body. It is coordinated by many volunteer organizations.

- The Internet Architecture Board (IAB) is responsible for approving standards and allocating resources.
- The Internet Engineering Task Force (IETF) is responsible for discussing and investigating the operational and technical problems of the Internet.
- The InterNIC is responsible for providing registration services to the Internet community.

3. Internet Function: The World Wide Web commonly known as the Web or www developed founded by Tim Berners – Lee in 1989, is a system of interlinked hypertext documents that are accessed via the Internet. These multimedia pages are ever-changing. A web browser (commonly referred to as a browser) is a software application for retrieving, presenting and traversing information resources on the World Wide Web.

4. Various Applications of the Internet are:

- Exchange messages using email (Electronic mail).
- Transfer files as well as software.
- Browse through information on any topic on the web.
- Communicate in real time (chat) with others connected to the Internet.
- Search databases of government, individuals and organizations.
- Read news available from leading newsgroups.

- Send or receive animation and picture files from distant places.
- Set up a site with information about your company's products and services.
- The seeds of the Internet were planted in 1969 when the US Department of Defense sponsored a project named ARPANET.

5. Connection Of Internet

- Through Dial-up Connection: A dial-up connection is a temporary connection, set up between your computer and ISP (Internet Service Provider)server. A dial-up connection is established using a modem, which uses the telephone line to dial up the number of ISP servers.
- Through Broadband Connection: The term broadband is short for broad bandwidth. Bandwidth refers to the amount of data that a signal or circuit can carry. Broadband connection speeds are measured in megabits per second (Mbps).
- Wireless Connection: These days we can also connect to the Internet wirelessly.
- Wi-Fi: It refers to Wireless Fidelity, which lets you connect to the Internet without a direct line from your PC to the ISP.
- WiMAX: It is a wireless digital communication system. WiMAX can provide broadband wireless access (BWA) up to 50 km for fixed stations

6. Various features of a Web Browser

- Menu bar: The menu bar, located at the very top of the screen, can be accessed using the mouse. Actions that are in black can be performed, while actions that cannot be performed will be in gray or lightened.
- Toolbar: The toolbar is located at the top of the browser; it contains navigational buttons for the Web. Basic functions of these buttons include:
- Location bar: The location bar, below the toolbar, is a box labeled "Location," "GoTo," or "Address." You can type in a site's address, and press the Return or Enter key to open the site.
- Status bar: The status bar is located at the very bottom of the browser window. You can watch the progress of a web page download to determine if the host computer has been contacted and text and images are being downloaded.

- Scroll bar: The scroll bar is the vertical bar located on the right of the browser window. You can scroll up and down a web page by placing the cursor on the slider control and holding down the mouse button.
- A website is a set of related web pages served from a single web domain.
- The Uniform Resource Locator abbreviated as URL is the Address for websites. Most of them begin with HTTP (HyperText Transfer Protocol), followed by a colon and two slashes. In most web browsers, the URL of a web page is displayed on top inside an address bar. An example of a typical URL would be "http://www.gradeup.co".
- The hyperlink is a reference to data that the reader can directly follow either by clicking or by hovering or that is followed automatically.
- An email attachment is a computer file sent along with an email message. One or more files can be attached to an email message, and be sent along with it to the recipient. The first email was sent by Ray Tomlinson to himself in 1971.
- CC (Carbon Copy) in email indicates those who are to receive a copy of a message addressed primarily to another. The list of CC'd recipients is visible to all other recipients of the message.
- An additional BCC (blind carbon copy) field is available for hidden notification; recipients listed in the BCC field receive a copy of the message but are not shown on any other recipient's copy (including other BCC recipients).
- An Internet Protocol address (also known as an IP address) is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network. It acts as an identifier for a computer. It is a unique address for every computer.
- Top-level domain: Each part of a domain name contains certain information. The first field is the hostname, identifying a single computer or organization. The last field is the top-level domain, describing the type of organization and occasionally country of origin associated with the address. For e.g. - .com – Commercial, .edu – Education.

Internet

- It is a worldwide or global system of computer networks which is interconnected.
- It uses the standard Internet Protocol (TCP/IP).

- Each and every computer on the Internet is recognized by a unique IP address.
- IP (Internet Protocol) Address is a unique set of numbers (such as 190.23.44.115) which identifies a computer’s location.
- To locate a computer name Domain name server is used. It provides a neme the IP Address.
- The Internet is accessible to every user worldwide.
- Anyone can access the internet for uploading and downloading the file.

Intranet

- The intranet is the system in which multiple Personal Computers are connected to each other.
- Personal Computers in an intranet system are not available to the world outside the intranet.
- The intranet is used mainly within a school, a company or some government office.
- Through Intranet files and information are shared within a defined area among personal computers within a company's secured environment.
- Usually, some organization has its own Intranet network and employees of the organization can access the computers in their network.
- Also, on the Internet each computer has a unique IP address.

Similarities between Internet and Intranet

- Both need an IP address for networking communication purposes.These include protocols like the FTP and TCP-IP.
- Both have instant messenger service like Google talk or yahoo.
- Both internet and intranet can be accessed only through a web browser.

Differences between Internet and Intranet

- The Internet is general to Personal Computers worldwide but Intranet is specific to a few personal computers.
- The Internet provides a better and wider access to websites to a large population, whereas Intranet is restricted to an organization or company.

- The Internet is not as safe as the Internet. Intranet can be safely privatized as per the need.

Internet Related Terms

1. URL

- A URL (Uniform Resource Locator) is the address of a resource on the internet and the protocol used to access it.
- URLs occur most commonly to reference web pages, but are also used for file transfer, email, database access and many other applications.
- An example of a URL is https://gradeup.co, which is the URL for the Gradeup website.

2. World Wide Web (www)

- It is a subset of the internet and is a collection of documents and applications residing on the internet services around the world.
- World Wide Web, WWW, W3, or Web is a graphical interface for the Internet that was the brainchild of Tim Berners-Lee.
- He invented the HTML coding language in 1989 that is the basis of the web. WWW became public service in 1993.
- The WWW is different from the Internet although most people today think the WWW is the Internet.
- The world wide web consists of billions of pages linked to each other that contain text, graphics, multimedia files, and other interactive software that are accessed using a browser.

3.Web Browser

- A web browser is a software that permits a user to locate, display, and download text, video, audio, and graphics stored in a host computer on the web.
- Examples- Internet Explorer, Mozilla Firefox, opera, safari and chrome etc.

4. Web Server

- A Web server is a program that uses HTTP (Hypertext Transfer Protocol) to serve the files that form Web pages to users, in response to their requests, which are forwarded by their computers' HTTP clients. Dedicated computers and appliances may be referred to as Web servers as well.

5. HTML (Hyper Text Markup language)

- It is a computer’s language used to create hypertext documents for the WWW. Web pages are created using HTML.

6. TCP/IP (Transmission Control Protocol/Internet Protocol)

- TCP/IP is the communication protocol for the Internet, it defines the rule which computers must follow to communicate with each other over the Internet.

7. FTP (File Transfer Protocol)

- File Transfer Protocol, FTP is the most common way of sending and receiving files between two computers.
- A good example of how FTP is used today is by web developers, who will connect to their web server using FTP and send updated versions of their web pages to the server.

8. HTTP

- HyperText Transfer Protocol, HTTP is a set of standards that allow users of the World Wide Web to exchange information found on web pages.
- When accessing any web page entering http:// in front of the address tells the browser to communicate over HTTP.
- Today's browsers no longer require HTTP in front of the URL since it is the default method of communication.

9. Hyperlink

- An element in an hypertext document that is highlighted by means of underlining or the use of a different colour.

- When the Highlighted element is clicked, the user is connected with another element in the same document or another document.

10. Domain Name

- It is a unique name that identifies an Internet site or web site.
- Domain names are formed by the rules and procedures of the Domain Name System (DNS). Any name registered in the DNS is a domain name.
- The suffix indicates what type of an organisation is hosting the site.
- There are six main categories which are as follows:

1. .com- Commercial organisation
2. .edu- Educational institutions
3. .gov- Government sites
4. .mil- Military sites
5. .net- Gateways and administrative hosts
6. .org- Private organisations

11. Domain Name Server

- A special type of Internet computer which converts a website's domain name into a unique numerical IP address that identifies where the website is stored.

12.IP Address

- Internet Protocol address, it is the unique numerical address of a computer on the Internet used to indicate the location of a computer or other device on a network using TCP/IP.
- It is expressed as four sets of numbers (maximum 3 digits each) separated by dots, for example- 150.237.176.24.

13. Homepage

- The main page of the website is its home page.
- A home page is similar to the title page and table of contents in a book.
- It identifies the site and contains links to other pages.

14. Gateway

- A gateway is a networked device which serves as an entry point into another network. For example, a wireless router is commonly the default gateway in a home network.

MOBILE NETWORK

We all are surrounded by the Mobile network, our day to day life is significantly dependent on these mobile network services. This makes it a relevant topic for the UGC NET Paper I. So, guys, let's check out the different generations of mobile networks.

1G and 2G

There never was something called 1G at first. It basically was a network with only voice call capabilities and only got the name 1G after 2G was put to use.

- During the 2G era, that lasted for quite a while from 1980s to 2003, there were quite a few advancements made within the spectrum itself such as GSM, GPRS, and EDGE.
- GSM: Short for *Global Systems for Mobile Communication* enabled data transfer on top of voice communication at speeds that are seen as a joke today (30-35 kbps). It played a critical role in the evolution of mobile technology as right about the time it was being used mobile phone connectivity and popularity exploded.
- GPRS: *General Packet Radio Service* operated on the similar 2G technology as GSM with a few refinements with gave it higher data speeds (110 kbps)
- EDGE: *Enhanced Data rates for GSM Evolution* introduced in 2003 was somewhat known to be 2.9G or 3G due to its significant advancements over GPRS and GSM. It offered high speeds of 135 kbps and continues to be used on many mobile networks even today as it satisfies the basic needs of both carriers and users in various parts of the world.

3G

- This was a big revolution in terms of technological advancement for network and data transmission.

- 3G had and has speed capabilities of up to 2 Mbps.
- It enabled smartphones to provide faster communication, send/receive large emails and texts, provide fast web browsing, video streaming and more security among others.
- It was widely based on CDMA2000 (Code-division multiple access) and EDGE technologies. Now you might wonder why EDGE? Well, because EDGE was so advanced it was able to provide enough capabilities to be considered as 3G. CDMA2000, on the other hand, operated on similar key concepts but did it better.
- It enabled multiple channels to communicate at one same thus improvising on the over speed and connectivity.

4G

The 4G standard sets several requirements for mobile networks including mandating the use of Internet Protocol (IP) for data traffic and minimum data rates of 100 Mbps. [LifeWire] which was a huge jump from the 2 Mbps for 3G. It is often referred to as MAGIC

- M – Mobile multimedia
- A – Anytime Anywhere
- G – Global mobility support
- I – an Integrated wireless solution
- C – Customized personal service

It is not much to do with the technology it uses but rather than the requirements set forth by the International Telecommunication Union's Radiocommunication Sector (ITU-R). These standards are known as International Mobile Telecommunications-Advanced (IMT-Advanced). The list of standards is quite complicated and thus were a barrier in fast adoption of the 4G spectrum.

Soon after 4G, 4G LTE was introduced. LTE stands for Long Term Evolution and it isn't as much a technology as it is the path followed to achieve 4G speeds. It was a complete redesign and simplification of 3G network architecture, resulting in a

significant reduction in transfer latency and thus, increasing efficiency and speeds on the network.

5G

It is still quite in its early stages and the technology is likely to appear in the market only by 2020 at the earliest.

- Goals for future 5G include significantly faster speeds (a minimum of 1 Gbps and perhaps up to 10 Gbps) plus lower power requirements to better support huge numbers of new Internet of Things (IoT) devices.
- It will have capabilities to provide faster dialling speeds, multiple device connectivity, higher data speeds just to name a few.

Conclusion

There has been a lot of advancements in the field of wireless network communication over the years in terms of overall development and change in core functionality, which has been crucial to putting us in a era that is driven by technology all around us and with 5G a couple years away, technologies such as IoT, Cloud computing and AI will completely redefine our world by 2025.

What are Call drops?

- It is a pattern of premature termination of a call at a frequency due to technical glitches or microwave or radio-wave interferences cheated during communication.
- Mobile phone companies enforce these glitches or premature termination to extract money or monitoring benefits from the consumers.
- Much of the loss is seen over a fixed plan connection where every call has a fixed pulse of money. This is called a call drop or enforced can drop.
- TRAI has regulated the telecoms in 2015 to cut down the channel of call drops and said that the maximum frequency of call drop in 24 hours must be more than 3 per customer.
- If it goes beyond 3 then the telecoms are liable to pay 3 times the money that the customer has lost.

- In 2016 Honorable SC stayed the TRAI regulations and call regulations remain unanswered till date

Difference Between Search Engine and Web Browser

Search Engine - The primary purpose of a search engine is to search for information on the Internet. It is software programs that search for websites based on keywords that the user types in. It then goes through their databases of information in order to locate the information you are looking for.

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Web Browser - A web browser is considered a software application that allows people to access, retrieve and view information on the Internet. The user can fill in the address of the website or webpage to visit that page. The “browsed” information can be in the form of text content on a web page, an image, video, audio etc.

 # Names of Web Browser - Firefox, Google Chrome, Internet Explorer, Opera and Safari, Edge, Slimjet Browser, UC Browser, Netscape, Maxthon, SeaMonkey, Vivaldi and Chromium.

Differences:

- Web Browser is a Software application we install in our computer or devices; for example, we download Google Chrome, Mozilla firefox. Some of us also have UC Browsers in our smartphones.
- But the Search engine is not any kind of software that we install. It is basically a software program which is already there on the Internet, you might remember typing www.google.com, this is the address of a Google Search engine and then here we type the keyword we want to search.
- A web browser provides various facilities like Bookmark, Download, History etc. But a Search Engine can be used only for searching and nothing else.
- We basically use a Web Browser to access information on the Internet, on the other hand, we use a Search Engine to point us in the right direction of a

website that relates to the words you type in. We actually have to use a Browser to get to a search engine, for example; typing in www.google.com.

- Chrome is a Web Browser, but Google(www.google.com) is a Search Engine.

TRADITIONAL MEDIA

- Generally, the medium used for communication is confined to print, television, radio, photography, internet etc. But there are many other ways of communication which exist around us for a long time.
- In villages where the modern form of communication is still far away, people have developed different ways of communication depending upon local language and culture.
- This non-electronic medium which works as part of our culture and as vehicles of transmitting tradition from one generation to another generation is called traditional media.

How did traditional means of communications develop?

- These forms of communication developed from beliefs, customs and rituals practised by the people from a long period of time.
- These forms of communication are very old and deep-rooted.
- It employs vocal, verbal, musical and visual folk art forms, transmitted to a society or group of societies from one generation to another.

Different forms of traditional media

The traditional form of communication may not be popular but this form of communication does the purpose of communication in family, friends and in society. These are:

- Traditional dance
- Drama
- Painting
- Sculpture
- Song
- Music
- Motifs and symbols.

Nagada- In the village, one must have seen this form of communication where the announcement is made by beating a drum with a stick. This is called Nagada.

Puppetry- In rural areas puppetry is the popular form of communication. Shadow puppetry and string puppetry are the most famous form of puppetry.

Patachitra Katha- These are the stories that have been told through the medium of palm leaf paintings.

Storytelling- We all know this form of communication. This form of communication existed even before the writing began. Example: Historical stories of freedom struggle which are unknown in textbooks and are not documented are communicated orally from one generation to another. They kept the stories alive.

Nautanki- It is folk art and includes a mixture of music and dance. This is most popular in northern India. it was even the most popular form of entertainment before the cinema began.

Fairs and festivals- People gathered at a place in fairs and festivals where they exchanged views amongst themselves.

Folk dances- These vary from one region to another. For example, you will find a variety of tribal dances in the north-eastern region, Orissa and Gujarat. Every tribe has a different dance form and dress, accessories, symbols and motifs.

Paintings- Traditional paintings, wall paintings, inscriptions, statues and stupas played a vital role in communicating ideas and culture from one generation to another.

Differences between Traditional Media and New Media

Traditional media	New media
1. Non-technical in nature.	1. Technical in nature.

2. It is less expensive.	2. It is expensive because it needs investment.
3. Its reach is limited	3. It reaches a larger number of people.
4. Communication takes place directly in front of a live audience.	4. Message is broadcasted. It could be live or recorded.
5. It is culturally rigid.	5. It is flexible

1. Memory: Computer memory is the storage space in the computer where data is to be processed and instructions required for processing are stored. The memory is divided into a large number of small parts called cells. Each location or cell has a unique address which varies from zero to memory size minus one.

<table>
<tr><td colspan="4">Memory</td></tr>
<tr><td colspan="3">Primary Memory</td><td>Secondary Memory</td></tr>
<tr><td>Cache Memory</td><td colspan="2">Main Memory</td><td rowspan="5">➢ Magnetic Disk(HDD)
➢ Optical Disk (CD, DVD,BRD)
➢ Flash Memory(Memory card, Pen Drive)</td></tr>
<tr><td>Registers</td><td colspan="2">RAM</td><td>ROM</td></tr>
<tr><td></td><td>SRAM</td><td>DRAM</td><td>PROM</td></tr>
<tr><td></td><td></td><td></td><td>EPROM</td></tr>
<tr><td></td><td></td><td></td><td>EEPROM</td></tr>
</table>

(a). Memory is primarily of two types:

- Primary Memory/Main Memory: Primary memory holds only those data and instructions on which computer is currently working. It has limited capacity and data is lost when power is switched off.
- Secondary Memory: This type of memory is also known as external memory or non-volatile. It is slower than main memory. These are used for storing data/Information permanently.

(b). Primary memory consists of mainly two types of memories:

- Random Access Memory (RAM): RAM is the internal memory of the CPU for storing data, program and program result. It is read/write memory which stores data until the machine is working. As soon as the machine is switched off, data is erased.
- RAM is volatile,e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence a backup uninterruptible power system (UPS) is often used with computers. RAM is small, both in terms of its physical size and in the amount of data it can hold.

(c). There are mainly three types of RAM available:

- Dynamic Random Access Memory (DRAM): A type of physical memory used in most personal computers. The term dynamic indicates that the memory must be constantly refreshed2 (reenergized) or it loses its contents. This type of memory is more economical.
- Static Random Access Memory (SRAM): A type of memory that is faster and less volatile than DRAM, but requires more power and is more expensive. The term static is derived from the fact that it does not need to be refreshed like DRAM.
- Synchronous Dynamic Random Access Memory (SDRAM): A type of DRAM that can run at much higher clock speeds.

(d). Read Only Memory (ROM): The memory from which we can only read but can not write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture. A ROM, stores such instructions that are required to start a computer. This operation is referred to as bootstrap.

There are mainly four types of ROM available:

- MROM (Masked ROM): The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kinds of ROMs are known as masked ROMs which are inexpensive.
- PROM (Programmable Read-only Memory): PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM program

- EPROM (Erasable and Programmable Read Only Memory): The EPROM can be erased by exposing it to ultraviolet light for a duration of up to 40 minutes. Usually, an EPROM eraser achieves this function.
- EEPROM (Electrically Erasable and Programmable Read Only Memory): The EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond).

(e). Cache Memory: It is a very high-speed semiconductor memory which can speed up CPU. It acts as a buffer between the CPU and main memory.

(f). Secondary Memory: This type of memory is also known as external memory. It is slower than main memory and non-volatile. These are used for storing data/Information permanently. Contents of secondary memories are first transferred to the main memory, and the CPU can access it. For example disk, CD-ROM, DVD etc.

Cyber attack

Cyber attack is a regular threat we all face in our cyberspace.

- Malware

Malware is a term used to describe malicious software, including spyware, ransomware, viruses, and worms. Malware breaches a network through a vulnerability, typically when a user clicks a dangerous link or email attachment that then installs risky software. Once inside the system, malware can do the following:

Blocks access to key components of the network (ransomware)

Installs malware or additional harmful software

Covertly obtains information by transmitting data from the hard drive (spyware)

Disrupts certain components and renders the system inoperable

- Phishing

Phishing is the practice of sending fraudulent communications that appear to come from a reputable source, usually through email. The goal is to steal sensitive data like credit card and login information or to install malware on the victim's machine. Phishing is an increasingly common cyberthreat.

- Man-in-the-middle attack

Man-in-the-middle (MitM) attacks, also known as eavesdropping attacks, occur when attackers insert themselves into a two-party transaction. Once the attackers interrupt the traffic, they can filter and steal data.

Two common points of entry for MitM attacks:

1. On unsecured public Wi-Fi, attackers can insert themselves between a visitor's device and the network. Without knowing, the visitor passes all information through the attacker.
2. Once the malware has breached a device, an attacker can install software to process all of the victim's information.

- Denial-of-service attack

A denial-of-service attack floods systems, servers, or networks with traffic to exhaust resources and bandwidth. As a result, the system is unable to fulfill legitimate requests. Attackers can also use multiple compromised devices to launch this attack. This is known as a distributed-denial-of-service (DDoS) attack.

- SQL injection

A Structured Query Language (SQL) injection occurs when an attacker inserts malicious code into a server that uses SQL and forces the server to reveal information it normally would not. An attacker could carry out a SQL injection simply by submitting malicious code into a vulnerable website search box

- Zero-day exploit

A zero-day exploit hits after a network vulnerability is announced but before a patch or solution is implemented. Attackers target the disclosed vulnerability during this window of time. Zero-day vulnerability threat detection requires constant awareness.

- DNS Tunneling

DNS tunnelling utilizes the DNS protocol to communicate non-DNS traffic over port 53. It sends HTTP and other protocol traffic over DNS. There are various, legitimate reasons to utilize DNS tunnelling. However, there are also malicious reasons to use DNS Tunneling VPN services. They can be used to disguise outbound traffic like DNS, concealing data that is typically shared through an internet connection. For malicious use, DNS requests are manipulated to exfiltrate data from a compromised system to the attacker's infrastructure. It can also be used for command and control callbacks from the attacker's infrastructure to a compromised system.

Hacking

- It is an attempt to exploit a computer system or a private network inside a computer.
- It is the unauthorized access to control over computer network security systems for some illicit purpose.
- Hackers are categorised as White hats(hack their own security system to make it safe), Black hats(hack other systems for personal gain) and Grey hats(they are curious hackers who hack to to locate potential loopholes).
- All types of hacking is illegal except White hats.
- Bait and Switch, Cookie theft, Distributed denial of service (DDoS), Eavesdropping, Viruses, Keyloggers, Rootkit, Spoofing attack, Packet Sniffer, Trojan horse, Password cracking are various techniques for hacking.

Bait and Switch

- Cyber criminals advertise on websites that are selling to third party advertisers.
- They look genuine with everything verified.

- But when the user clicks on these links they get bobby-trapped with malware.

Cookie Theft

- Cookies hold a wealth of information about the users. Their personal, financial data, user credentials and passwords.
- Cookies could be stolen by hackers and decrypted to reveal information.
- Periodically clearing browser and system caches will reduce the number of cookies that could be stolen.

Distributed Denial of Service(DDoS)

- In this system or network is brought down by overloading them with login attempts.
- These sites are bombarded with requests. This leads to an increase in traffic on the website.

Computer Virus

- A computer virus is a malicious software program loaded onto a user's computer without the user's knowledge and performs malicious actions.
- Stuxnet, Petya, Wanna Cry, Code red, Melissa, Sasser, Zeus, Mydoom, CryptoLocker, Flashback are some examples of Viruses.
- The Elk Cloner virus was the first self-replicating computer program to spread on a large scale. It was created by a 15-year-old Rich Skrenta in 1982.
- Ryuk, Troldesh are a ransomware family of newly discovered viruses.

Computer Worm

- A computer worm is a malicious, self-replicating software program (malware) which affects the functions of software and hardware programs.
- Stuxnet is the most famous computer worm.

Ransomware

- Ransomware is a type of malware program that infects and takes control of a system.
- It infects a computer with the intention of extorting money from its owner.

Botnet

- Botnet is a set of networks connected to computers/devices that are used for malicious purposes.
- Each computer in a botnet is called Bot. It is also known as Zombie.

Trojan horse

- It is a type of malware that presents itself as legitimate software.
- It may perform actions on a computer that is genuine but will install malware actions.

Keylogger

- A keylogger is a type of malware that stores all keystrokes of a computer.
- It can record all sorts of personal information, such as usernames, passwords, credit card numbers, and personal documents such as emails and reports.
- Virtual Keyboards are guard against this type of attack.

Rootkit

- A rootkit is a secret computer program designed to provide continued access to a computer while actively hiding its presence.
- Rootkits are associated with malware such as Trojans, worms, viruses.

Spyware

- Spyware is a software that is installed on a computing device without the end user's knowledge.
- It steals internet usage data and sensitive information such as usernames and passwords, activating the microphone or camera on a computer to record physical activity.

Adware

- Adware is unwanted software designed to display advertisements on the computer screen to generate income.
- This type of ads cannot be removed easily.

Phishing

- Phishing is a cyber-attack that used to steal user data, including login credentials and credit card numbers.
- They use email as a weapon and trick the email recipient into believing that the message is received from real companies such as banks, Amazon etc to harvest the recipient's details. Email Phishing, Spear Phishing (targets special person/organization) are techniques of Phishing.

Information and Communication Technology (ICT) is building a Digital Revolution in India. The Government of India is also round the clock working for the utilization of benefits of ICT in the governance model. E-Governance is a new way of as ICT helps to simplify tasks, make the government processes more efficient and the delivery of government services more effective. It also can improve citizen participation in governance.

E-Governance in India has steadily evolved from computerization of Government Departments to initiatives that promote citizen centricity, service orientation and transparency.

The concepts in e-governance include,

- Management Information System (MIS) – refers to the processing of information through computers and other intelligent devices to manage and support managerial decisions within an organization
- Decision Support System (DSS) – for development, planning and responsive administration in governments which led to the genesis of present-day "e-Government" concept
- Bridging the Digital Divide
- Social and Financial Inclusion through ICT

- Reaching- the-Unreached

Government Schemes

- Many States/UTs have started various e-Governance projects. Though these e-Governance projects were citizen-centric, they could make less than the desired impact.
- A government of India launched the National e-Governance Plan (NeGP) in 2006. 31 Mission Mode Projects covering various domains were initiated.
- Despite the successful implementation of many e-Governance projects across the country, e-Governance as a whole has not been able to make the desired impact and fulfill all its objectives.
- It has been felt that a lot more thrust is required to ensure e-Governance in the country promotes inclusive growth that covers electronic services, products, devices and job opportunities. Moreover, electronic manufacturing in the country needs to be strengthened

Digital India : In order to transform the entire ecosystem of public services through the use of information technology, the Government of India has launched the Digital India programme with the vision to transform India into a digitally empowered society and knowledge economy. ICTs can positively contribute to the growth of the economy, employment and productivity.

The Digital India programme is centered on three key vision areas:

- Digital Infrastructure
- Governance & Services
- Digital Empowerment of Citizens

Pro-Active Governance and Timely Implementation (PRAGATI) platform:

- Is a multi-purpose and multi-modal platform
- The platform is aimed at addressing common man's grievances, and simultaneously monitoring and reviewing important programmes and projects of the Government of India as well as projects flagged by State Governments.
- The PRAGATI platform uniquely bundles three latest technologies: Digital data management, video-conferencing and geo-spatial technology
- It is a three-tier system (PMO, Union Government Secretaries, and Chief Secretaries of the States)
- Prime Minister will hold a monthly programme where he will interact with the Government of India Secretaries, and Chief Secretaries through Video-conferencing enabled by data and geo-informatics visuals
- The system has been designed in-house by the PMO team with the help of National Informatics Center (NIC).

National Informatics Centre (NIC):

Has emerged as a "prime builder" of e-Government / e-Governance applications up to the grassroots level. The activities are

- Setting up of ICT Infrastructure
- Implementation of National and State Level e-Governance Projects
- Products and Services
- Consultancy to the government departments
- Research and Development
- Capacity Building

Has taken up various initiatives like Government eProcurement System(GePNIC), Office Management Software (eOffice), Hospital Management System (eHospital), Government Financial Accounting Information System (eLekha), etc.

NIC is supporting a majority of the mission mode e-Governance projects.

The National e-Governance Plan (NeGP)

NeGP was approved in 2006 to take a holistic view of e-governance initiatives across the country, integrating them into a collective vision. As result,

- massive countrywide infrastructure reaching down to the remotest of villages is being developed
- large-scale digitization of records is taking place

NeGP comprises 31 mission mode projects (MMPs), which are further classified as a state, central or integrated projects. Each state government can also define five MMPs specific to its individual needs.

- Most of these projects have been made operational and have started providing services.
- However, e-governance as a whole has not been able to make the desired impact
- The availability of electronic government services to citizens was still low
- Lack of needs analysis, business process re-engineering, interoperability across MMPs, and coping with new technology trends (such as mobile interfaces, cloud computing) were some of the limitations

This has led to the adoption of a new plan e-Kranti or NeGP 2.0

<u>e-Kranti / NeGP 2.0</u>

e-Kranti was approved in 2015 with the vision of “Transforming e-Governance for Transforming Governance”. e-Kranti is an important pillar of the Digital India programme. The approach and methodology of e-Kranti are fully aligned with the Digital India programme.

There are 44 Mission Mode Projects under the e-Kranti programme.

- A mission mode project (MMP) is an individual project within the National e-Governance Plan (NeGP) that focuses on one aspect of electronic governance, such as banking, land records or commercial taxes etc.
- The projects have clearly defined objectives, scopes, and implementation timelines and milestones, as well as measurable outcomes and service levels.

Digital Initiatives in Information and Communication Technology

- The digital revolution in India in recent times has evolved every sphere of life, and higher education is also not untouched by it. The government has taken various initiatives, specifically by the ministry of human resource and development (MHRD) to promote and spread digital education.
- The primary aim is to increase the gross enrolment ratio (GER) to 30 by 2022. The initiatives like SWAYAM, Swayam Prabha, National Digital library (that contains around 7 million books), The National Academic Depository (containing and storing all the academic records of any individual) etc. are few of the recent initiatives by the government.
- The technological development has many benefits, most important being surpassing the brick and mortar structure and the need for the teacher to be physically present with the students at the same time making quality education reach the masses.
- The use of technology is imperative due to many reasons, few among them are:-

1. High quality
2. Affordable
3. Quicker access
4. Wide reach
5. Bridging the rural-urban divide
6. Ending the gender bias
7. Use of internet

Below are the few important initiatives in recent times that focus on digital education and the twin principles of accessibility and affordability are:-

1. National Programme on Technology Enhanced Learning (NPTEL): It is a mission by the seven Indian Institutes of Technology (Bombay, Delhi, Kanpur, Madras, Guwahati and Roorkee) and IISc in 2003. The primary objective of this mission was to develop courses for core subjects in engineering. At present, we have Phase II of

NPTEL running (2009-2014). It now has more than 600 video courses with 471+ million views.

2. National Mission on Education through Information and Communication Technology(NMEICT): It is a centrally sponsored scheme which was launched to realise the potential of ICT in research.

The T10kT project at IIT Bombay permits thousands of teachers to benefit from this program. The use of an online and blended approach allows participants to complete a significant part of their training online, thus reducing the time which is usually spent on face-to-face interaction.

A-View software has been developed under the program for teacher's training. The universities have been provided with 1 Gbps connectivity and colleges have been connected through VPN.

There is an N-list program of INFLIBNET, that provides lakhs of e-books and high quality paid e-journals to the colleges and research institutes. The main aim is to inculcate research culture in the students.

3. SWAYAM:

- It is a programme initiated by the Government of India and designed to achieve the three aims of the Education Policy that are, access, equity and quality.
- The objective of this effort is to take the best available teaching-learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for the students who are untouched by the digital revolution. There are four important parts of Swayam namely video lectures, specially prepared reading material that can be downloaded/printed, self-assessment tests through tests and questionnaires and finally an online discussion forum for clearing the doubts of the students.

4. E- Kalpa: this is the digital learning environment for Design in India. A full-fledged digital design resource database has been created under it for crafts along with the social networking and collaborative learning space for design.

5. National Academic Depository: it is an MHRD initiative for keeping, issuing and accessing the academic awards issued by the academic institutions. It is an initiative toward the government aim of " Digital India". It removes the need to physically carry academic records like degree, certificates and diplomas. The employer can access the documents when and where required with due permissions.

6. e- Shodh Sindhu: Under this initiative, International electronic journals and e-books are made available to all the higher education institutions. The concept of equality and accessibility to quality resources is the main aim here.

7. SWAYAM Prabha- This is a subcategory of the SWAYAM portal which consists of 32 educational DTH channels. Several high-quality education programs are telecasted 24*7 through this channel. It is transferred through GSAT-15 satellite. There is a new content generated every day of 4- hours and which is repeated five times a day.

8. e- Yantra: This comes under the NMEICT with the aim to include Robotics into the engineering curriculum. It creates projects to train teachers and require good knowledge of mathematical knowledge.

9. Talk to a teacher: It is an initiative by IIT Bombay, which is funded by MHRD. It provided free access to many graduates and postgraduate courses. The collaboration tool is developed by the Amrita University for virtual classrooms across the country.

10. National Digital Library (NDL): This program deals with the building and integrating of all the libraries across India, to build a national asset. It is developed by IIT- Kharagpur under NMEICT by MHRD. More than 72 lakh digital books are available through the NDL.

11. e- Acharya: called " Integrated e-content portal of NMEICT, is the official repository of all the content produced and is put under the Repository platform at INFLIBNET centre Gandhinagar.

These are some of the initiatives under the digital programs launched by the government of India. The aim of all of these is to provide quality education to everyone in the country without any barrier of place, age or finance.

Application of Information and Communication Technology (ICT) in Research

- Revolutionising Information and Communication Technologies (ICT's) remains the top agenda of many developing countries including India. Much stress has been made to facilitate the application of ICT's in developmental planning and research. Application of ICTs in higher education and research is seen as another potent and convincing paradigm for development in developing countries.
- Despite its polemic nature, ICTs have undoubtedly impacted the teaching and learning process in a positive manner. Human beings have an advanced skill that allows them to share knowledge with others and the use of ICTs to make this transfer and sharing of knowledge all more interesting is, indeed, praiseworthy. ICTs enhance our access to knowledge as well as act as a supplement of knowledge that we gather through traditional sources. In this post, we will focus more on the application of ICTs in academic research at the universities.

1. Broadly, there are three levels where ICTs have made a mark on academic research namely:

(a). Level 1: Pre-Data Analysis Phase

1. Role of ICTs in Pre-Data Analysis Phase: This includes the application and use of ICT tools during the research process before one reaches the data analysis phase. It is quite appalling to observe the ways in which technological tools can be used to achieve the pre-data analysis research goals. Undeniably, computers and the internet have made a remarkable impact in this area. Some of the ways in which ICT can be used during the pre-data analysis phase are:

- ICT's can be very helpful for the literature review of any topic in any discipline. The college libraries have adequate material to help research scholars for writing a dissertation; yet to incorporate the fast-paced global changes into one's writing and literature review, the internet is highly reliable.
- Some universities have e-library (digital library) access as well. This saves time and effort for the researchers to travel back and forth between two spaces.
- Portals like e-Gyankosh, JStor, Google Scholar, ShodhGanga, Microsoft Academic Search etc. are very helpful to do a rich literature review. There are several other online repositories of multi-disciplinary literature such as SSRN, EPW, and Encyclopaedia Britannica among others.
- ICT tools are helpful for the process of data collection. Surveys can be done online using Google forms. To conduct a large scale study, tools like survey monkey and Qualtrics are very helpful. These tools help to accommodate questions based on conditions, logic and do experiment trials.
- Software like Mendeley is very useful for the purpose of the literature track. Mendeley helps to manage, share and find literature content. Such a thing was not possible in the past.
- Microsoft Word also has features that help to manage content and dissertation writing. Many college professors ask for write-ups and data via email. They send back reviewed files to the scholars with suggested changes and suggestions. The 'track changes' feature in MS-Word saves time and effort of both researchers and mentors in terms of avoiding unnecessary meetings.
- Features like Google translator have profound value for international students and students coming from regions where different language or dialects are spoken.
- There are mobile applications that allow scholars to connect and share knowledge with each other.

(b). Level 2: Data Analysis Phase

2. Role of ICTs in Data Analysis Phase: The role of ICT's during data analysis is immense. It can be very useful for qualitative as well as quantitative data analysis.

- Quantitative data analysis: involves varied techniques such as regression models, t-test, analysis of variance, path analysis, hierarchical regression analysis, linear modelling etc. All this requires using a huge database collected at national and state levels. Some statistical software that helps is STATA, SPSS (Statistical Package for Statistical Computing), MATLAB (The Mathworks), R (R Foundation for Statistical Computing), SAS (Statistical Analysis Software), and GraphPad Prism among others. Such software makes it quite easy to run regressions and make data analysis more comprehensive for the researcher as well as a general audience.
- Qualitative data analysis: also makes use of several ICT tools. Tools like recorders have proved to be very valuable for keeping all the information stored collected at the time of multiple interview schedules. Recorders make it super easy for the ethnographers to listen to the interviews. In terms of storing information, software like Google Drive, Dropbox etc. are very helpful. These give access to multiple parties including the researcher, mentors, academic friends etc. To make qualitative data more scientific and objective, data analysis tools like ATLAS.ti, SPSS Text Analysis, NVivo, Transana (used for video transcribing) etc. are widely used.

(c). Level 3: Post Data Analysis Phase

3. Role of ICTs in Post-data analysis Phase: Once the data has been collected and the data analysis process is over, ICTs can be applied in the post-data analysis phase as well. Some of the ways in which ICTs can be used during the post-data analysis phase are:

- ICTs such as a computer, internet, online journals, newspaper etc. are a good platform to share findings with academia as well as the general audience. A lot of policy decisions are made in accordance with the new and worthwhile findings made by individual researchers in various fields. An online journal such as Economic and Political Weekly, The Social Science, Idea for India, ScienceOpen are good mediums for getting one's work published.
- There are collaborative writing tools (Typewrite, Upwork) that are widely used in cases when several researchers wish to write and combine studies.
- In terms of bibliography and referencing, ICT tools like advanced versions of Microsoft Office Packages are very useful.

- ICT's have proved to be very useful for the purpose of plagiarism checks as well. Some tools used for this are Plagiarism Checker, Anti Plagiarism, Plagiarisma, so on and so forth.

National Supercomputing Mission

- Launched in 2014
- It aims to empower national academic and R&D institutions by installing a vast supercomputing grid comprising more than 70 high-performance computing facilities.
- The mission is jointly implemented by the Ministry of Electronics and IT and Department of Science and Technology along with C-DAC and IISc as executing agencies.
- Under this mission, Param Shivay- first Supercomputer is installed in IIT (BHU).

What are supercomputers?

- It is a computer with a high level of performances compared to a general-purpose computer.
- Performance is measured in FLOPS (floating-point operations per second).
- Its applications areas are Climate Modelling, Computational Biology, Atomic Energy Simulations, national Securing, Disaster management, Big Data analytics etc.

Top-500 Project

- It ranks the 500 most powerful non-distributed computers in the world.
- It was started in 1993.
- China is at the top with 229 supercomputers and USA is at second with 121 supercomputers.
- In the Top-500 list, India has 4 supercomputers with Pratyush and Mihir being the fastest supercomputers in India.

Difference between LTE and VOLTE

- LTE stands for 'Long Term Evolution'.
- LTE is also called 4G.
- In this, the internet runs at 4G speed on your smartphone.
- But, the internet and calling don't work at the same time.
- This issue was resolved by VOLTE.
- Airtel launched the first LTE network service in India in 2012.
- VoLTE stands for 'Voice over Long Term Evolution
- It supports Calling and Internet Connectivity together.
- It was launched by JIO in India in 2016.

Wifi

- The term wifi stands for wireless fidelity.
- It uses radio transmission technology.
- It allows high speed and secure communication between a wide variety of digital services, access points and hardware.
- They transmit at a frequency of 2.4 GHz or 5 GHz.

Radio-Frequency Identification (RFID)

- In this, radio waves are used to capture and read information stored on a tag attached to an object.
- A tag can be read from up to several feet away and does not need to be within direct line-of-sight of the reader to be tracked.
- Most recent use is in FASTag for ease of payment at toll both.

Ransomware

- It infects computers in a network and encrypts files on these computers.
- Then the hackers demand ransom to recover these files.
- Recently, IT service provider Cognizant had faced a Maze Ransomware attack.
- In 2019, Kaspersky security, a global cybersecurity firm, identified three prominent ransomware- Ryuk, Purga and Stop.

Pegasus

- It is a mobile spyware developed by Israeli cyber firm.
- Once invaded in Android and iOS platforms, it could have complete access to the data on the victim’s phone.

Cryptocurrency

- It is a type of digital currency that uses cryptography for security.
- The control of each cryptocurrency works through distributed ledger technology called a blockchain.
- It is not issued by the government in India.
- China is testing its digital currency “Digital Currency Electronic Payment, DC/EP”.
- RBI banned cryptocurrency in India, but recent supreme court judgement removed the ban.
- Examples of cryptocurrency- Bitcoin, Ethereum, Ripple etc.